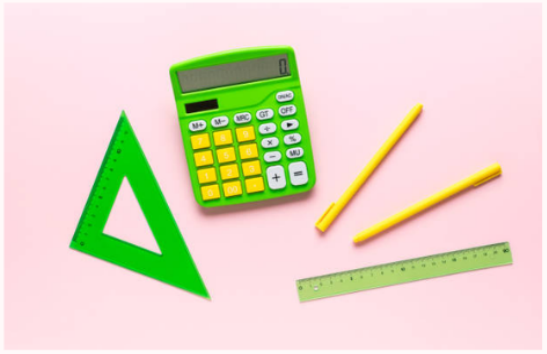
KENDRIYA VIDYALAYA SANGATHAN

तत् त्वं पूषन् अपावृणु
केन्द्रीय विद्यालय संगठन

CBA TEST ITEMS

MATHEMATICS

CLASS 9



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DIRECTOR'S MESSAGE……

It is with profound delight and utmost pride that we present the Competency Based Assessment question bank for **CLASS 9** which was prepared by TGT(Mathematics) of the feeder regions during the 03 – day workshop on "**Competency Based Assessment in Mathematics: Design of test items**" It's my firm belief that access to quality education should know no boundaries, transcending social and economic constraints. Our collective vision is to empower all students and teachers with the tools for success and intellectual growth.

With their steadfast dedication, the TGT(Mathematics) from the feeder Regions namely Bangalore, Chennai, Ernakulam and Hyderabad have invested their knowledge and expertise in preparation of the CBA test items.

It is with pleasure that I place on record my commendation for the commitment and dedication of the team of TGT(Mathematics) from the four Regions, Shri. Siby Sebastian, Principal KV INS Dronacharya, Kochi, Ernakulam Region & Associate Course Director, the Resource persons Mr. M. S. Kumar Swamy, TGT(Maths), KV Gachibowli, Hyderabad & Ms P S Kavitha, TGT(Maths), K V DRDO Bengaluru and Mr. D. Sreenivasulu, Training Associate (Mathematics) from ZIET Mysore who has been the Coordinator of this assignment.

Wishing you all the very best in your academic journey!

MENAXI JAIN
DIRECTOR
ZIET MYSURU

Contributors.....

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1	MS. DEEPA K. TGT (MATHS)	PM SHRI KV HEBBAL BENGALURU	• SURFACE AREA AND VOLUMES
2	MR. SUMIT BHARDWAJ TGT (MATHS)	KV ARUVANKADU CHENNAI	• NUMBER SYSTEM • COORDINATE GEOMETRY
3	MR. PRADEEP KUMAR TGT (MATHS)	KV VIRUDHUNAGAR CHENNAI	• POLYNOMIALS • LINEAR EQUATION IN TWO VARIABLES
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INDEX

Note: DESCRIPTION OF ASSESSMENT OBJECTIVE

AO1	Demonstrate knowledge and understanding of mathematical ideas, techniques and procedures
AO2	Apply knowledge and understanding of mathematical ideas, techniques and procedures to classroom and real-world situations

CHAPTER -1 : NUMBER SYSTEMS

MULTIPLE CHOICE QUESTIONS

Q1) On simplifying $(36)^{3/2}$, we get

a) 36 b) 6 c) 216 d) 72 (AO1)

Q2) Which of the following rational number is equivalent to a decimal that terminates?

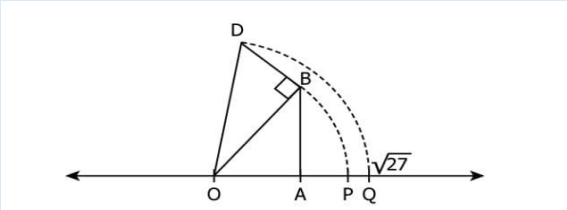
a) $\frac{1}{3}$ b) $\frac{3}{8}$ c) $\frac{5}{6}$ d) $\frac{8}{9}$ (AO1)

Q3) An expression is given : $2(\sqrt{k}-1) + \sqrt{8}$

If on adding $-8\sqrt{2}$ to the expression results in a rational number, what is the value of k?

a) 6 b) 12 c) 18 d) 36 (AO2)

Q4) Kevin's work to represent 27 on a number line is shown. In the number line, arc DQ is drawn using OD as radius.



Looking at Kevin's work, Tina and Ajay made the following statements

Tina: OA = 5 units, AB= BD = 1 unit

Ajay : OB = $\sqrt{26}$ units , AB = 1 unit (AO2)

Who is correct ?

a) Only Tina b) Only Ajay c) Both of them d) Neither of them

Q5) Every point on a number line (AO2)

a) Can be associated with a rational number.
b) Can be associated with a irrational number.
c) Can be associated with a natural number.
d) Can be associated with a real number.

Q6) The decimal expansion of the number $\sqrt{3}$ is (AO2)

a) A finite decimal
b) 1.732
c) Non-terminating recurring
d) Non-terminating non-recurring

Q7) On simplifying $(\sqrt[3]{x^2})^{\frac{3}{2}}$, we get (AO1)

a) $\sqrt{x}$ b) x^1 c) $x^{\frac{3}{2}}$ d) 1

Q8) The earth has a surface area of approximately 510100000 km^2 . Express this in SI units (in square m) (AO2)

a) 5.101 x 10^{14} m^2 b) 5.101 x 10^{11} m^2 c) 5101 x 10^{11} m^2 d) 5.101 x 10^8 m^2

ASSERTION AND REASON QUESTIONS

Direction : In the following questions as statement of assertion(A) is followed by a statement of reason(R) . Mark the correct choice as:

a) Both assertion(A) and reason(R) are true and reason (R) is the correct explanation of assertion(A).
b) Both assertion (A) and reason (R) are true but reason(R) is not the correct explanation of assertion (A).
c) Assertion(A) is true but reason (R) is false.
d) Assertion(A) is false but reason (R) is true.

Q9) Assertion(A) : Rational number lying between two rational numbers x and y is $\frac{x+y}{2}$.

Reason (R) : There are infinitely many rational numbers between any two rational numbers. (AO2)

Q10) Assertion(A) : Sum of two irrational numbers 5 + √3 and 4 + √3 is a rational number .

Reason (R) : Sum of two irrational numbers can be rational/irrational number. (AO1)

Q11) Assertion(A) : The number 4.01001000100001…….. is a irrational number..

Reason (R) : Decimal representation of rational numbers cannot be non-terminating non-repeating. (AO2)

Q12) Assertion(A) : $2^3 \times 2^{\frac{2}{5}} = 2^{\frac{17}{5}}$ (AO1)

Reason (R) : Exponents can be added if base is same in product of numbers.

2 MARKS QUESTIONS

Q13) Rohit asked two of his friends that two numbers are given in the ratio of $2\sqrt{3} : 5\sqrt{3}$. If HCF of these two numbers is 3. Find out the numbers. (AO2)

Q14) Simplify $\sqrt[4]{81} - 8(\sqrt[3]{216}) + 15(\sqrt[5]{32}) + \sqrt{225}$ (AO2)

Q15) Nakul was thinking how to solve $[1^3 + 2^3 + 3^3 + 4^3 + 5^3]^{\frac{1}{2}}$.

How will you help him in solving this. (AO2)

Q16) Simplify $\sqrt{5\sqrt{5\sqrt{5\sqrt{5}}}}$ ... ... (AO2)

Q17) Find the rational number of the form $\frac{p}{q}$ corresponding to the decimal representation

0.22222….., where p and q are integers and q ≠ 0. (AO1)

3 MARKS QUESTIONS

Q18) In the following equations, examine whether x, y and z represents rational or irrational number.

i) $x^3 = 27$
ii) $y^2 = 7$
iii) $z^2 = 0.16$ (AO2)

Q19) Find the value of a and b if $\left(\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)^2 = a + b\sqrt{3}$. (AO2)

Q20) If $x + \frac{1}{x} = \sqrt{3}$, then the value of $x^3 + \frac{1}{x^3}$. (AO2)

Q21) Prove that $\frac{1}{3-\sqrt{8}} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-2} = 5$ (AO1)

Q22) Sumit have $\left\{\left[(625)^{-\frac{1}{2}}\right]^{-\frac{1}{4}}\right\}^2$ number of chocolates and Ujjwal have $64^{-\frac{1}{3}}\left[64^{\frac{2}{3}} - 64^{\frac{1}{3}}\right]$ number of chocolates. Find out who is having more. (AO2)

5 MARKS QUESTIONS

Q23) Rohan says " I have money in the powers of 2 as 2^a " , Radhika told she has money in the powers of 3 as 3^b and Rahul says " I have money as lcm of (2,3) raised to power of c" . Interestingly, all of them have the same amount of money, then prove that relation between a, b and c is given by $c = \frac{ab}{a+b}$. (AO2)

Q24) Express 1.323232….. + 0.353535…. as a fraction in simplest form (AO1)

Q25) Luckshay was drinking cold drink using cylindrical can whose radius is $\left[\left(2+\sqrt{3}\right)^2 - 4\sqrt{3}\right] cm$ and height is given by $\left[\frac{1}{2+\sqrt{3}} + \sqrt{3}\right] cm$. He tried to find out its volume.

Prove that the volume of can is a irrational number. (AO2)

CASE BASED QUESTION (4 MARKS EACH)

Q26) Mr. Roy, a Mathematics teacher explained some key points of unit 1 of class IX to his students. Some are given here.

- There are infinite rational numbers between any two rational numbers.
- Rationalisation of a denominator means to change the irrational denominator to rational form.
- A number is irrational if its decimal form is non-terminating non-recurring.

On the basis of these key points, he asked the following questions to class. Can you help the class to solve these questions.

i) What is the reciprocal of $4 - \sqrt{15}$ with rational denominator? (1) (AO2)

ii) Is 2.201200120001…… a rational number? Give reasons. (1) (AO2)

iii) A vehicle started from point A with speed as a irrational number $50\sqrt{2}$ km/hr to reach point B. Distance between points A and B is given by a rational number 350km . Tell whether the time will be given by a rational number or irrational number. Given reasons. (2) (AO2)

Q27) Two girls were playing with numbers to test each others concept by asking each other riddles with numbers.

Rohini says " A number x when raised to the power 5 of its 5^{th} root, multiplied to its 5^{th} root and the resultant is again multiplied to its power raised to $\frac{4}{5}$ then the result is 25."

Mohini says " A number y is raised to the power $\frac{-4}{5}$ and then the new number's 5^{th} root is raised to the power $\frac{-5}{4}$ and the resultant is raised to the power 5. The result comes out to be 5"

Based on the above information answer the following questions:

i) What can be the possible solutions of Rohini's riddle? (2) (AO2)

ii) What is the algebraic equation of Mohini's riddle ? (1) (AO2)

iii) Is x = y if both x and y are natural numbers? (1) (AO2)

Q28) Ajay is on a road trip in his car. He starts his trip on a road at point A and covers a distance of ($x + \frac{1}{x}$) km in the first lap and reaches the destination B. Then he comes back on the same road for a distance of 5($x + \frac{1}{x}$) km to reach destination C.

If the journey in the direction of AB is taken as positive and $x = \frac{(5+\sqrt{21})}{2}$ km, then answer the following questions based on this information.

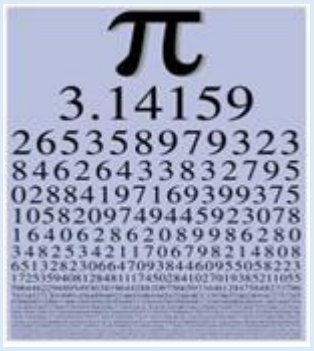
i) How much distance did he travel in the first trip? (2) (AO2)
ii) How much distance did he travel in the second trip? (1) (AO1)
iii) How far is he from the starting point ? (1) (AO1)

Q29) Games are necessary for health and proper development of body. In residential societies also, clubs are there to keep the people fit and healthy according to their interest. In "Vinayaka society" there are 99 flats in which some of the flats have senior citizens who do not participate in club activities and do not give any fund for it. In 76 of the flats, 15.75% people have chose badminton as their activity, remaining have their interest in cricket. On the basis of above information answer the following questions:

i) What is the decimal form of flats which are not giving any funds and not joined any club? (2) (AO2)
ii) What will be $\frac{p}{q}$ form of people who are having interest in cricket ? (2) (AO2)

Q30) Yuvan was playing with circular disc. While playing he got an idea to measure the circumference and diameter of disc using compass and measuring tape. He measured the circumference and diameter and then divided circumference by diameter. He noticed that value is coming out to be approximately equal to 3.14159265359…….

Then he followed the same experiment with other circular objects and noticed the same result. But he was confused because teacher told that $\frac{circumference}{diameter} = \pi$ whose value is $\frac{22}{7}$.



Based on the above information, he asked the following doubts to his friends which you have to give answers:

i) Write the decimal form of $\frac{22}{7}$. (1) (AO1)

ii) Write the value of π using given information (1) (AO1)

iii) Analyse the situation and tell whether π and $\frac{22}{7}$ are same. If no, which is rational and which is irrational and why ? Explain your answer. (2) (AO2)

SOLUTIONS OF CHAPTER-1: NUMBER SYSTEMS

MULTIPLE CHOICE QUESTIONS

Sol 1 : c) 216

Sol 2 : b) $\frac{3}{8}$

Sol 3 : c) 18

Sol 4 : c) Both of them

Sol 5 : d) Can be associated with a real number.

Sol 6 : d) Non-terminating non-recurring.

Sol 7 : b) x^1

Sol 8 : a) 5.101 x 10^{14} m^2

ASSERTION AND REASON QUESTIONS

Sol 9 : a) Both assertion(A) and reason(R) are true and reason (R) is the correct explanation of assertion(A).

Sol 10 : d) Assertion(A) is false but reason (R) is true.

Sol 11 : a) Both assertion(A) and reason(R) are true and reason (R) is the correct explanation of assertion(A).

Sol 12 : a) Both assertion(A) and reason(R) are true and reason (R) is the correct explanation of assertion(A).

2 MARKS QUESTIONS

Sol 13 : Let the two numbers be $2\sqrt{3}x$ and $5\sqrt{3}x$

A.T.Q HCF ($2\sqrt{3}x$, $5\sqrt{3}x$) = 3

$\sqrt{3}x = 3$

$x = \sqrt{3}$

So the numbers are first number = $2\sqrt{3}x = 2\sqrt{3} \times \sqrt{3} = 6$

Second number = $5\sqrt{3}x = 5\sqrt{3} \times \sqrt{3} = 15$

Sol 14 : $\sqrt[4]{81} - 8(\sqrt[3]{216}) + 15(\sqrt[5]{32}) + \sqrt{225}$

$= \sqrt[4]{3\ x\ 3\ x\ 3\ x\ 3} - 8(\sqrt[3]{6\ x\ 6\ x\ 6} + 15(\sqrt[5]{2\ x\ 2\ x\ 2\ x\ 2\ x\ 2}) + \sqrt{15\ x\ 15}$

$= (3^4)^{\frac{1}{4}} - 8(6^3)^{\frac{1}{3}} + 15(2^5)^{\frac{1}{5}} + (15^2)^{\frac{1}{2}}$

$= 3 - 8\ (6) + 15(2) + 15$

$= 3 - 48 + 30 + 15 = 0$

Sol 15 : $[\ 1^3 + 2^3 + 3^3 + 4^3 + 5^3\ ]^{\frac{1}{2}}$

$= [\ 1 + 8 + 27 + 64 + 125\ ]^{\frac{1}{2}}$

$= (225)^{\frac{1}{2}}$

$= (15^2)^{\frac{1}{2}}$

$= 15$

Sol 16: Let x = $\sqrt{5\sqrt{5\sqrt{5\sqrt{5}}}}$ ... ... ---------- equation 1

Squaring both sides

$x^2 = 5\sqrt{5\sqrt{5\sqrt{5\sqrt{5}}}}$ ... ...

$x^2 = 5x$

$x^2 - 5x = 0$

$x\ (x - 5) = 0$

$x = 0$ or $x = 5$

x cannot be zero because of equation 1

So, $x = 5$

Sol 17 : Let x = 0.222222……..

Here only one digit is repeating

So, Multiplying both sides by 10, we get

$10x = 2.22222\ldots\ldots$

$10x = 2 + 0.22222\ldots..$

$10x = 2 + x$

$10x - x = 2$

$9x = 2$

$x = \frac{2}{9}$

3 MARKS QUESTIONS

Sol 18 : i) $x^3 = 27$

$x = \sqrt[3]{27}$

$x = \sqrt[3]{3\ x\ 3\ x\ 3}$

$x = (3^3)^{\frac{1}{3}}$

$x = 3 = \frac{3}{1}$

So, it is a rational number.

ii) $y^2 = 7$

$y = \sqrt{7}$ $\quad [\neq \frac{p}{q}$, where p and q are integers.]

So, it is not a rational number.

iii) $z^2 = 0.16 = \frac{16}{100}$

$z = \sqrt{\frac{16}{100}} = \sqrt{\frac{4\ x\ 4}{10\ x\ 10}}$

$z = \frac{4}{10} = \frac{2}{5}$

So, it is a rational number.

Sol 19 : Step -1 : First we have to rationalise $\frac{\sqrt{3}-1}{\sqrt{3}+1}$

$$\frac{\sqrt{3}-1}{\sqrt{3}+1} = \frac{\sqrt{3}-1}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1} = \frac{(\sqrt{3}-1)^2}{(\sqrt{3})^2-1^2} = \frac{3+1-2\sqrt{3}}{3-1} = \frac{4-2\sqrt{3}}{2} = \frac{2(2-\sqrt{3})}{2} = \mathbf{2 - \sqrt{3}}$$

Step – 2 : $\left(\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)^2 = \left(2 - \sqrt{3}\right)^2 = 4 + 3 - 4\sqrt{3} = 7 - 4\sqrt{3}$

Step -3 : $\left(\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)^2 = a + b\sqrt{3}$

$7 - 4\sqrt{3} = a + b\sqrt{3}$

Comparing both sides

$a = 7$ and $b = -4$

Sol 20 : Given $x + \frac{1}{x} = \sqrt{3}$

Cubing both sides

$$\left(x + \frac{1}{x}\right)^3 = (\sqrt{3})^3$$

$$x^3 + \frac{1}{x^3} + 3 \cdot x \cdot \frac{1}{x}\left(x + \frac{1}{x}\right) = 3^{\frac{3}{2}}$$

$$x^3 + \frac{1}{x^3} + 3\sqrt{3} = \sqrt{3^3}$$

$$x^3 + \frac{1}{x^3} + 3\sqrt{3} = \sqrt{3\ x\ 3\ x\ 3}$$

$$x^3 + \frac{1}{x^3} + 3\sqrt{3} = 3\sqrt{3}$$

$$x^3 + \frac{1}{x^3} = 3\sqrt{3} - 3\sqrt{3}$$

$$x^3 + \frac{1}{x^3} = 0$$

Sol 21 : $\frac{1}{3-\sqrt{8}} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-2}$

$$= \frac{1}{3-\sqrt{8}} \times \frac{3+\sqrt{8}}{3+\sqrt{8}} - \left(\frac{1}{\sqrt{8}-\sqrt{7}} \times \frac{\sqrt{8}+\sqrt{7}}{\sqrt{8}+\sqrt{7}}\right) + \frac{1}{\sqrt{7}-\sqrt{6}} \times \frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}+\sqrt{6}} - \left(\frac{1}{\sqrt{6}-\sqrt{5}} \times \frac{\sqrt{6}+\sqrt{5}}{\sqrt{6}+\sqrt{5}}\right) + \frac{1}{\sqrt{5}-2} \times \frac{\sqrt{5}+2}{\sqrt{5}+2}$$

$$= \frac{3+\sqrt{8}}{3^2-(\sqrt{8})^2} - \left(\frac{\sqrt{8}+\sqrt{7}}{(\sqrt{8})^2-(\sqrt{7})^2}\right) + \frac{\sqrt{7}+\sqrt{6}}{(\sqrt{7})^2-(6)^2} - \left(\frac{\sqrt{6}+\sqrt{5}}{(\sqrt{6})^2-(\sqrt{5})^2}\right) + \frac{\sqrt{5}+2}{(\sqrt{5})^2-2^2}$$

$$= \frac{3+\sqrt{8}}{3^2-(\sqrt{8})^2} - \left(\frac{\sqrt{8}+\sqrt{7}}{(\sqrt{8})^2-(\sqrt{7})^2}\right) + \frac{\sqrt{7}+\sqrt{6}}{(\sqrt{7})^2-(6)^2} - \left(\frac{\sqrt{6}+\sqrt{5}}{(\sqrt{6})^2-(\sqrt{5})^2}\right) + \frac{\sqrt{5}+2}{(\sqrt{5})^2-2^2}$$

$$= \frac{3+\sqrt{8}}{9-8} - \left(\frac{\sqrt{8}+\sqrt{7}}{8-7}\right) + \frac{\sqrt{7}+\sqrt{6}}{7-6} - \left(\frac{\sqrt{6}+\sqrt{5}}{6-5}\right) + \frac{\sqrt{5}+2}{5-4}$$

$$= 3 + \sqrt{8} - (\sqrt{8} + \sqrt{7}) + \sqrt{7} + \sqrt{6} - (\sqrt{6} + \sqrt{5}) + \sqrt{5} + 2$$

$$= 3 + \sqrt{8} - \sqrt{8} - \sqrt{7} + \sqrt{7} + \sqrt{6} - \sqrt{6} - \sqrt{5} + \sqrt{5} + 2$$

$$= 3 + (\sqrt{8} - \sqrt{8}) + (-\sqrt{7} + \sqrt{7}) + (\sqrt{6} - \sqrt{6}) + (-\sqrt{5} + \sqrt{5}) + 2$$

$$= 3 + 0 + 0 + 0 + 0 + 2$$

$$= 5$$

Sol 22 : Number of chocolates Sumit have $= \left\{\left[(625)^{-\frac{1}{2}}\right]^{-\frac{1}{4}}\right\}^2$

$= (625)^{-\frac{1}{2}\times\left(\frac{-1}{4}\right)\times 2}$

$= (5 \times 5 \times 5 \times 5)^{\frac{1}{4}}$

$= (5^4)^{\frac{1}{4}}$

$= 5^{4\times\frac{1}{4}} = 5$

Number of chocolates Ujjwal have $= 64^{-\frac{1}{3}}\left[64^{\frac{2}{3}} - 64^{\frac{1}{3}}\right]$

$= (4^3)^{-\frac{1}{3}}\left[(4^3)^{\frac{2}{3}} - (4^3)^{\frac{1}{3}}\right]$

$= 4^{-3\times\frac{1}{3}} \times \left[4^{3\times\frac{2}{3}} - 4^{3\times\frac{1}{3}}\right]$

$= 4^{-1}[4^2 - 4^1]$

$= \frac{1}{4}[16 - 4]$

$= \frac{1}{4}$ x 12 = 3

So , Sumit is having more number of chocolates.

5 MARKS QUESTIONS

Sol 23 : Let $2^a=3^b=6^c=k$,

then

$2 = k^{1/a}$, $3 = k^{1/b}$ and $6= k^{1/c}$

Now,

2 x 3=6

$k^{1/a}$ x $k^{1/b} = k^{1/c}$

$k^{1/a + a/b} = k^{1/c}$

$\frac{1}{a} + \frac{1}{b} = \frac{1}{c}$

$\frac{a+b}{ab} = \frac{1}{c}$

Taking reciprocal both sides

$c = \frac{ab}{a+b}$

Sol 24 : Let x = 1.32323232…. and y = 0.35353535…..

Consider x = 1.32323232…….

Since, two digits are repeating

So, Multiplying by 100 both sides

100x = 132.32323232…….

$100x = 131 + 1.32323232\ldots\ldots$

$100x = 131 + x$

$100x - x = 131$

$99x = 131$

$x = \frac{131}{99}$

Now, consider $y = 0.35353535\ldots\ldots$

Since, two digits are repeating

So, Multiplying by 100 both sides

$100y = 35.353535\ldots\ldots$

$100y = 35 + 0.35353535\ldots\ldots$

$100y = 35 + y$

$100y - y = 35$

$99y = 35$

$y = \frac{35}{99}$

Now,

$1.323232\ldots.. + 0.353535\ldots. = x + y = \frac{131}{99} + \frac{35}{99} = \frac{131+35}{99} = \frac{166}{99}$

Sol 25 : Let radius of cylindrical can be r and height be h

$r = \left[\left(2+\sqrt{3}\right)^2 - 4\sqrt{3}\right]$cm and $h = \left[\frac{1}{2+\sqrt{3}} + \sqrt{3}\right]$cm

$r = [2^2 + \left(\sqrt{3}\right)^2 + 2(2)\left(\sqrt{3}\right) - 4\sqrt{3}\,]$cm and $h = [\,\frac{1}{2+\sqrt{3}} \times \frac{2-\sqrt{3}}{2-\sqrt{3}} + \sqrt{3}\,]$cm

$r = [\,4 + 3 + 4\sqrt{3} - 4\sqrt{3}\,]$cm and $h = [\,\frac{2-\sqrt{3}}{2^2-\left(\sqrt{3}\right)^2} + \sqrt{3}\,]$cm

$r = 7$cm and $h = [\,\frac{2-\sqrt{3}}{4-3} + \sqrt{3}\,]$cm

and $h = [\,2 - \sqrt{3} + \sqrt{3}\,]$cm

and $h = 2$ cm

Volume of cylindrical can = $\pi r^2 h$

$= \pi$ x r x r x h

$= \pi$ x 7cm x 7cm x 2cm

$= 98\ \pi\ cm^3$

Since, 98 is a rational number and π is an irrational number.

Therefore, Volume = 98 π is an irrational number because multiplication of rational number and irrational number is always an irrational number.

CASE BASED QUESTION (4 MARKS EACH)

Sol 26 : i) Reciprocal of $4 - \sqrt{15} = \frac{1}{4-\sqrt{15}} \times \frac{4+\sqrt{15}}{4+\sqrt{15}}$

$$= \frac{4+\sqrt{15}}{4^2-(\sqrt{15})^2} = \frac{4+\sqrt{15}}{16-15} = \frac{4+\sqrt{15}}{1} = 4 + \sqrt{15}$$

ii) No, 2.201200120001…… is not a rational number because decimal form of rational numbers is either terminating or non-termination recurring but it is non-terminating non-recurring.

iii) Distance between points A and B = 350km

speed of vehicle $= 50\sqrt{2}$ km/hr

Time taken by vehicle to go from point A to point B $= \frac{distance}{speed}$

$$= \frac{350\ km}{50\sqrt{2}\ km/hr}$$

$$= \frac{7}{\sqrt{2}} \text{ hr}$$

$$= \frac{7}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} \text{ hr} = \frac{7\sqrt{2}}{2} \text{ hr}$$

Since, $\frac{7}{2}$ is a rational number and $\sqrt{2}$ is an irrational number and we know that product of rational number and irrational number is always an irrational number .

Therefore, time $= \frac{7\sqrt{2}}{2}$ is an irrational number.

Sol 27 : i) Possible solutions of Rohini's riddle will be given by

$$[\left(x^{\frac{1}{5}}\right)^5 \times x^{\frac{1}{5}}] \times x^{\frac{4}{5}} = 25$$

$$\left[x^1 \times x^{\frac{1}{5}}\right] \times x^{\frac{4}{5}} = 25$$

$$x^{\frac{6}{5}} \times x^{\frac{4}{5}} = 25$$

$$x^{\frac{10}{5}} = 25$$

$$x^2 = 25$$

$$x^2 - 5^2 = 0$$

$$(x+5)(x-5) = 0$$

$$x + 5 = 0 \quad or \quad x - 5 = 0$$

$$x = -5 \quad or \quad x = 5$$

ii) Algebraic equation of Mohini's riddle will be given by

$$\left\{\left(\left(y^{-\frac{4}{5}}\right)^{\frac{1}{5}}\right)^{-\frac{5}{4}}\right\}^{5} = 5$$

$$\left(y^{-\frac{4}{5}\times\frac{1}{5}}\right)^{-\frac{5}{4}\times 5} = 5$$

$$y^{-\frac{4}{25}\times\left(\frac{-25}{4}\right)} = 5$$

$$y = 5$$

iii) If x and y are natural numbers, then x = y = 5.

Sol 28 : we have $x = \frac{5+\sqrt{21}}{2}$

So, $\frac{1}{x} = \frac{2}{5+\sqrt{21}}$

$= \frac{2}{5+\sqrt{21}} \times \frac{5-\sqrt{21}}{5-\sqrt{21}}$ [Rationalising denominator]

$= \frac{2(5-\sqrt{21})}{5^2-(\sqrt{21})^2}$

$= \frac{2(5-\sqrt{21})}{4}$

$= \frac{5-\sqrt{21}}{2}$

Now

$(x + \frac{1}{x}) = \frac{5+\sqrt{21}}{2} + \frac{5-\sqrt{21}}{2}$

$= \frac{5+\sqrt{21}+5-\sqrt{21}}{2}$

$= \frac{10}{2}$

$= 5$

i) Distance travelled from point A to point B (first trip) = $(x + \frac{1}{x})$ km
= 5 km

ii) Distance travelled from point B to point C (second trip) = $5(x + \frac{1}{x})$
= 5 x 5km
= 25km

iii) Distance of final point from starting point= $5(x + \frac{1}{x}) - (x + \frac{1}{x})$
= 5 x 5km – 5km
= 25km – 5km
= 20km

Sol 29 : i) Total number of flats = 99

Number of flats giving fund = 76

Number of flats not giving any funds and not joined any club = 99-76 = 23

Fraction of flats not giving any funds and not joined any club = $\frac{23}{99}$

Decimal form of flats not giving any funds and not joined any club = 0.232323…….

ii) In 76 flats, people having interest in badminton = 15.75%

In 76 flats, people having interest in cricket = 100% - 15.75%

= 84.25 %

$\frac{p}{q}$ form of people who are having interest in cricket = 84.25 %

$= \frac{84.25}{100}$

$= \frac{8425}{10000}$

$= \frac{337}{400}$

Sol 30 : i) Decimal form of $\frac{22}{7}$ = 3.142857142857142857……

$= 3 \cdot \overline{142857}$

ii) Value of π = 3.14159265359…….

ii) Value of π and value of $\frac{22}{7}$ is not same.

π is an irrational and $\frac{22}{7}$ is rational number because decimal form of π is non-terminating non-recurring whereas

CHAPTER -2: POLYNOMIAL

MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

Q.1 The polynomial which has degree 1 is known as (AO1)

a) cubic polynomial b) Linear polynomial

c) quadratic polynomial d) bi-quadratic polynomial

Q.2 The expanded form of $(x + y)^2$ is (AO1)

a) x^2+y^2+2xy b)$x^2+y^2 - 2xy$ c)x^2-y^2-2xy d) none of these

Q.3 If xy = 6 and 3x+2y = 12, the value of $9x^2+ 4y^2$ will be (AO2)

a)70 b) 72 c) -72 d) none of these

Q.4 If a+b+c = 10 and $a^2+b^2+c^2$ = 38, the value of $a^3+b^3+c^3$- 3abc (AO2)

a)60 b)79 c) -79 d)70

Q.5. One of the factors of $(25x^2 - 1) + (154 + 5x)^2$ is: (AO1)

a) 5 + x b) 5 – x c) 5x – 1 d) 10x

Q.6 Which of the following options gives the correct value of the polynomial $x^3 - 10x^2 + 3x - 4$ at x = -1? (AO1)

a) -18 b) 10 c) 4 d) 2

Q.7 P(y) = y^2 – y + 1 is a polynomial. The value of P(0) is (AO1)

a) 0 b) 1 c) -1 d)2

Q8. A binomial of degree 20 in the following is (AO2)

a) 20x + 1 b) $x^{20} + 1$ c) $\frac{x}{20} + 1$ d) $x^2 + 20$

Q9. What is the degree of Polynomial $\sqrt{3}$? (AO1)

a) 0 b) 1 c) $\frac{1}{2}$ d) 2

ASSERTION AND REASON QUESTIONS

A statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.
a) Both A and R are true and R is the correct explanation of A
b) Both A and R are true but R is not the correct explanation of A
c) A is true but R is false
d) A is false but R is true

Q.10. Assertion (A) : The factorisation of $z^3 + 125$ is $(z + 5)(z^2 – 5z + 25)$. (AO1)
Reason (R) : We know $x^3 + y^3 = (x + y)^3 + 3xy(x + y)$

Q.11. Assertion (A): The polynomial $p(x) = 4x^3 - 3x^2 + 5x - 6$ when divided by $(x - 1)$ gives zero as the remainder. (AO2)

Reason (R) : $(x - 1)$ is a factor of the polynomial $p(x) = 4x^3 - 3x^2 + 5x - 6$

Q. 12. Assertion (A) : The degree of Polynomial of $(x - 2)(x - 3)(x + 4)$ is 4. (AO1)

Reason (R) : The number of zeros of polynomial is the degree of that polynomial.

Q.13. Assertion (A) : $(x + 1)$ is a linear polynomial. (AO1)

Reason (R) : Linear polynomials have one zero.

2 MARKS QUESTIONS

Q. 14. Find the value of $9x^2 + 4y^2$ if $xy = 6$ and $3x + 2y = 12$. (AO2)

Q. 15. Find the value of the polynomial $5x - 4x^2 + 3$ at $x = 2$ and $x = -1$. (AO1)

Q. 16. Find the value of K if $y + 3$ is a factor of $3y^2 + ky + 6$ (AO1)

Q.17. If $x + \frac{1}{x} = 10$. Find the value of $x^2 + \frac{1}{x^2}$ (AO1)

Q.18. if $x + \frac{1}{x} = 2$. What will be the value of $x^{100} + \frac{1}{x^{101}}$ (AO2)

3 MARKS QUESTIONS

Q.19. Find the value of a and b if $\frac{3+\sqrt{2}}{3-\sqrt{2}} = a + b\sqrt{2}$ (AO1)

Q.20. If $(x - 2k)$ is a factor of $f(x) = x^4 - 4k^2x^2 + 2x + 3k + 3$. Find the value of K. (AO2)

Q.21. Find the remainder when $f(x) = 9x^3 - 3x^2 + 14x - 3$ is divided by $(3x - 1)$. (AO1)

Q.22. Rationalise: $\frac{1}{\sqrt{7}+\sqrt{3}-\sqrt{2}}$ (AO2)

Q.23. By actual division, Find the Quotient and remainder when $3x^4 - 4x^3 - 3x - 1$ is divided by $(x + 1)$ (AO2)

(OR)

What must be added to $(x^3 - 3x^2 + 4x - 13)$ to obtain a polynomial which is exactly divisible by $(x - 3)$? (AO2)

5 MARKS QUESTIONS

Q.24. Find the value of $x^3 + y^3 + z^3 - 3xyz$ if $x^2 + y^2 + z^2 = 83$ and $x + y + z = 15$. (AO2)

Q.25. Factorise: $2x^3 - 3x^2 - 17x + 30$ (AO2)

Q.26. Find the value of a and b: $\frac{7+\sqrt{5}}{7-\sqrt{5}} - \frac{7-\sqrt{5}}{7+\sqrt{5}} = a + \frac{7\sqrt{5}b}{11}$ (AO1)

CASE BASED QUESTIONS (4 MARKS EACH)

Q. 27. Vetrivel and Vignesh start a new business together. The amount invested by both partners together is given by the polynomial p(x) = $3x^2$+ 10x + 7. Which is the product of their individual shares.

i) Coefficient of x^2 in the given expression. (AO1)

ii) Find the individual shares of both. (AO1)

iii) Find the total amount invested by both if x = 200 (AO1)

iv) If another partner also came in the business with share q(x) = $7x^2$ + 12x + 9. What will be total amount of combined of shares of all. (AO1)

SOLUTIONS OF CHAPTER - 2: POLYNOMIALS

MULTPLE CHOICE QUESTIONS

Q1. (b)

Q2. (a)

Q3. (b)

Q4. (d)

Q5. (d)

Q6. (a)

Q7. (b)

Q8. (b)

Q9. (a)

ASSERTION AND REASON QUESTIONS

Q10. (c) is Correct

Because, $z^3 + 125 = (z)^3 + (5)^3$

We know that

$$(a)^3 + (b)^3 = (a + b)[a^2 + b^2 - ab]$$

$$(z)^3 + (5)^3 = (z + 5)[z^2 + 5^2 - z \times 5]$$

$$z^3 + 125 = (z + 5)[z^2 - 5z + 25]$$

So, Assertion is correct

but,

$x^3 + y^3 = (x + y)^3 + 3xy(x + y)$ is wrong.

Because know that

$$(x + y)^3 = x^3 + y^3 + 3xy(x + y)$$

$$\therefore x^3 + y^3 = (x + y)^3 - 3xy(x + y)$$

Q11. (a) is correct.

Because,

if *(x – 1)* is a factor of polynomial

$$P(x) = 4x^3 - 3x^2 + 5x - 6$$

Then by factor theorem,

On substituting x=*1* in P(x),

P(1) should be equals to 0.

Let us check

$$P(1) = 4(1)^3 - 3(1)^2 + 5(1) - 6$$

$$P(1) = 4 - 3 + 5 - 6$$

$$P(1) = 9 - 9$$

$$P(1) = 0$$

∴(x-1) is a factor of given P(x) and when we divide P(x) by (x-1), it is remainder as 0(zero)

Q12. (d) is correct.

Because, The number of zeros in given polynomial $P(x) = (x - 2)(x - 3)(x + 4)$ is only 3.and we know that the number of zeros of polynomial is the degree of that polynomial

∴ The degree of given polynomial will be 3 not 4.

Q13. (a) is correct

Because, polynomial (x+1) has degree = 1

∴ i+ is a linear polynomial.

We know that,

The number of x the number of degree of polynomial is the number of zeros of that polynomial.

∴ Linear polynomials have one zero.

2 MARKS QUESTIONS

Q14. Given $xy = 6$ and $3x + 2y = 12$

Taking squares on both sides of equation

$(3x = 2y)^2 = 12^2$ (1)

by using identity $(a+b)^2 = a^2 + b^2 + 2ab$

here $a = 3x$ and $b = 2y$

∴Equation (1) becomes as follows

$$(3x)^2 + (2y)^2 + 2.3x.2y = 144$$

$$9x^2 + 4y^2 + 12xy = 144$$

$$xy = 6 \text{ given}$$

$$9x^2 + 4y^2 + 12.6 = 144$$

$$9x^2 + 4y^2 + 72 = 144$$

$$9x^2 + 4y^2 = 144 - 72$$

$$9x^2 + 4y^2 = 72$$

Hence, the value of $9x^2 + 4y^2$ is 72.

Q15. The given polynomial is

$$P(x) = 5x - 4x^2 + 3$$

At $x = 2$

$$P(2) = 5(2) - 4(2)^2 + 3$$

$$P(2) = 10 - 16 + 3$$

$$P(2) = -3$$

At $x = -1$

$$P(-1) = 5(-1) - 4(-1)^2 + 3$$

$$P(-1) = -5 - 4 + 3$$

$$P(-1) = -9 + 3$$

$$P(-1) = -6$$

Hence , The value of polynomial $5x - 4x^2 + 3$ at $x = 2$ is -3 and at $x = -1$ is -6

Q.16. If y + 3 is a factor of $3y^2 + ky + 6$ by using factor theorem ⟶

$p(y) = 3y^2+ky +6$ value become 0 at

y = -3

∴ p(-3) will be 0.

⇒ $p(-3) = 3(-3)^2 + k(-3) + 6 = 0$

⇒ $27 - 3k + 6 = 0$

⇒ $33 - 3k = 0$

$\Rightarrow 3k = 33$

$\Rightarrow k = 11$

Hence the value of K is 11.

Q.17. $\therefore x + \frac{1}{x} = 10$

Squaring both sides of equation (1)

$\Rightarrow (x + \frac{1}{x})2 = (10)$

$\Rightarrow x^2 + \frac{1}{x^2} + 2, x\ \frac{1}{x}) = 100$

$\Rightarrow x^2 + \frac{1}{x^2} = 100 - 2$

$\Rightarrow x^2 + \frac{1}{x^2} = 98$

Q.18. $x + \frac{1}{x} = 2$ (given)

By trial method,

If we substitute x = 1

L.H.S. $= x + \frac{1}{x}$

$= 1 + \frac{1}{1}$

$= 1 + 1$

$= 2$ R.H.S.

$\therefore$ x = 1 satisfy the equation (1)

$\therefore$ x = 1 is the solution of equation (1)

So, $x^{100} + \frac{1}{x^{101}}$

$= (1)^{100} + \frac{1}{(1)^{101}} \Rightarrow 1 + \frac{1}{1}$

$= 1 + 1$

$= 2$

Hence, the value of $x^{100} + \frac{1}{x^{101}}$ is also 2.

3 MARKS QUESTIONS

Q. 19. $\frac{3+\sqrt{2}}{3-\sqrt{2}} = a + b\sqrt{2}$ (given)

multiplying the L.H.S. with the conjugate of $(3 - \sqrt{2})$ i.e. $(3 + \sqrt{2})$ in both numerator and denominator.

$$\Rightarrow \frac{3+\sqrt{2}}{3-\sqrt{2}}\frac{(3+\sqrt{2})}{(3+\sqrt{2})} = a + b\sqrt{2}$$

by using the identity –

$(a + b)(a – b) = a^2 – b^2$

$$\Rightarrow \frac{(3+\sqrt{2})^2}{(3)^2-(\sqrt{2})^2} = a + b\sqrt{2}$$

$\Rightarrow$ by identity $(a + b)^2 = a^2+b^2+2ab$

$$\Rightarrow \frac{(3+\sqrt{2})^2+2.3.\sqrt{2}}{9-2} = a + b\sqrt{2}$$

$$\Rightarrow \frac{11+6\sqrt{2}}{7} = a + b\sqrt{2}$$

$$\Rightarrow \frac{11}{7} + \frac{6\sqrt{2}}{7} = a + b\sqrt{2}$$

$on\ comparing\ both\ sides \dashrightarrow$

$a = \frac{11}{7}\ and\ b = \frac{6}{7}$

$Q.20.\ \therefore (x - 2k) is\ the\ factor\ of$

$f(x) = x^4 – 4k^2x^2+2x+3k+3$ by factor theorem –

on x = 2k

$\Rightarrow f(2k) = 0$

$\Rightarrow f(2k) = (2k)^4 - 4k^2(2k)^2 + 2(2k) + 3k + 3 = 0$

$\Rightarrow 16k^4 - 16k^4 + 4k + 3k + 3 = 0$

$\Rightarrow 7k + 3 = 0$

$\Rightarrow 7k = -3$

$\Rightarrow k = \frac{-3}{7}$

$Q.21.\ by\ remainder\ theorem -$

$\Rightarrow 3x - 1 = 0$

$\Rightarrow 3x = 1$

$$\Rightarrow x = \frac{1}{3}$$

$$Now\ f\left(\frac{1}{3}\right) = 9\left(\frac{1}{3}\right)^3 - 3\left(\frac{1}{3}\right)^2 + 14\left(\frac{1}{3}\right) - 3$$

$$f\left(\frac{1}{3}\right) = 9\left(\frac{1}{27}\right)^1 - 3\left(\frac{1}{9}\right)^1 + \left(\frac{14}{3}\right) - 3$$

$$= \frac{1}{3} - \frac{1}{3} + \frac{14}{3} - 3$$

$$= \frac{14}{3} - 3$$

$$= \frac{5}{3}$$

Hence when $f(x) = 9x^3 - 3x^3 - 3x^2 + 14x - 3$ is divided by (3x-1), the remainder is $\frac{5}{3}$

Q.22. $\frac{1}{\sqrt{7}+\sqrt{3}-\sqrt{2}}$

multiplying by conjugate –

$$\Rightarrow \frac{\sqrt{7}-(\sqrt{3}-\sqrt{2})}{\sqrt{7}+(\sqrt{3}-\sqrt{2})\sqrt{7}-(\sqrt{3}-\sqrt{2})}$$

$$\Rightarrow \frac{\sqrt{7}-(\sqrt{3}-\sqrt{2})}{(\sqrt{7})^2+(\sqrt{3}-\sqrt{2})^2}$$

by using identity $(a + b)(a-b) = a^2 - b^2$

$$\therefore \frac{\sqrt{7}-(\sqrt{3}-\sqrt{2})}{7-((\sqrt{3})^2+\sqrt{2})^2-2\sqrt{3}\sqrt{2})}$$

$$= \frac{\sqrt{7}-(\sqrt{3}-\sqrt{2})}{7-(3+\sqrt{6})}$$

$$= \frac{\sqrt{7}-(\sqrt{3}-\sqrt{2})}{7-5+2\sqrt{6}}$$

$$= \frac{\sqrt{7}-(\sqrt{3}+\sqrt{2})}{2+1\sqrt{6}} \times \frac{(1-(\sqrt{6})}{(1+\sqrt{6})}$$

$$= \frac{(\sqrt{7}-\sqrt{3}+\sqrt{2})\,(1-(\sqrt{6})}{2((1)^2-1\,(6)^2)}$$

$$= \frac{\sqrt{7}-(\sqrt{42}-3\sqrt{3}+4\sqrt{2})}{-10}$$

$$= \frac{\sqrt{42}+3\sqrt{3}-\sqrt{7}+4\sqrt{2})}{10}$$

Q.23. By actual division –

$$x + 1(3x^4 - 4x^3 - 3x - 1 \quad (3x^3 - 7x^2 + 7x - 10$$

$$-3x^4 \pm 3x^3$$

$-\ 7x^3 - 3x$

$-\ 7x^3 - 7x$

$-10x - 1$

$-10x - 10$

9

∴ The quotient = $3x^3 - 7x^2 + 7x - 10$ and the remainder is 9.

(OR)

Let we should add K in $x^3 - 3x^2 + 4x - 13$

so that the result will be exactly divisible by $(x - 3)$

∴ the new polynomial will be –

$p(x) = x^3 - 3x^2 + 4x - 13 + k$

∴ p(x) will be exactly divisible by (x-3)

∴ *the remainder will be* 0.

By remainder theorem ⇒

⇒ P (3) = 0

⇒ $(3)^3 - 3\ (3)^2 + 4(3) - 13 + k = 0$

⇒ 27-27+12-13+k=0

⇒ -1+k=0

⇒ k = 1

Hence we should add 1 in $x^3 - 3x^2 + 4x - 13$

so that the new polynomial will be exactly divisible by (x-3)

5 MARKS QUESTIONS

Q.24. ∴ $x+y+z=15$ and $x^2+y^2+z^2 = 83$

∴ $x+y+z=15$

squaring both sides –

$(x+y+z)^2 = (15)^2$

$\Rightarrow x^2+y^2+z^2 +2\ (xy + yz + zx) = 225$

$\Rightarrow 83 + 2\ (xy+yz+zx) = 225$

$\Rightarrow 2\ (xy+yz+zx) = 225-83$

$\Rightarrow xy+yz+zx = \frac{142}{2}$

$\Rightarrow xy+yz+zx = 71$

$\therefore x^2+y^2+z^2-3xy = (x+y+z)\ (x^2+y^2+z^2-xy-yz-zx)$

$= (x+y+z)\ [x^2+y^2+z^2-\ (xy+yz+zx)]$

$on\ substituting\ the\ values -$

$= 15\ [83-71]$

$= 15\ x\ 12$

$= 180$

Hence the value of $x^2+y^2+z^2-3xyz$ is 180.

Q.25. $2x^3 - 3x^2 - 17x + 30$ (Factorise)

$\therefore$ here constant term = 30

$= 1 \times 2 \times 3 \times 5$

Let x = 2

whether (x-2) will be the factor of $p(x) = 2x^3 - 3x^2-17x+30$. we use factor theorem.

$\therefore p(2) = 2(2)^3 - 3(2)^2 - 17 \times 2 + 30$

$= 16 - 12 - 34 + 30$

$= 46 - 46$

$p(2) = 0$

$\therefore (x-2) is\ the\ factor\ of\ p(x)$

$Now, by\ Actual\ method\ of\ division$

x-2) $2x^3 - 3x^2 - 17x + 30$ ($2x^2$ + x – 15

$2x^3$ - $4x^2$

x^2- 17x

x^2- 2x

$-15x + 30$

$-15x + 30$

0

$\therefore 2x^3-3x^2-17x+30 = (x-2)\ (2x^2+x-15)$

Now we find the zeros of polynomial

$2x^2+x-15$ by splitting middle term method.

$= 2x^2+x-15$

$= 2x^2+(6-5)\ x-15$

$= 2x^2+6-5x-15$

$= 2x\ (x+3)-5(x+3)$

$= (x+3)\ (2x-5)$

∴ The zeros of given polynomial are $2x^3-3x^2-17x+30 = (x-2)\ (x+3)\ (2x-5)$

Q.26. given

$$\frac{(7+\sqrt{5})(7+\sqrt{5})}{(7-\sqrt{5})(7+\sqrt{5})} - \frac{(7-\sqrt{5})(7-\sqrt{5})}{(7+\sqrt{5})(7-\sqrt{5})} = a + \frac{7\sqrt{5}}{11}b$$

using identity $(a+b)(a-b)=a^2b^2$

$$\frac{(7+\sqrt{5})^2}{(7)^2-(\sqrt{5})^2} - \frac{(7-\sqrt{5})^2}{(7)^2-(\sqrt{5})^2} = a + \frac{7\sqrt{5}}{11}b$$

$$\frac{(7+\sqrt{5})^2}{49-5} - \frac{(7-\sqrt{5})^2}{49-5} = a + \frac{7\sqrt{5}}{11}b$$

$$\frac{(7+\sqrt{5})^2}{44} - \frac{(7-\sqrt{5})^2}{44} = a + \frac{7\sqrt{5}}{11}b$$

by identity $(a^2-b^2) = (a+b)\ (a-b)$

$$\frac{[7+\sqrt{5}\ \ 7-\sqrt{5}][[7+\sqrt{5}-\ \ 7+\sqrt{5}]}{44} = a + \frac{7\sqrt{5}}{11}b$$

$$\frac{14(2\sqrt{5})}{44} = a + \frac{7\sqrt{5}}{11}b$$

$$\frac{14\ x(2\ \sqrt{5})}{44} = a + \frac{7\sqrt{5}}{11}b$$

$$\frac{7}{11}\sqrt{5} = a + \frac{7\sqrt{5}}{11}b$$

$$0 + \frac{7\sqrt{5}}{11} = a + \frac{7\sqrt{5}}{11}b$$

a = 0 and b = 1

CASE BASED QUESTIONS

$Q.27(i)$. ∴ $p(x) = 3x^2 + 10x + 7$

here coefficient of x^2 is 3.

Q.27(ii). ∴ The total amount invested is

$p(x) = 3x^2 + 10x + 7$ and it is given that p(x) is the product of their individual shares.

$\therefore$ *we find the zeroes of* $p(x)$

$\therefore p(x) = 3x^2 + 10x + 7$

by splitting the middle term method,

$p(x) = 3x^2 + (3 + 7)x + 7$

$p(x) = p(x) = 3x^2 + 3x + 7x + 7$

$p(x) = 3x\ (x+1) + 7(x+1)$

$p(x) = (x+1) + (3x+7)$

Hence, the individual shares are (x+1) and (3x+7)

Q.27(iii). if x = 200 then

Total amount invested will be

$p(200) = 3(200)^2 + 10(200)+7$

$= 3 \times 40000 + 2000+7$

$= 120000 + 2000 + 7$

$p(200) = 122007$

Hence, the total amount invested is 122007 Rs.

Q.27(iv). another business partner came with share $q(x) = 7x^2+12x+9$

$\therefore$ The total amount = p(x) + q(x)

$= 3x^2 + 10x + 7 +7x^2+12x+9$

$= 10x^2 +22x + 16$

Hence, the total amount will be $= 10x^2 +22x + 16.$

CHAPTER -3: COORDINATE GEOMETRY

MULTIPLE CHOICE QUESTIONS

Q1) In which of the following points lies on the line y = - x? (AO2)

a) (2,2) b) (2,-2) c) (3,3) d) (-2,3)

Q2) In which quadrant does the point (-4,-3) lies? (AO1)

a) I b) II c) III d) IV

Q3) The points (2,-1), (3, -5) and (-1,-2) (AO2)

a) lie in II quadrant
b) lie in III quadrant
c) lie in IV quadrant
d) do not lie in the same quadrant.

Q4) If the coordinates of two points are A(-7,9) and B(3,4), then

(abscissa of A) – (abscissa of B) is (AO2)

a) 4 b) -10 c) 10 d) -5

Q5) The point whose ordinate is 3 and which lies on y-axis is (AO2)

a) (0,3) b) (0,-3) c) (3,0) d) (-3,0)

Q6) The equation of x-axis is (AO2)

a) x = 0 b) y = 0 c) x = 0, y = 0 d) none of these

Q7) What is perpendicular distance of point (0, -5) from x-axis? (AO1)

a) -5 units b) 0 units c) 5 units d) 2 units

Q8) A point which lies in third quadrant have sign. (AO1)

a) + , + b) - , + c) + , - d) - , -

ASSERTION AND REASON QUESTIONS

Direction : In the following questions as statement of assertion(A) is followed by a statement of reason(R) . Mark the correct choice as:

e) Both assertion(A) and reason(R) are true and reason (R) is the correct explanation of assertion(A).
f) Both assertion (A) and reason (R) are true but reason(R) is not the correct explanation of assertion (A).
g) Assertion(A) is true but reason (R) is false.
h) Assertion(A) is false but reason (R) is true.

Q9) Assertion (A) : The point (0,0) lies in quadrant I.

Reason (R) : The point O(0,0) lies on both the axes. (AO2)

Q10) Assertion (A) : The abscissa of point (3,5) is 5.

Reason (R) : The signs of points in quadrants I, II, III and IV are respectively (+ , +) , (- , +) , (-, -) and (+, -) (AO1)

Q11) Assertion (A) : Point(0,1) lies on the line y = 2x +1?

Reason (R) : If we put x = 0 and y = 1 in the equation of line y = 2x + 1, LHS and RHS are equal. It means point lie on line. (AO2)

Q12) Assertion (A) : The point P(-3,0) lies on x-axis.

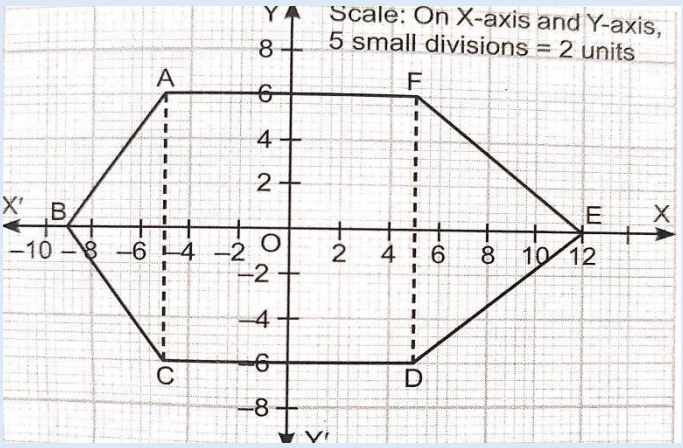
Reason (R) : Every point on x-axis is of the form (x,0). (AO1)

2 MARKS QUESTIONS

Q13) If the coordinates of two points are P(-2,3) and Q(-3,5), then find

[(abscissa of P) – (abscissa of Q)] + [(ordinate of Q) – (ordinate of P)]. (AO2)

Q14) Write the coordinates of the point A, B, C, D, E and F of the figure formed on the graph. Also, write coordinates of the points of intersection of AC and DF with the x-axis. (AO2)

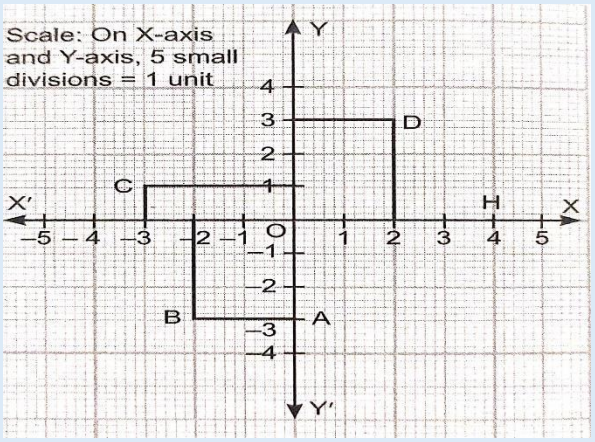


Q15) If (2x+1, 3y+5) = (0,0) , find the values of x and y. (AO2)

Q16) P(3,2) and Q(7,7) are two points. Perpendiculars are drawn to the x-axis from P and Q meeting the x-axis at L and M respectively.

i) Find the coordinates of L and M.
ii) Find the length of LM. (AO2)

Q17) Write the coordinates of the points A, B, C and D given in the figure. Can you find any two points which when joined by a line, then the line passes through the origin? What are those points? (AO1)



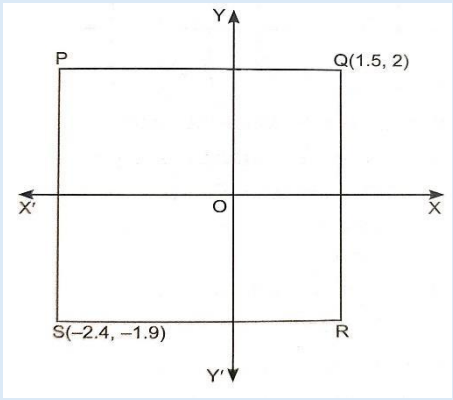
3 MARKS QUESTIONS

Q18) The perpendicular distance of the point A(m,2n) from the x-axis and y-axis is 6 units. Given that $m < 0$ and $n > 0$, then what are the coordinates of point B(n+1, m) ? (AO2)

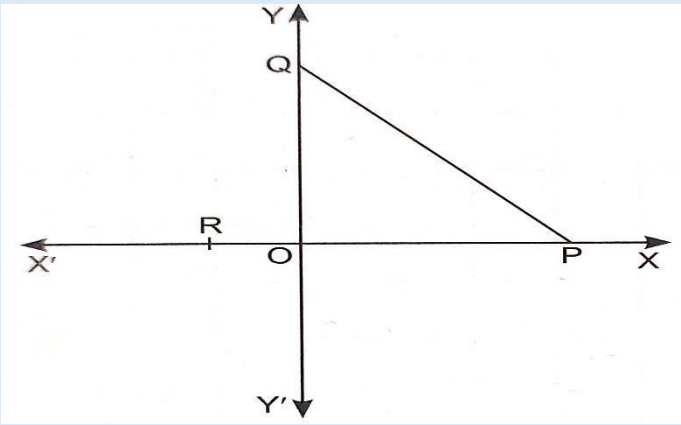
Q19) In the given figure, PQRS is a square.

Find the

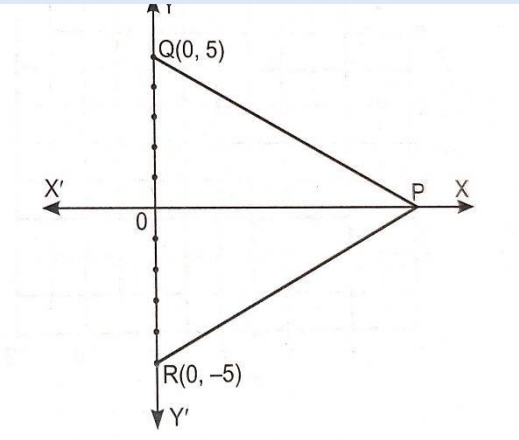
i) Coordinates of points P and R.
ii) side of given square.
iii) Find area of sqauare. (AO2)



Q20) In the given figure , POQ is a triangle with coordinate of P and O as ($\sqrt{13}$, 0) and (0,0) respectively. If PQ = 7, find the coordinates of Q. (AO2)



Q21) In the given figure, ΔPQR is an equilateral triangle with coordinates of Q and R as (0,5) and (0,-5) respectively. Find the coordinates of vertex P. (AO2)



Q22) The following table gives the relation between natural numbers and odd natural numbers.

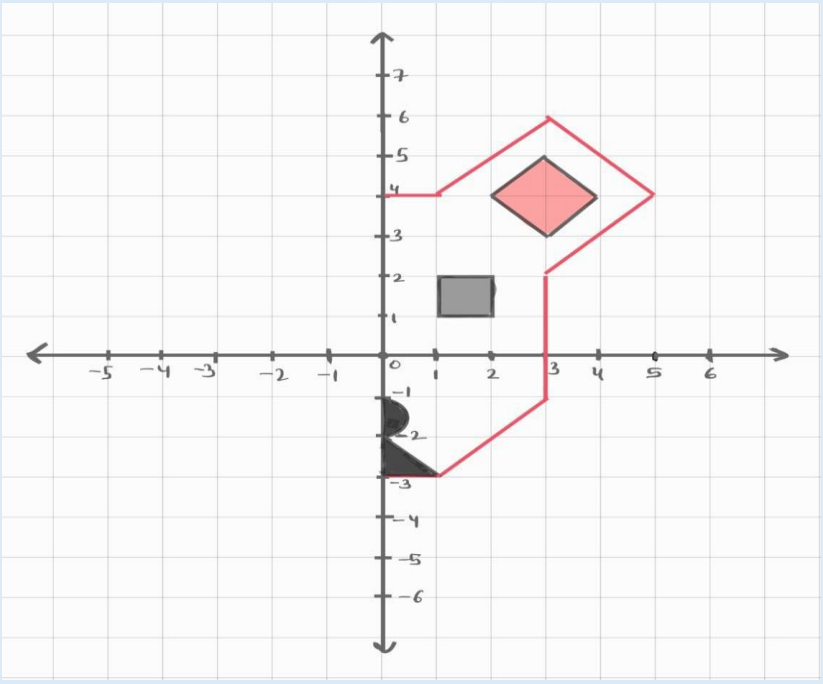
x	1	2	3	4	5	6	7
y	3	5	7	9	11	13	15

Plot the points and join them. Do you get a straight line by joining these points ?

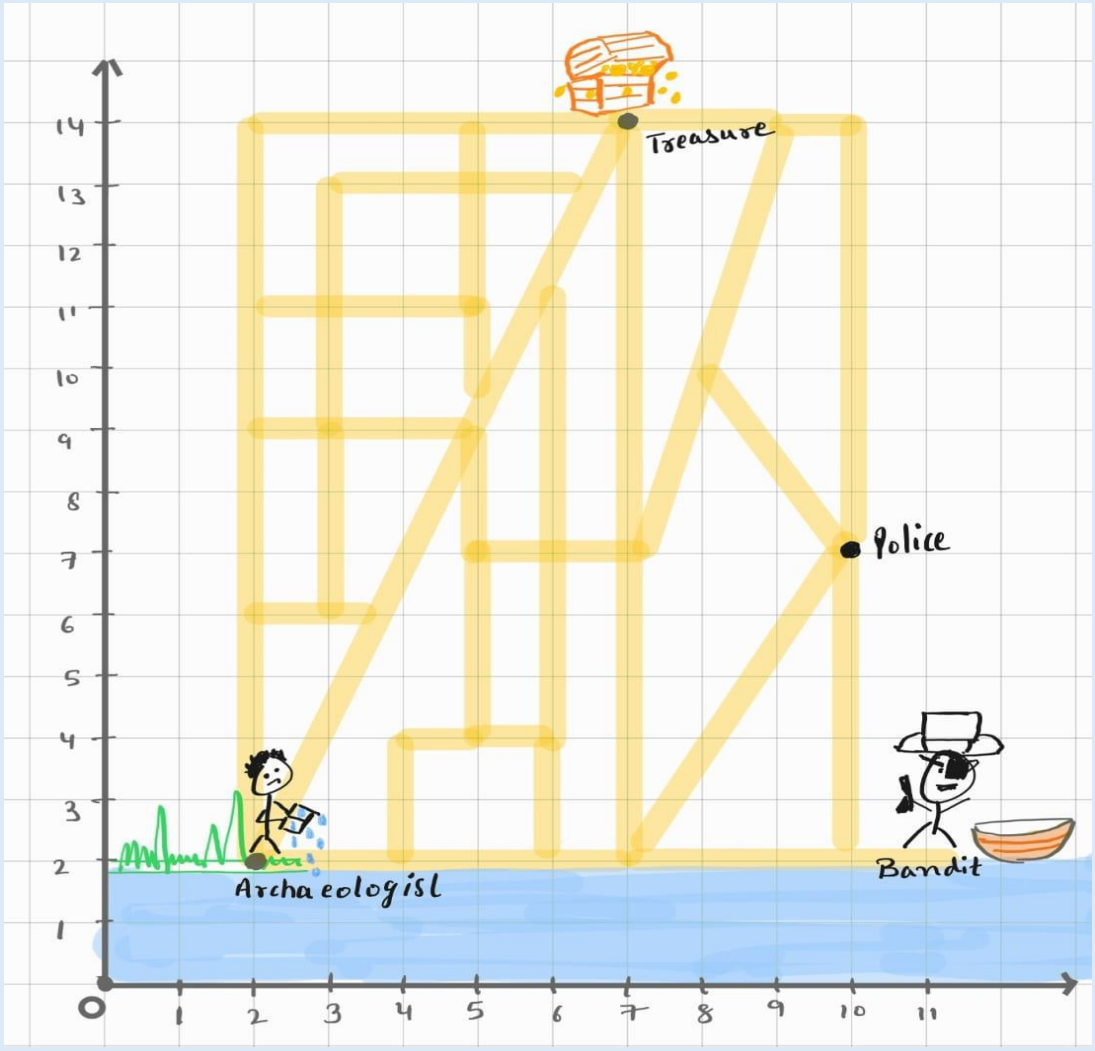
Analyse each coordinate and establish a relation between ordinate and abscissa. (AO2)

5 MARKS QUESTIONS

Q23) Rony was reading a Maths magazine in which he saw an interesting figure which was half drawn as shown below. He wish to draw it completely. Draw again and help him to complete the figure and tell which line of symmetry you use. Along with that mark all the coordinates used in this drawing. (AO2)



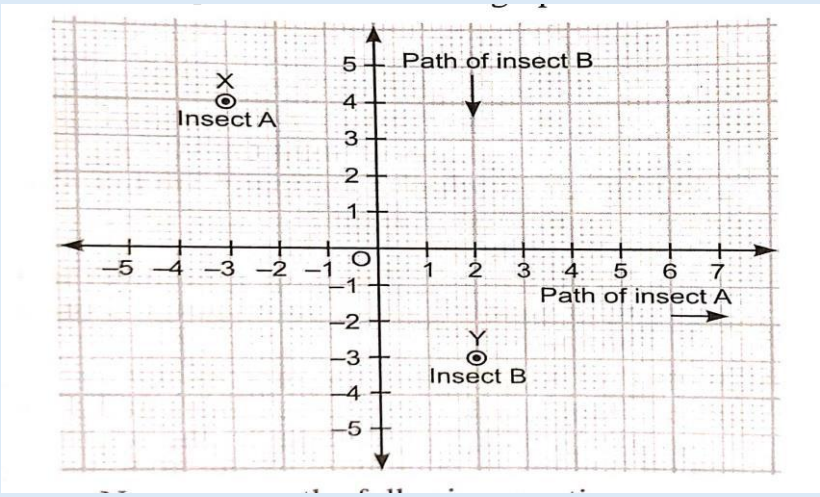
Q24) Once an Archaeologist was doing research in cave where he got a map to find treasure. So he went in search of treasure. But when he reached there his map fell into the water and everything vanished from the map. On the other side Bandit know the way to reach there but Police is behind him to catch. Tell archaeologist about the coordinates of Treasure and the length of shortest path to get the treasure before bandit (1 unit in map = 1Km).
(AO2)



Q25) Lucky started from origin towards North-east direction to reach his school where east direction is represented by the positive x-axis. While coming back from school, he came with different path. He started from school 8km towards south direction and then turn right to walk 6km to reach home again. If speed of Lucky is 5 km/hr , how much time will he take to reach his school in the morning and what are the coordinates of school. (AO2)

CASE BASED QUESTION (4 MARKS EACH)

Q26) There are two insects A and B. A is moving from left to right horizontally and B is moving from top to bottom vertically. We have divided their path into unit distance of 1cm and it looks like a cartesian plane. After tracing path , insect A is at point X and insect B is at point Y as shown in graph.



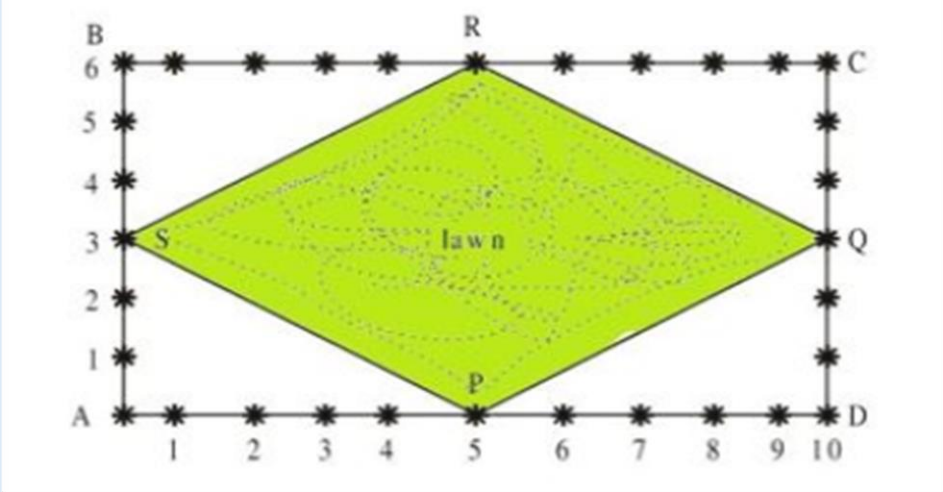
Based on the above information, answer the following questions :

i) If insect A moves to the point (2,4) and point B moves unit distance, what will be the distance between both insects? (2)
(AO2)

ii) The coordinate where abscissa is + and ordinate is - , lies in which quadrant . (1)
(AO1)

iii) What is the ordinate of any point on x-axis. (1)
(AO1)

Q27) The Class IX students of a secondary school in Krishinagar have been allotted a rectangular plot of land for their gardening activity. Sapling of Gulmohar are planted on the boundary at a distance of 1m from each other. There is a square lawn PQRS in the ground as shown in below figure.

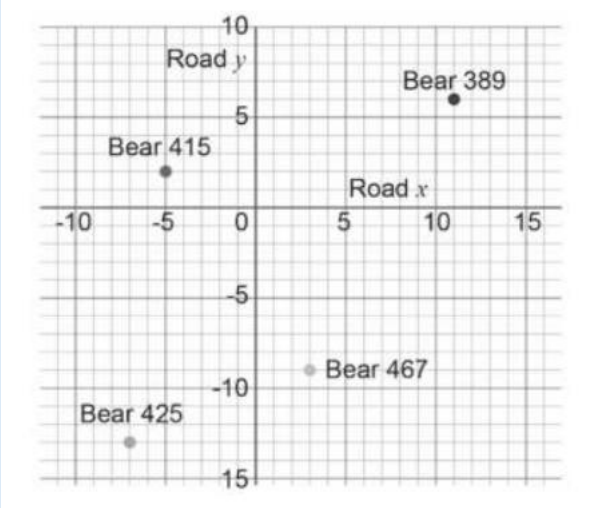


Based on the above information, answer the following questions:

i) What is area of the lawn PQRS (2)
(AO2)

ii) Students want to fence lawn PQRS. If the rate of fencing is Rs $20\sqrt{34}$ per metre, what is the total cost of fencing ? (2)
(AO2)

Q28) A forest ranger keeps track of bears in his area. He plotted their location on a graph. The origin represents the ranger's control room's location. To access and maintain equipment, Road x and Road y have been laid and paved inside the forest. They pass through the control room. One unit on the graph paper represents 1km.

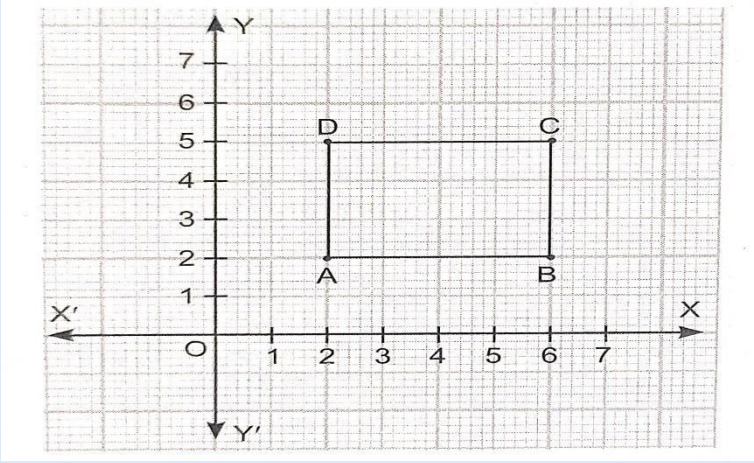


Based on the above information, answer the following questions:

i) A tiger is at (11,4). How far from it is the nearest bear? (2) (AO2)

ii) In the forest, rain shelters are at an interval of 2km along paved roads. A forest ranger is travelling on Road x. He crosses a rain shelter located at (3,0). What is likely to be the location of the next shelter? (2) (AO2)

Q29) For a group activity of class IX, teacher divided the space as cartesian plane and chairs are placed at various points for the group of four students at points A, B, C and D as shown in the picture below:



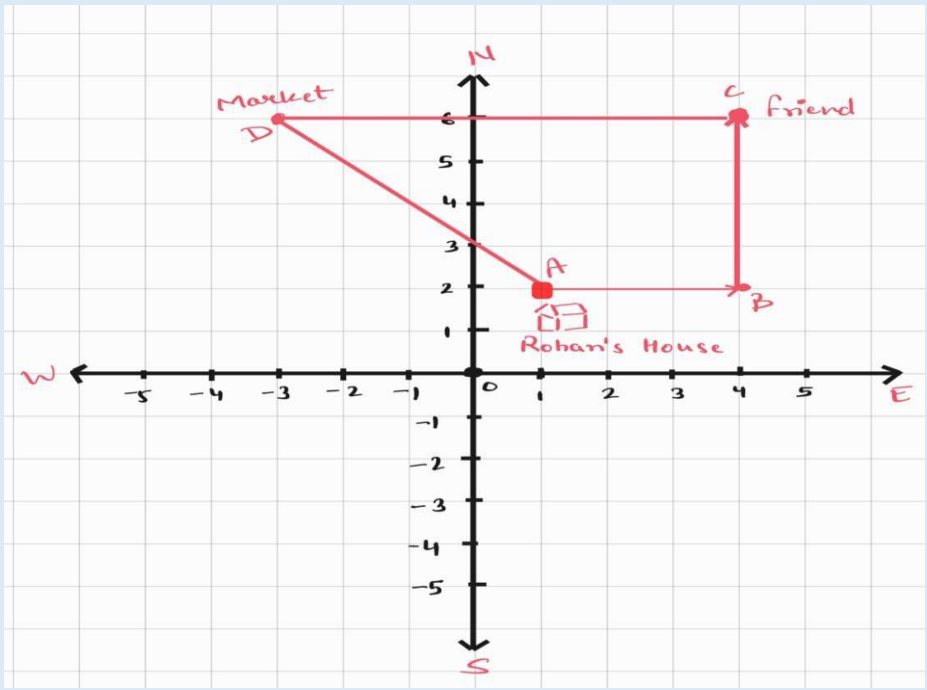
Now answer the following questions:

i) Write the coordinates of A, B, C, D. (1) (AO1)

ii) Is there any common point between A and D. If yes, explain your answer. (1) (AO1)

iii) Find the area of rectangle ABCD. (2) (AO2)

Q30) Today is Rohan's birthday. So he asked his friend to help him in shopping for the party. Rohan walked 3km from his house towards east direction and then turn left to meet his friend. From there, they together went to market and bought some items. After shopping, both of them came to Rohan's house to do arrangements.



Based on above information, answer the following questions:

i) How can Rohan reach to his friend early. Suggest him the way and shortest distance to reach to his friend. (2) (AO2)

(ii)Is the figure formed in the picture is concave or convex polygon? Give reasons to support your answer

SOLUTIONS OF CHAPTER -3: COORDINATE GEOMETRY

MULTIPLE CHOICE QUESTIONS

Sol 1 : b) (2,-2)

Sol 2 : c) III

Sol 3 : d) do not lie in the same quadrant.

Sol 4 : b) -10

Sol 5 : a) (0,3)

Sol 6 : b) y = 0

Sol 7 : c) 5 units

Sol 8 : d) - , -

ASSERTION AND REASON QUESTIONS

Sol 9 : d) Assertion(A) is false but reason (R) is true.

Sol 10 : d) Assertion(A) is false but reason (R) is true.

Sol 11 : a) Both assertion(A) and reason(R) are true and reason (R) is the correct explanation of assertion(A).

Sol 12 : a) Both assertion(A) and reason(R) are true and reason (R) is the correct explanation of assertion(A).

2 MARKS QUESTIONS

Sol 13 : Given : P(-2,3) and Q(-3,5), then

[(abscissa of P) – (abscissa of Q)] + [(ordinate of Q) – (ordinate of P)].

= [-2 – (-3)] + [5 -3]

= (-2 + 3) + 2

= 1 + 2

= 3

Sol 14 : Coordinates of the points A, B, C, D, E and F are

A(-5,6) , B(-9,0), C(-5,-6), D(5,-6), E(12,0) and F(5,6)

coordinates of the point of intersection of AC with the x-axis is (-5,0) and

coordinates of the point of intersection of AC with the x-axis is (5,0)

Sol 15 : (2x+1, 3y+5) = (0,0)

2x + 1 = 0 and 3y + 5 = 0

2x = -1 and 3y = -5

x = $\frac{-1}{2}$ and y = $\frac{-5}{3}$

Sol 16 : i) Coordinates of L is (3,0)

Coordinates of M is (7,0)

ii) Length of LM = abscissa of M – abscissa of L

= 7 – 3 units

= 4 units

Sol 17: coordinates of the points A, B, C and D are A(0,-3), B(-2,-3), C(-3,1), D(2,3) .

B(-2,-3) and D(2,3) are the points which when joined by a line, then the line passes through the origin.

3 MARK QUESTIONS

Sol 18 : Since, the perpendicular distance of the point A(m,2n) from the x-axis and y-axis is 6 units

Therefore, (m,2n) = (-6,6) [because $m < 0$ and $n > 0$ i.e II quadrant]

m = -6 and 2n = 6

m = -6 and $n = \frac{6}{2} = 3$

So, Coordinates of point B(n+1, m) = (3+1, -6)

= (4, -6)

Sol 19 : i) Coordinates of P = (abscissa of S , ordinate of Q)

= (-2.4 , 2)

Coordinates of R = (abscissa of Q , ordinate of S)

= (1.5, -1.9)

ii) Side of given square = ordinate of Q – ordinate of R

= 2 – (-1.9)

= 2 + 1.9

= 3.9 units

iii) Area of square PQRS = side x side

= 3.9 x 3.9 sq. units

= 15.21 sq. units

Sol 20 : Coordinate of P = ($\sqrt{13}$, 0) and Q = (0,0)

So, OP = $\sqrt{13}$ and PQ = 7 (given)

Using Pythagoras property

$(OP)^2 + (OQ)^2 = (PQ)^2$

$(\sqrt{13})^2 + (OQ)^2 = (7)^2$

$13 + (OQ)^2 = 49$

$(OQ)^2 = 49 - 13$

$OQ = \sqrt{36}$

$OQ = 6$

So, the coordinates of Q is (0, 6) because Q lies on y-axis.

Sol 21 : coordinates of Q = (0,5) and R = (0,-5)

Length of side QR = ordinate of Q – ordinate of R

$= 5 - (-5)$

$= 5 + 5$

$= 10$ units

Since, given triangle is an equilateral triangle.

Therefore, PQ = PR = QR = 10 units

Now, we have PQ = 10 , OQ = 5 , OP = ?

Using Pythagoras property

$(OP)^2 + (OQ)^2 = (PQ)^2$

$(OP)^2 + (5)^2 = (10)^2$

$(OP)^2 + 25 = 100$

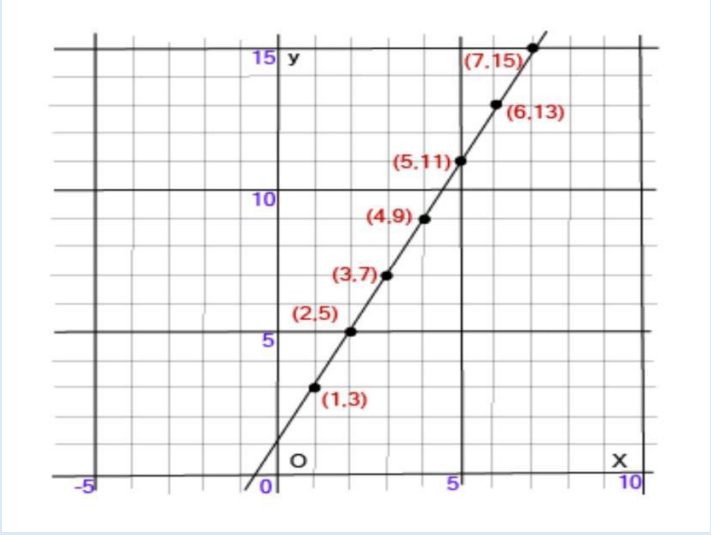
$(OP)^2 = 100 - 25$

$OP = \sqrt{75} = \sqrt{5 \; x \; 5 \; x \; 3}$

$OP = 5\sqrt{3}$ units

So, the coordinates of P is ($5\sqrt{3}$, 0) because P lies on x-axis.

Sol 22 :



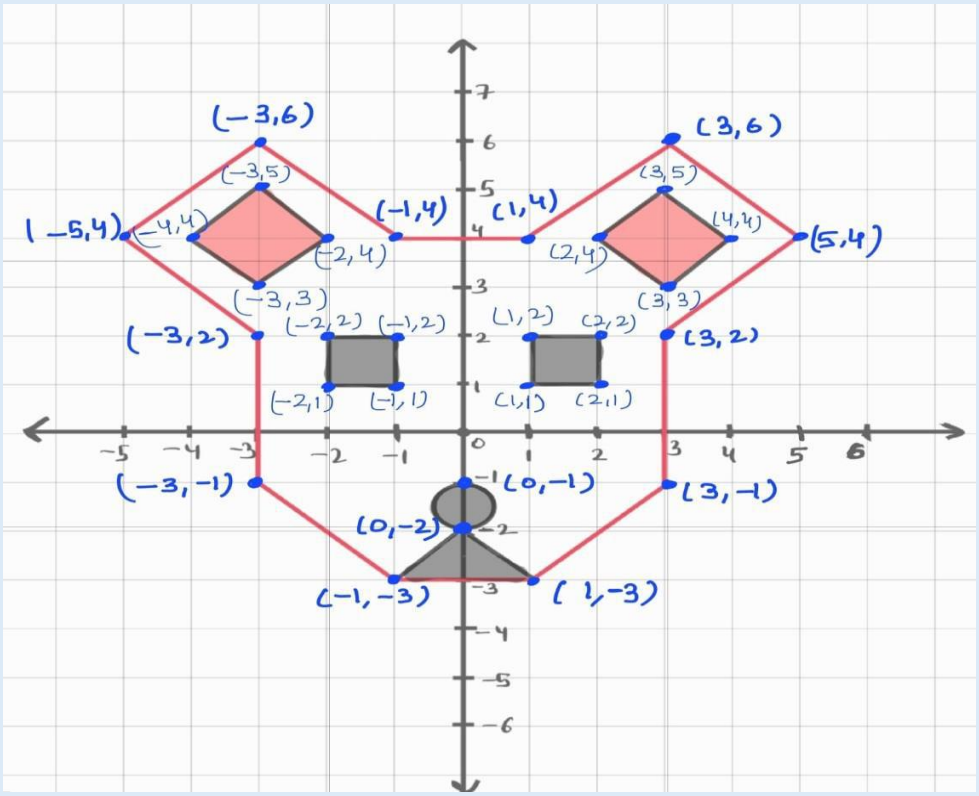
Yes, we get a straight line by joining these points.

X	1	2	3	4	5	6	7
Y	3=2x1+1	5=2x2+1	7=2x3+1	9=2x4+1	11=2x5+1	13=2x6+1	15=2x7+1

So, from above relations , we can see that if x is any natural number then y = 2x +1

5 MARK QUESTIONS

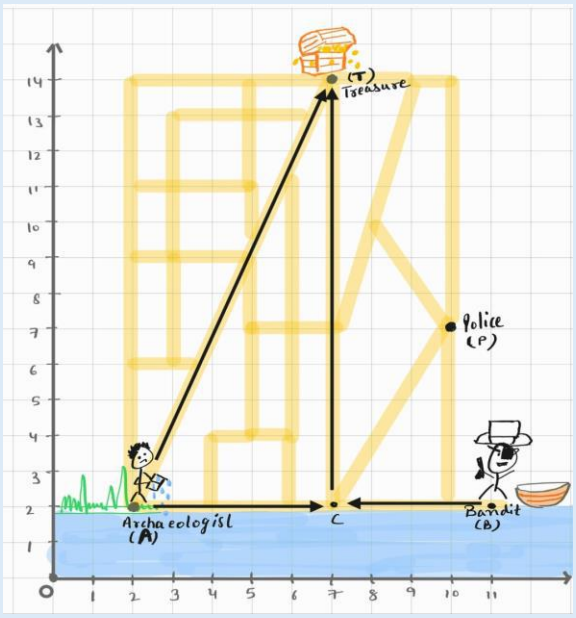
Sol 23 : We use y-axis as the line of symmetry to complete the figure.



Sol 24 : Coordinates of treasure (T) = (7,14)

Coordinates of Archaelogist (A) = (2,2)

Coordinates of point C= (7,2)



So, AC = 7-2 =5

And CT = 14 – 2 = 12

And the shortest path to reach there is AT

So, for finding length of shortest path ,

we use Pythagoras property

$(AT)^2 = (AC)^2 + (CT)^2$

$(AT)^2 = 5^2 + 12^2$

$(AT)^2 = 25 + 144$

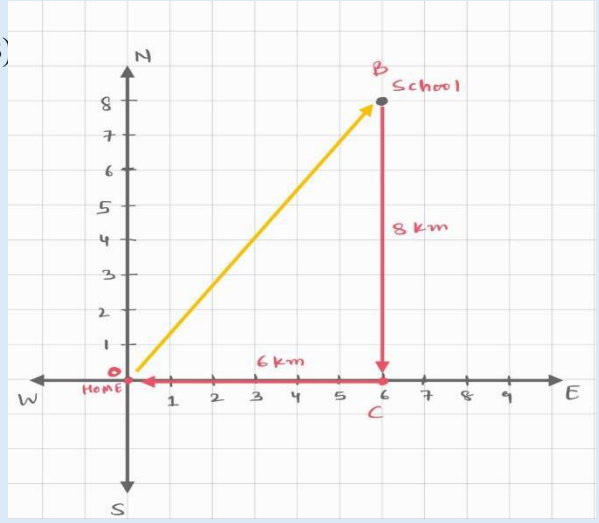
$(AT)^2 = 169$

$AT = \sqrt{169}$

AT = 13km

So, the length of shortest path AT is 13km.

Sol 25 : Coordinates of School (B) = (6,8)



To find out the distance from Home to School (OB)

We use Pythagoras property

$(OB)^2 = (BC)^2 + (CO)^2$

$(OB)^2 = 8^2 + 6^2$

$(OB)^2 = 64 + 36$

$(OB)^2 = 100$

$OB = \sqrt{100}$

OB = 10 km

Now,

Since, the distance between home to school is 10km and speed of lucky is 5km/hr.

So, Time taken to reach his school from home in the morning = $\frac{Distance}{speed}$

$= \frac{10km}{5km/hr} = 2hr$

CASE BASED QUESTION (4 MARKS EACH)

Sol 26 : i) Coordinates of insect A after moving = (2,4)

Coordinates of insect B after moving = (2, -4)

Distance between both insects = Ordinate of Insect A – Ordinate of Insect B

= 4 – (-4) units

= 4 + 4 = 8 units

ii) IV quadrant

iii) Ordinate of any point on x-axis = 0

Sol 27 : Given AP = 5m , AS = 3m , PS = ?

Using Pythagoras property

$(PS)^2 = (AP)^2 + (AS)^2$

$(PS)^2 = 5^2 + 3^2$

$(PS)^2 = 25 + 9$

$(PS)^2 = 34$

$PS = \sqrt{34}$ m

So, side of square lawn = $\sqrt{34}$ m

i) Area of lawn PQRS = side x side

$= \sqrt{34}$ m x $\sqrt{34}$ m

= 34 sq. m

ii) For fencing lawn PQRS, we should perimeter first.

Perimeter of lawn PQRS = 4 x side

$= 4 \times \sqrt{34}$ m $= 4\sqrt{34}$ m

Cost of fencing per metre = Rs $20\sqrt{34}$

Cost of fencing $4\sqrt{34}$ m = Rs $(20\sqrt{34}) \times (4\sqrt{34})$

= Rs 2720

Sol 28 :

i) Nearest Bear from tiger is Bear 389, whose location is (11,6)

And location of tiger is (11,4)

Distance between tiger and bear 389 = ordinate of Bear 389 – ordinate of tiger

= 6 – 4

= 2km

ii) Coordinates of Forest ranger = (3,0)

Rain shelter is located at an interval of 2km

So, Location of next shelter is likely to be possible at = (3 + 2, 0)

= (5,0)

Sol 29 :

i) Coordinates of A, B, C and D are A(2,2) , B(6,2), C(6,5), D(2,5)

ii) Yes, there is a common point between A and D and it is their abscissa i.e 2.

iii) Length of side AB = abscissa of A – abscissa of B

= 6-2 units

= 4 units

Length of side AD = ordinate of D – ordinate of A

= 5 – 2 units

= 3 units

Area of rectangle ABCD = Length x Breadth

= AB x AD

= 4 x 3 sq. unit

= 12 sq. unit

Sol 30 : Coordinates of A = (1,2) , B = (4,2) and C = (4,6)

Length of AB = abscissa of B – abscissa of A

= 4 – 1 = 3 units

Length of BC = ordinate of C – ordinate of B

= 6 – 2 = 4 units

i) Rohan can reach to its early by following the path diagonally.

Length of diagonal AC can be find using Pythagoras property

$(AC)^2 = (AB)^2 + (BC)^2$

$(AC)^2 = 3^2 + 4^2$

$(AC)^2 = 9 + 16$

$(AC)^2 = 25$

$AC = \sqrt{25} = 5$ km

ii) Figure formed in the picture is convex polygon because polygons that are convex have no portions of their diagonals in their exteriors or any line segment joining any two different points, in the interior of the polygon, lies wholly in the interior of it

CHAPTER – 4: LINEAR EQUATION IN TWO VARIABLES

MULTIPLE CHOICE QUESTIONS

Q.1. In an exhibition, the cost of tickets for an adult is Rs.5 more than thrice the cost of a ticket for child. Which equation relates the cost y, of adult tickets in terms of the cost x, of child tickets?
(AO2)

a) $y = 5 + 3x$ b) $y + 5 = 3x$ c) $y = 3 + 5x$ d) $y + 3 = 5x$

Q.2. The value of p, if $y = p$ and $x = 3/2$ is a solution of the linear equation $2x – y + 27 = 0$, is:
(AO1)

a) - 24 b) - 9 c) 30 d) 19

Q3. Which option shows $5y – 8x = 7(x + y) – 9$ expressed in the form of $ax + by + c = 0$?
(AO1)

a) $-x + 6y – 9 = 0$ b) $-x + 12y – 9 = 0$ c) $15x + 2y – 9 = 0$ d) $15x – 4y – 9 = 0$

Q4. $3x + 10 = 0$ will have (AO1)

a) Unique solution b) Two Solutions

c) infinitely many solutions d) No solutions

Q.5 Linear equation in two variables has (AO1)

a) unique solution b) no solution

c) infinitely many solutions d) only two solutions

Q.6 If $x = 2$, $y = 1$ is a solution of equation $12x+7y = k$, the value of k is (AO2)

a) 13 b) -13 c) 30 d) 31

Q.7. The solution of equation $x – 2y = 4$ is (AO1)

a) (0,2) b) (2,0) c) (4,0) d) (1,1)

Q8 The cost of ball pen (y) is Rs. 10 less than half of the cost of fountain pen(x) . The linear equation in two variable will be
(AO2)

a) $x+y+10 = 0$ b) $2x+y+20 = 0$ c) $2x-y+20 = 0$ d) $x+2y-20 = 0$

ASSERTION AND REASON QUESTIONS

A statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.
a) Both A and R are true and R is the correct explanation of A
b) Both A and R are true but R is not the correct explanation of A
c) A is true but R is false
d) A is false but R is true

Q.9. Assertion: An equation of the form ax+by+c = 0 where a,b and c are real numbers. Such that a and b are not both zero, is called a linear equation in two variables.

Reason: A linear equation in two variables has infinitely many solutions. (AO1)

Q.10. Assertion: If x = 2, y = 1 is a solution of the equation 2x + 3y = k then the value of k is 7. (AO1)
Reason: The solution of the line will satisfy the equation of the line.

Q.11. Assertion: If x = 2k – 1 and y = k is a solution of the equation 3x – 5y – 7 = 0, then the value of k is 10. (AO1)
Reason: A linear equation in two variables has infinitely many solutions.

Q.12. Assertion: x = 3 and y = 2 is a solution of the linear equation 2x + 3y = 12 (AO1)
Reason: x = 4 and y = 2 is a solution of the linear equation x + 3y = 10

Q. 13. Assertion: The point (3,0) lies on the graph of the linear equation 4x + 3y = 12 (AO2)
Reason: (3, 0) satisfies the equation 4x + 3y = 12.

2 MARKS QUESTIONS

Q.14. Write two solutions of the following equations. 2x + y = 7. (AO1)

Q.15. If (1, -2) is a solution of the equation 2x – y = p then find the value of P. (AO1)

Q.16. Express $\frac{x}{4} - 3y = -7$ in the form of ax + by + c = 0. (AO2)

Q.17. Find the value of mi if (5, 8) is a solution of the equation 11x – 2y = 3m then Find one more solution of this equation (AO2)

Q.18. Write the equation 5x = $\frac{7}{2}$ in the form of a linear equation in two variables. (AO2)

3 MARKS QUESTIONS

Q.19. Find out three different solutions of the equation. x + 2y = 6. (AO1)

Q.20. Write each of the following equations in the form of ax + by + c = 0 and find out the values of a, b, and c in each case. (AO1)

(i) 2x + 3y = 4
(ii) x – 7 = 12y
(iii) 17 = 5x – 3y

Q.21. Write each of the following as an equation in two variables: (AO2)

a) x = -5 b) y = 2 c) 2x = 3

Q.22. Solve. $5x + \frac{7}{2} = \frac{3x}{2} - 14$ (AO1)

Q.23. Solve. $\frac{6x+1}{3} + 1 = \frac{x-3}{6}$ (AO1)

5 MARKS QUESTIONS

Q.24. The linear equation that converts Fahrenheit (F) to Celsius (C) is given by the relation

$$c = \frac{5F-160}{9}$$

(i) If the temperature is 86°F, what is the temperature in Celsius? (AO1)
(ii) If the temperature is 35°C, what is the temperature in Fahrenheit? (AO1)
(iii) If the temperature is 0°C what is the temperature in Fahrenheit and if the temperature is 0°F, what is the temperature in Celsius? (AO1)
(iv) What is the numerical value of the temperature which is same in both the scales? (AO2)

Q.25. A positive number is 5 times another number. If 21 is added to both the numbers, then one of the new numbers become twice the other new number. What are the numbers? (AO2)

Q.26. The organisors of an essay competition decide that a winner in the competition, gets a prize, of Rs. 100 and a participant who does not win gets a prize of Rs.25. The total prize money distributed is Rs.3,000. Find the number of winners, if the total number of participants is 63. (AO2)

CASE BASED QUESTIONS(4 MARKS EACH)

Q.27. Prime Minister's National Relief Fund is the fund raised to provide support for people affected by Natural and man-made disasters. Natural disasters that are covered under this flood, cyclone, earthquake etc. Man-made disasters that are included are major accidents, Acid Attacks, rains, etc.

Two friends Vasanta and Vishwajith, together contributed Rs.200 towards Prime Minister Relief Fund.

Answer the following :

(i) How to represent the above situation in linear equation in two variables? (AO2)
(ii) If Vasanta contributed Rs. 76, then how much was contributed by Vishwajith? (AO1)
(iii) If both contributed equally, then how much is contributed by each. (AO1)
(iv) Write the standard form for the equation x = -5. (AO2)
(v) Write two solutions for the given linear equation in two variables: 2x – 3y – 4 = 0. (AO1)

SOLUTIONS OF CHAPTER -4: LINEAR EQUATION IN TWO VARIABLES

MULTIPLE CHOICE QUESTIONS

Q. 1. (a) Q. 5. (c)

Q. 2. (c) Q. 6. (d)

Q. 3. (c) Q. 7. (c)

Q. 4. (a) Q. 8. (d)

ASSERTION AND REASON QUESTIONS

Q.9. (b) is correct

Q.10. (a) is correct

because if x = 2, y = 1, so, by the equation

$2x + 3y = k$

$k = 2 \times 2 + 3 \times 1$

$k = y + 3$

$k = 7$

and are know that the solution of the line will satisfy the equation of line.

Q.11. (b) is correct.

because, x = 2k-1 and y = k is the solution of equation 3x – 5y – 7=0 (given)

∴ the values of x and y will satisfy the given equation

∴ $3(2k - 1) - 5(k) - 7 = 0$

$6k - 3 - 5k - 7 = 0$

$6k - 5k - 10 = 0$

$k - 10 = 0$

$k = 10$

and also A linear equation in two variables has infinitely many solutions.

but Reason (R) is not the correct explanation of Assertion (A).

Q.12. (b) is correct

because,

if x = 3 and y = 21 is the solution of linear equation 2x + 3y = 12 then they will satisfy the equation.

LHS $= 2x + 3y$

$= 2 \times 3 + 3 \times 2$

$= 6 + 6$

= 12 R.H.S.

∴ x = 3 and y = 2 is the solution

Now, again we cheek for $x = 4\ and\ y = 2$ in equation $x + 3y = 10$.

LHS = $x + 3y$ $=4 + 3 \times 2$

$= 4 + 6$

=10 RHS

$\therefore x = 4\ and\ y = 2$ are the solution of

$x + 3y = 10.$

but reason(R) is not the correct explanation of Assertion(A).

Q.13. (a) is the correct.

because A always satisfy the equation of line if it lies on that.

let us check for point(3,0)

For the given equation

LHS = 4x+3y

=4x3+3x0

=12+0

12 RHS

∴ both A and R are true and R is the correct explanation of A.

2 MARK QUESTION

Q.14. Given equation is 2x+y=7, We know that solution for a linear equation in two variables are those values which satisfy the given equation.

∴, if x=0 then-

=2x0+y=7

=0+y=7=(y=7)

Therefore, first solution is (0,7)

now, if y=0 then-

2x+0=7=2x=7

=x=$\frac{7}{2}$

The second solution is ($\frac{7}{2}$,0)

hence, the two solution of given equation are (0,7) and ($\frac{7}{2}$,0)

Q.15. Because (1,2) is the solution of equation 2x-y=p

∴ this value of x and y will satisfy the given equation.

=2x1-(-2) = p

=2+2=p

$\boxed{=p=y}$

Q.16. $\frac{x}{y} - 3y = -7$

multiplying the equation by 4

$=4x(\frac{x}{y}-3y) = 4x-7$

=x-12y=-28

=x-12y+28=0

Q.17. Because (5,8) is a solution of the equation 11x-2y=3m

=11x5-2x8

=55-16=3m

=3m=39

$m=\frac{39}{3}$

m=13

∴ the equation will be

=11x-2y=3x13

=11x-2y=39

Now we can find another solution

if y=0

=11x-2x0=39

=11x=39

$x=\frac{39}{11}$

∴ another solution for equation 11x-2y=39 will be $(\frac{39}{11}, 0)$

Q.18. $5x=\frac{7}{2}$

=5xX2=7

=10x=7

=10x+0.y-7=0

=10x+0.y-7=0

The above form is the linear equation in two variables.

3 MARKS QUESTIONS

Q.19. given equation is x+2y=6.

For the First Solution,

let x=0

=0+2y=6 =2y=6

=y=3

For the second solution

Let y=0

x+2x0=6

x+0=6

x=6

For the third solution

Let x = 2

∴ the equation will be,

=2+2y=6

=2y=y

y=2

Hence the three different solutions of the equation x+2y=6 are

(0,3), (6,0) and (2,2)

Q.20.

(i)2x+3y=4

=2x+3y-4=0 if we compare with

ax+by+c=o then

a=2, b=3 and c=-4

(ii)x-7=12y

= x-12y-7=0 if we compare with

ax+by++c=o then

a=1,b=-12,=-7

(iii)17=5x-3y

=-5x+3y+17=0 if we compare

with ax+by+c=0

a=-5,b=3,c=17

Q.21. (a)x=-5

=x+0=-5

=x+0.y+5=0

(b)y=2

=0+y=2

=0.x+y=2

=0.x+y-2=0

(c)2x=3

=2x+0=3

=2x+0.y=3

=2x+0.y-3=0

Q.22. $5x+\frac{7}{2}=\frac{3x}{2}-14$

by multiplying the equation with 2

$=2x(5x+\frac{7}{2})=2x(\frac{3x}{12}-14)$

=10x+7=3x-28

=10x-3x=-28-7

=7x=-35

$=x=\frac{-35}{7}$

=x=15

Q.23. $\frac{6x+1}{3}+1=\frac{x-3}{6}$

by multiplying the equation with 6.

$6x(\frac{6x+1}{3}+1)=(\frac{x-3}{6})x6$

=2(6x+1)+6=x-3

=12x+2+6=x-3

=12x-x=-3-8

=11x=-11

=x=-1

5 MARKS QUESTIONS

Q.24. Because the given equation is $c = \frac{5f-160}{9}$

(i) because the temperature is 86°F

∴ the equation $c = \frac{5f-160}{9}$

$c = \frac{5x86-160}{9}$

$c = \frac{430-160}{9}$

$c = \frac{270}{9}$

C = 30°

∴ the Temperature in Celsius is 30°

(ii)because the Celsius temperature = 35°

by equation

$35 = \frac{5f-160}{9}$

⇒ 35x9=5f-160

⇒ 315=5f-160

⇒ 5f=315+160

⇒ 5f=475

⇒ $f = \frac{475}{5}$

f = 95°

∴ the temperature in Fahrenheit is 95°F

(ii) ∴ If temperature = 0°C by the equation

$o = \frac{5F-160}{9}$

⇒ o = 5F – 160

∴ 5F = 160

⇒ $F = \frac{160}{5}$

F = 32°

Again if temp. is 0°F by equation -

⇒ $C = \frac{5 \times 0 - 160}{9}$

$\Rightarrow \quad C = \frac{0-160}{9} \quad \Rightarrow \quad C = \frac{160}{9}$

∴ If temp. is 0°F then in Celsius = -17.7°C

iv) Let the temp. which is same in both the scale is = x°

by the equation

$$X = \frac{5x - 160}{9}$$

$\Rightarrow \quad 9x = 5x - 160$

$\Rightarrow \quad 9x - 5x = -160$

$\Rightarrow \quad 4x = -160$

$\Rightarrow \quad X = \frac{160}{4}$

$\Rightarrow \quad X = 40$

Hence, -40° is the temperature which is same in both the scales

Q.25. Let the first number = x

∴ the second number will be = 5x

ATQ, -

$2 (x + 21) = (5x + 21)$

$\Rightarrow \quad 2x + y2 = 5x+21$

$\Rightarrow \quad 5x - 2x = y2-21$

$\Rightarrow \quad 3x = 21$

$\Rightarrow \quad x = 7$

∴ the First number is = 7 and the second number is 5 x 7 = 35.

Q.26. Let the participant who does not win = x

∴ the participant who win = 63 – x

because total number of participants = 63

ATQ,

Total prize win by winners = 100 (63 – x)

Total prize obtained by who does not win 25(x)

∴ The total prize money distributed = 3000

∴ $25x + 100 (63 - x) = 3000$

$\Rightarrow \quad 25x + 6300 - 100x = 3000$

$\Rightarrow \quad -75x = 3000 - 6300$

⇒ -75x = 3300

x = $\frac{3300}{75}$

x = 44

∴ The total number of winners = 63 – 44
= 19

CASE BASED QUESTIONS (4 MARKS EACH)

Q.27. Let Vasanta contributed = Rs. x
and Vishwajith contributed Rs. y
ATQ –
x + y = 200
⇒ x + y – 200 = 0

Q2B. ∴ Vasanta contributed Rs. 76
∴ by Linear equation
⇒ 76 + y = 200
⇒ y = 200 – 76
y = 124 Rs.
Hence, Vishwajith contributed Rs. 124

Q.29. If both contributed equally
∴ x = y
by Linear equation ⇒ x + x = 200
⇒ 2x = 200
⇒ x = Rs. 100
Therefore, if both contributed equally, then each contributed Rs. 100.

Q.30. x = -5
⇒ x + 0 = -5
⇒x + 0. y = -5
⇒x + 0.y + 5 = 0
This is the standard form ax + by + c = 0 for Linear equation in two variable.

Q.31. given equation is
2x – 3y – y = 0
For the First solution –
Let x = 0
2 x 0 – 3y - 4 = 0
⇒ -3y = 4
⇒ y = $\frac{4}{3}$
For the second solution –
Let y = 0
⇒2x – 3x0 – y = 0
⇒2x – y = 0
⇒2x = y
⇒x = 2

Hence the solutions of Linear equation in two variables 2x – 3y – 4 = 0 are (0, $\frac{4}{3}$) and (2, 0).

CHAPTER-5: INTRODUCTION TO EUCLID'S GEOMETRY

MULTIPLE CHOICE QUESTIONS

1: How many straight lines can be draw through two given points?

a) None b) Only one c) Two d) Three

2: What is the minimum number of lines required to make a closed figure?

a) One b) Two c) Three d) Four

3: Which of the following is an axiom?

a) Theorems

b) Definitions

c) The universal truth in all branches of Mathematics

d) Universal truth specific to geometry

4: How many dimensions does a surface has?

a) One b) Two c)Three d) Four

5: A solid has how many dimensions?

a) One b)Two c)Three d) Four

6: What do you call a figure formed by two straight lines having a common point?

a) Angle b) Triangle c)Rhombus d) Kite

7: How many lines can pass through one point?

a) One b) Two c) Three d) infinite

8: Which of the following are boundaries of a surface?

a) Lines b) Curves c) Surfaces d) Points

ASSERTION AND REASON QUESTIONS

A statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.
a) Both A and R are true and R is the correct explanation of A
b) Both A and R are true but R is not the correct explanation of A
c) A is true but R is false
d) A is false but R is true

9: Assertion: There can be an infinite number of lines that can be drawn through a single point.

Reason: from this point we can draw only two lines.

10: Assertion: Through two distinct points there can be only one line that can be drawn.

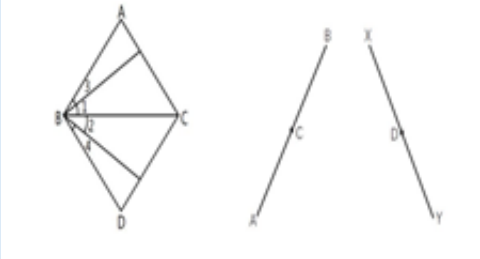
Reason: From this two point we can draw only one line

11: Assertion: According to Euclid's 1st axiom- "Things which are equal to the same thing are also equal to one another".

Reason: if AB = PQ and PQ = XY, then AB = XY

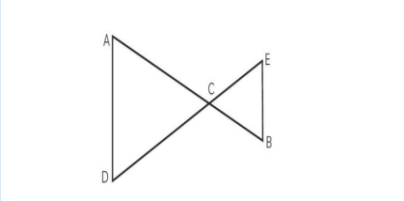
2 MARKS QUESTIONS

12: In the given below left figure, we have 1 = ∠2, ∠3 = ∠4. Show that ∠ ABC = ∠ DBC. State the Euclid's axiom used.

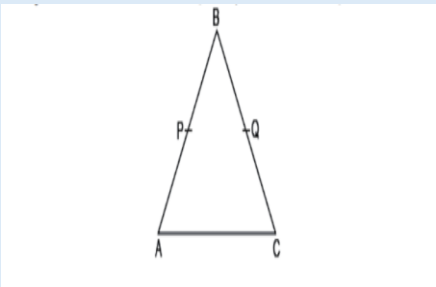


13: In the above right sided figure, we have: AC = XD, C is the midpoint of AB and D is the mid-point of XY. Using an Euclid's axiom, show that AB = XY.

14: In the given figure AC = DC, CB = CE, then show that AB = DE



15: In the given figure, if AB = BC and AP = CQ, then prove that BP = BQ.



16: Define a point and a line. (AO1)

3 MARKS QUESTIONS

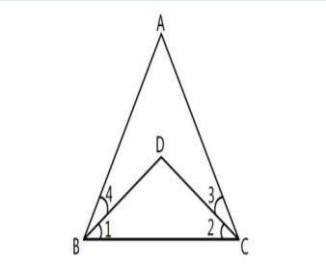
17: Prove that every line segment has one and only one mid-point.

18: (a) If x + y = 10, then x + y + z = 10 + z. Euclid's which axiom illustrates this statement?

(b) Solve the equation a – 30 = 40 and state which axiom did you used here.

19: In the given figure, we have ∠ABC = ∠ACB, ∠3 = ∠4. Show that (i) ∠1 = ∠2.

(ii) BD = DC.



20: Which of the given following assertions are true and which are false? Give explanations for your solutions.

(i) Just one line can pass through a given single point.

(ii) An infinite number of lines pass through two required distinct points.

(iii) A given terminated line can be created indefinitely on both sides.

21: Define the following terms individually. Are there other terms that ought to be specified first? What are they, and how will you describe them?

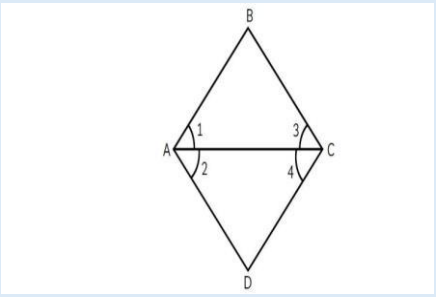
(i)The parallel lines

(ii) The perpendicular lines

(iii) The line segment

5 MARKS QUESTIONS

22: (a) In the figure, we have ∠1 = ∠3, ∠2 = ∠4. Show that ∠A = ∠C.



(b) Ritish went Manali with his 2 friends. Ritish and his friend Arun has total 10 shirts where as the number of shirts Arun have is equal to the number of shirts Aditya have. Show that Ritish and Aditya also have a total of 10 shirts.

23: Assume the two 'postulates' given below

(i) Given any two distinct points, A and B, there exists a third point, C, between A and B.

(ii) At least three points are not on the same line.

Do these postulates contain any undefined terms? Are these postulates consistent? Do they follow Euclid's postulates? Explain.

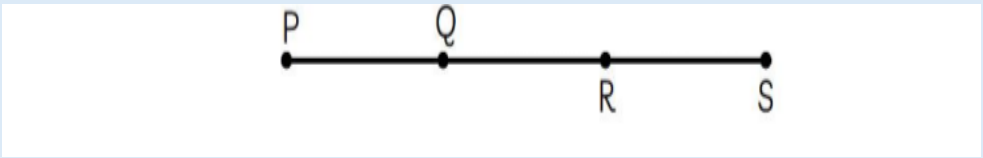
CASE BASED QUESTIONS (4 MARKS EACH)

24: In last year, cyclone comes out in Andhra Pradesh. Due to this cyclone, many persons lost their lives and property. Deepak and Rohit decided to contribute equal amounts to National Disaster Relief Fund, so that the suffered person get some relief.

(a) In this process, which axiom is used. Also write their statement.

(b) If Deepak contributed ₹30,000, then how much contribute the Rohit?

(c)In the given figure, if PR = QS, then prove that PQ = RS



25: Rahul has a fantasy of collecting the old stamp. So, one day he went to collect old stamps from two different market stores of the Indira Nagar market. So, Rahul decides to take 3 from each store.

(a) It is known that a + b = 20 and a = c. Show that c + b = 20.

(b) How many stamps remain with each store after Rahul's purchase?

(c) Solve the equation y + 12 = 15 and state the Euclid axiom used here.

26: In a right-angled triangle ABC, ∠A = 90°, AB = 5 cm, and BC = 13 cm.

Answer the following questions

I. What is the definition of a right-angled triangle in Euclid's Geometry?

II. What is the Pythagorean Theorem?

III. Use the Pythagorean Theorem to find the length of side AC.

27: An architect designs a building with a rectangular base measuring 15 meters by 8 meters. If the building's height is 12 meters.

Questions:

I. What is the definition of a rectangle in Euclid's Geometry?

II. What is the formula for the area of a rectangle?

III. What is the area of the roof?

SOLUTIONS OF CHAPTER-5: INTRODUCTION TO EUCLID'S GEOMETRY

MULTIPLE CHOICE QUESTIONS

1. b

2. c

3. c

4. b

5. c

6. a

7. d

8. b

ASSERTION AND REASON QUESTIONS

9. c

10. a

11. a

2 MARKS QUESTIONS

12: Ans. Given, $\angle 1 = \angle 2$ and $\angle 3 = \angle 4$.

Using Euclid's second axiom, if equals are added to equals, then the wholes are equal.

Now, $\angle 1 + \angle 3 = \angle 2 + \angle 4$

$\Rightarrow \angle ABC = \angle DBC$

13: Ans. Given, AC = XD, C is the midpoint of AB and D is the mid-point of XY.

As C is the midpoint of AB,

$\therefore$ AB = 2AC

As D is the midpoint of XY,

$\therefore$ XY = 2XD

From Euclid's axiom, things that are double of same things are equal to one another

Hence, AB = XY

14: Ans. We have AC = DC ...(i) [Given]

And CB = CE ...(ii) [Given]

Now, by axiom 2, if equals are added to equals, the wholes are equal.

Adding eqs. (i) and eqs. (ii).

We get AC + CB = DC + CE

Hence, AB = DE

15: Ans. Given: AB = BC ...(i)

and AP = CQ ...(ii)

According to Euclid's axiom, if equals are subtracted from equals, the remainders are equal.

Therefore, on subtracting (ii) from (i), we get

AB – AP = BC – CQ (Given AP = CQ)

BP = BQ

16: A point has no part.

A line has breathless length. It can be extended in both directions.

3 MARKS QUESTIONS

17: PR = 1/2PT

PS = ½ PT ($\because$ R and S are mid-points according to assumption)

$\Rightarrow$ PR = PS ($\because$ Things which are equal to the same things are equal to one another)

But this is possible only if R and S coincide.

Hence our assumption is wrong. Thus every segment has one and only one midpoint.

18: (a) If x + y = 10, then x + y + z = 10 + z. Euclid's which axiom illustrates this statement?

(b) Solve the equation a – 30 = 40 and state which axiom you used here.

Ans. (a) Euclid's second axiom; If equals are added to equals, then the wholes are equal

(Additional property of equality).

Here, we can see that x + y = 10

Then we are adding an equal quantity, i.e., z to both

x + y + z = 10 + z

(b) a – 30 = 40

$\Rightarrow$ a = 40 + 30 $\Rightarrow$ a = 70

Euclid's second axiom is used here.

19: Ans. Given, $\angle 3 = \angle 4$ or $\angle 4 = \angle 3$ ...(1)

and $\angle ABC = \angle ACB$

$\therefore \angle 1 + \angle 4 = \angle 2 + \angle 3$ ...(2)

Using Euclid's third axiom, if equals are subtracted from equals, then remainders are equal.

On subtracting eq. (1) from eq. (2), we get

$\angle 1 + \angle 4 - \angle 4 = \angle 2 + \angle 3 - \angle 3$

$\therefore \angle 1 = \angle 2$

Sides opposite to equal angles are equal.

$\therefore$ BD = DC

20: (i) The above statement is False

Reason: If we draw a point O on the surface of a paper. Utilizing pencil and scale, we can draw an infinite number of straight lines passing

(ii) The above statement is False

Reason: In the following figure, multiple straight lines pass through P. There are numerous lines, passing through Q. But there is one line which is passing through P and Q.

(iii)The above statement is True

Reason: Postulate 2 says, "A terminated line can be produced indefinitely."

21: Yes, we need to know the words like point, line, ray, angle, plane, circle and quadrilateral, etc., before describing the necessary words.

Descriptions of the necessary words are given below:

(i) The parallel lines:

The two lines l and m in a plane are expressed as parallel if they have no common point, and we note them as l ∥ m.The distance between the lines always remains the same.

(ii) The perpendicular lines:

The two lines, p and q, lying in the same plane, are expressed to be perpendicular if they intersect each other at right angle, and we note them as p ⊥ q.

(iii)The line Segment:

A required line segment is a part of a line and has a definite length. It has two endpoints. In the figure, a line segment has endpoints A and B. It cannot be extended.

5 MARKS QUESTIONS

22: Ans. (a) Given, ∠1 = ∠3, ∠2 = ∠4

According to the Euclid's second axiom, if equals are added to equals, then the wholes are equal.

Add ∠1 = ∠3 and ∠2 = ∠4

⇒ ∠1 + ∠2 = ∠3 + ∠4

⇒ ∠A = ∠C

Therefore, ∠A = ∠C.

(b) Ritish + Arun = 10 ... (i)

and Arun = Aditya

From Euclid's second axiom, when equals are added to equals, the wholes will be equal.

So, on adding Ritish on both sides of Arun and Aditya we get,

Arun + Ritish = Aditya + Ritish

From eq. (i), 10 = Aditya + Ritish

∴ Aditya + Ritish = 10

23:Yes, these postulates have undefined terms such as 'Point and Line. Furthermore, these postulates are consistent because they deal with two different situations as

(i) states that required two points A and B, there is a point C on the line between them. Whereas

(ii) states that, given points A and B, you can take point C, not lying on the line through points A and B.

No, these postulates do not obey Euclid's postulates. Nevertheless, they abide by the axiom, "Given two distinct points, there is a unique line that passes through them."

CASE BASED QUESTIONS (4 MARKS EACH)

24: Ans. (a) In this process, Axiom 1 is used i.e., things which are equal to the same things are equal to the one another.

(b) We have, Deepak and Rohit distribute equal amounts.

Since, Deepak contributes ₹30,000, so Rohit also contribute ₹30,000.

(c) It is given, PR = QS

From the given figure, we get,

PR = PQ + QR

and QS = QR + RS

∴ PQ + QR = QR + RS ...(i)

[Given: PR = QS]

Subtract QR from both sides of the equation (i), we get,

PQ + QR – QR = QR + RS – QR

PQ = RS

25: Ans. (a) According to the question, We have, a + b = 10 ...(i)

and a = c ...(ii)

Applying Euclid's axiom, if equals are added to equals, the whole are equal. We get,

From eqs. (i) and (ii)

a + b = c + b ...(iii)

From eqs. (i) and (iii), c + b = 10

(b) Let, each store have x stamps. Now, after Rahul bought 3 stamps, store left with (x – 3) stamps.

(c) y + 12 – 12 = 15 – 12

⇒ y = 15 – 12

⇒ y = 3.

It is stated in Euclid's Third axiom.

26: A right-angled triangle has one angle equal to 90°.

$a^2 + b^2 = c^2$, where a and b are the legs and c is the hypotenuse.

$AC^2 = BC^2 - AB^2 \Rightarrow AC^2 = 13^2 - 5^2 \Rightarrow AC^2 = 144 \Rightarrow AC = \sqrt{144} \approx 12$ cm

27: A rectangle is a quadrilateral with all sides equal and all angles right angles.

Area = length × width

Area = 15 × 8 = 120 square meters

CHAPTER - 6: LINES AND ANGLES

MULTIPLE CHOICE QUESTIONS

1. Which of the following statements is incorrect? (AO1)

(A) A line segment has definite length.

(B) Three lines are concurrent if and only if they have a common point.

(C) Two lines drawn in a plane always intersect at a point.

(D) One and only one line can be drawn passing through two given points.

2. If the measure of an angle is twice the measure of its supplementary angle, then the angle is: (AO1)

(A) 60° (B) 90° (C) 120º (D) 130º

3. The supplement of an angle y is: (AO1)

(A) y + 90º (B) 90° - y (C) y + 180º (D) 180 - yº

4. If two supplementary angles are in the ratio 2: 7, then the angles are: (AO1)

(A) 35°, 145° (B) 70°, 110° (C) 40°, 140° (D) 50°, 130

5. If the sum of two adjacent angles is 100° and one of them is 35°, then the other is (AO1)

(A) 70° (B) 65° (C) 135° (D) 145°

6. Which one of the following statements is true? (AO1)

(A) Only one line can pass through a single point.

(B) There are an infinite number of lines which pass through two distinct points.

(C) Two distinct lines cannot have more than one point in common.

(D) If two circles are equal, then their radii are not equal

7. The angle which is equal Ito 8 times its complement is: (AO2)

(A) 80° (B) 72° (C) 90° (D) 88º

8. Two lines are respectively perpendicular to two perpendicular lines. Then these two lines to each other are: (AO2)

(A) parallel (B) perpendicular

(C) inclined at same acute angle (D) intersecting at 110º

ASSERTION AND REASON QUESTIONS

DIRECTION: From 9 to 12 questions, a Statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of

assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

9. Assertion: A triangle can have two obtuse angles. : (AO1)

Reason: The sum of all the interior angles of a triangle is 180º

10. Assertion: Supplement of angle is one fourth of itself. The measure of the angle is 144º

Reason: Two angles are said to be supplementary if their sum of measure of angles is 180º. (AO1)

11. Assertion: If two internal opposite angles of a triangle are equal and external angle is given to be 110º, then each of the equal internal angle is 55º.

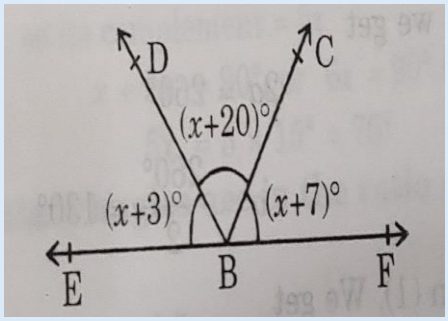
Reason: A triangle with one of its angle 90º, is called a right triangle. (AO1)

12. Assertion: If two interior angles on the same side of a transversal intersecting two parallel lines are in the ratio 5 : 4, then the greater of the two angles is 100º.

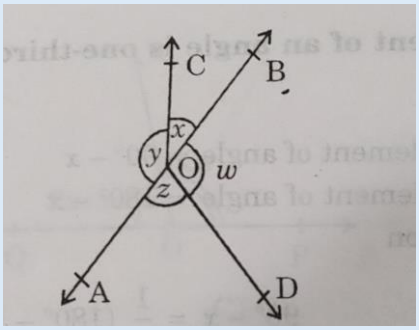
Reason: If a transversal intersects two parallel lines, then the sum of the interior angles on the same side of the transversal is 180º. (AO1)

2 MARKS QUESTIONS

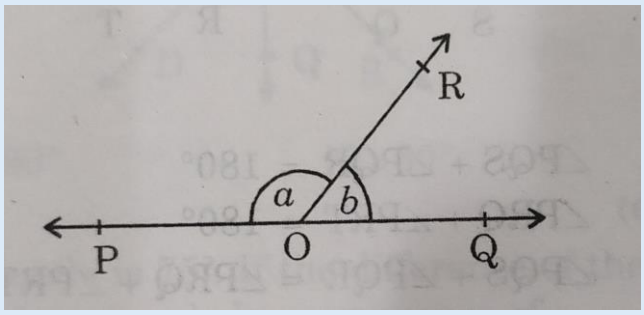
13.In the given figure, find the value of x. (AO2)



14. In figure given below, if x + y = w+z, then prove that AOB is a line. (AO2)

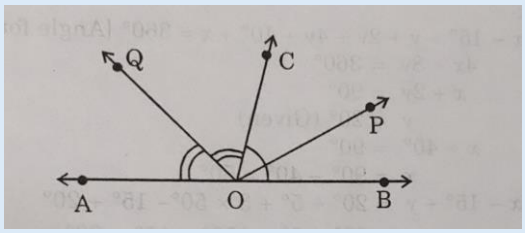


15. In figure given below, if ∠POR and ∠QOR from a linear pair and a-b = 80º, then find the value of a and b. (AO2)



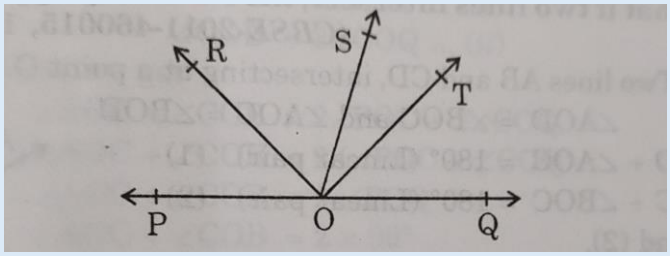
16 Lines PQ and RS intersect each other at point O. If ∠POR : ∠QOR = 5 : 7, find all angles. (AO2)

17. In the figure given below, OP bisects ∠BOC and OQ bisects ∠AOC. Show that ∠POQ = 90º. (AO2)



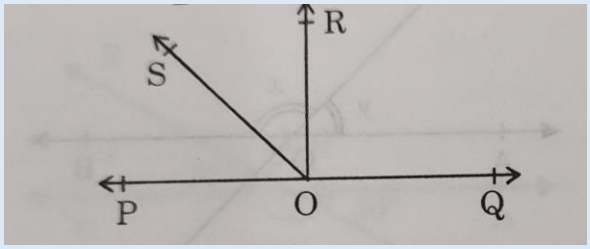
3 MARKS QUESTIONS

18.in figure given below, ray OS stands on a line POQ. Ray OR and OT are angle bisectors of ∠POS and ∠SOQ respectively. If ∠POS = x, find ∠ROT. (AO2)



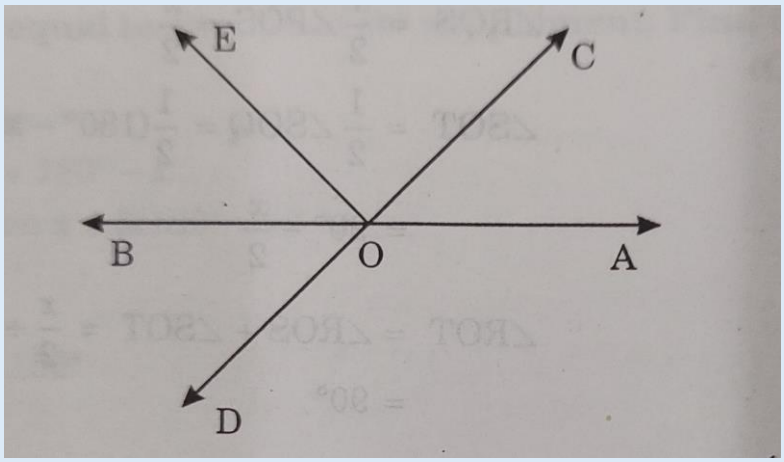
19. In figure given below, POQ is a line, ray OR is perpendicular to line PQ and OS is another ray lying between rays OP and OR. Prove that

∠ROS = ½(∠QOS - ∠POS).(AO2)

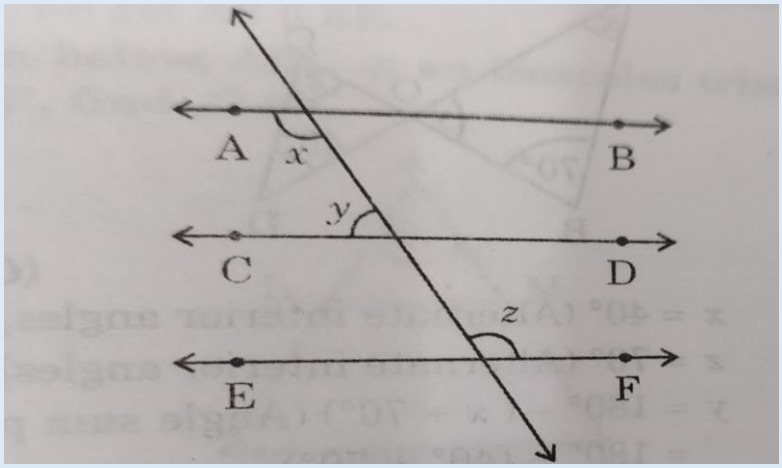


20. Prove that if two lines intersect, the vertically opposite angles are equal. (AO2)

21. In the given figure, lines AB and CD intersect at O. If ∠AOC + ∠BOE = 70º and ∠BOD = 40º, find ∠BOE and reflex ∠EOC. (AO2)

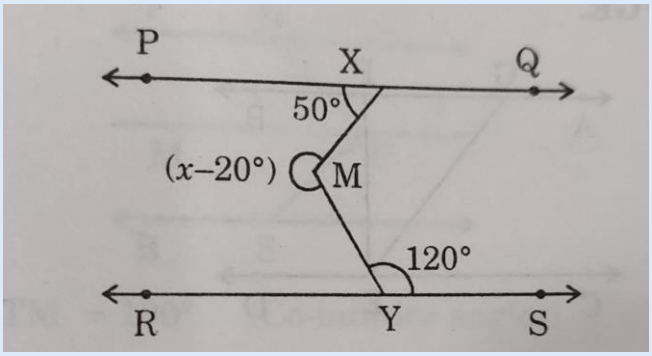


22. In figure given below, if AB ||CD, CD || EF and y : z = 3 : 7, find the measures of x,y and z. (AO2)

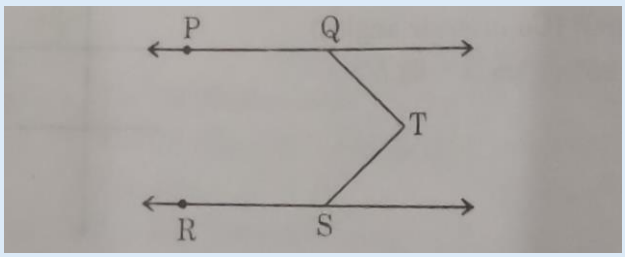


5 MARKS QUESTIONS

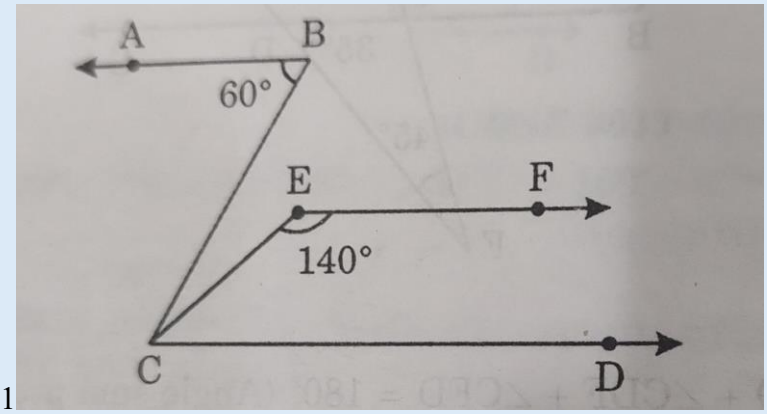
23.In figure given below, if PQ || RS, ∠PXM = 50º and ∠MYS = 120º, find the value of x. (AO2)



24. In figure given below, PQ || RS and T is any point as shown in the figure. Then, show that ∠PQT + ∠QTS + ∠RST = 360º (AO2)

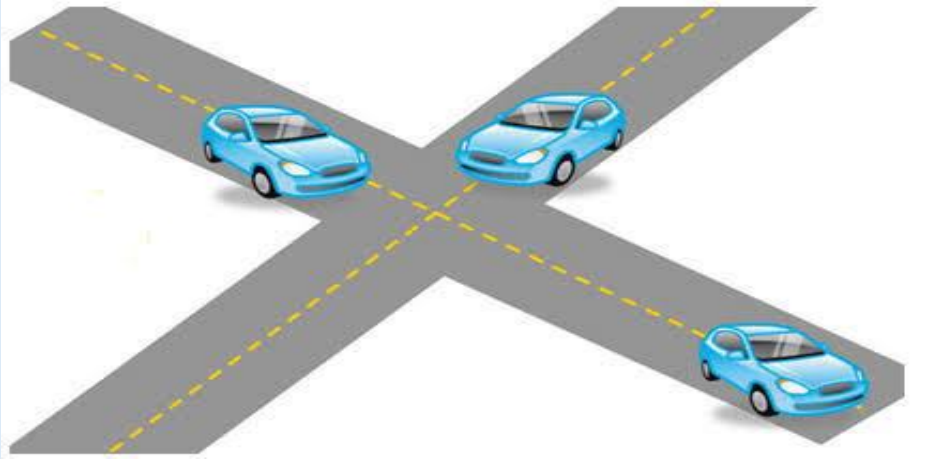


25.In the figure given below, AB || CD || EF and ∠ABC = 60º, ∠CEF = 140º, find the value of ∠BCE. (AO2)

21 

CASE STUDY BASED QUESTIONS (4 MARKS EACH)

26. A civil engineer is planning a new road intersection where two roads intersect at a point O, forming a pair of vertically opposite angles. The angles on one side of the intersection are found to be 2x and 3x degrees, and the engineer has to ensure that the total angle at the intersection is 180°.



Questions:

(a): What are the values of x? (2) (AO2)

(b): Find the measures of the vertically opposite angles.(1) (AO1)

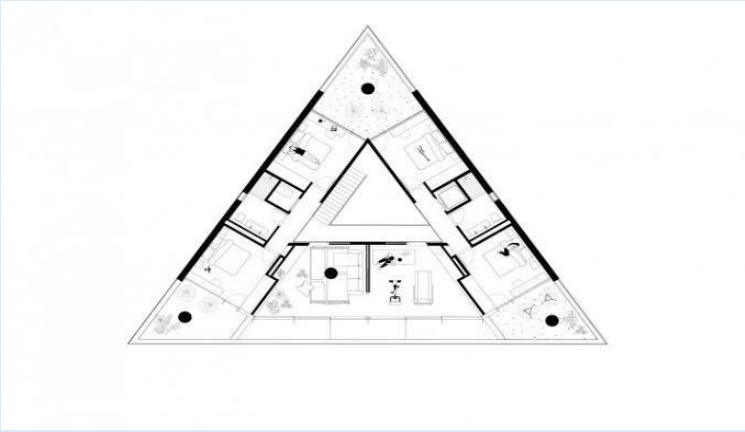
(c): Prove that the other pair of opposite angles is equal to the pair found in Question 2. (1) (AO2)

27. An architect designs a building with a triangular facade. The angles of the triangle are given as follows:

$\angle A = 2x - 10^{0}$

$\angle B = x + 20^{\circ}$

$\angle C = 3x - 30^{\circ}$



Questions:

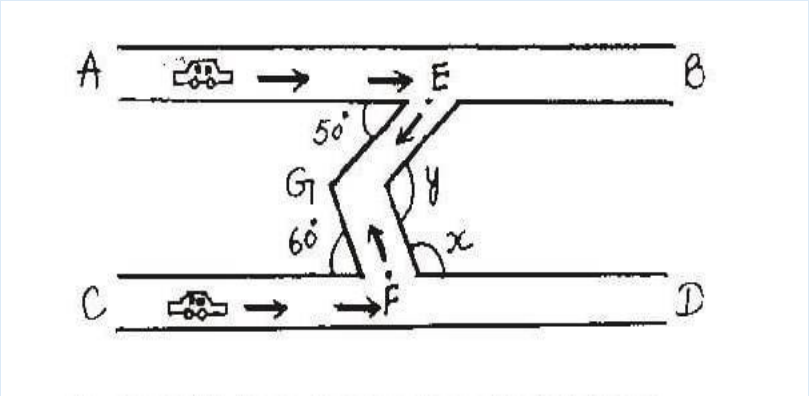
(a): Find the value of x. (2) (AO2)

(b): Calculate the measures of all three angles.(1) (AO2)

(c): Determine the type of triangle (acute, obtuse, or right-angled).(1) (AO1)

28.Two cars are moving on two parallel roads represented as AB and CD respectively in the given figure. First car reaches at point E and takes a turn towards its right at an angle of 50^{0}.

At the same time, second car reaches at point F and takes a turn towards its left at an angle of 60º. They both meet at a point G. Based on the above information and given figure, answer the following question (without considering the width of the roads)

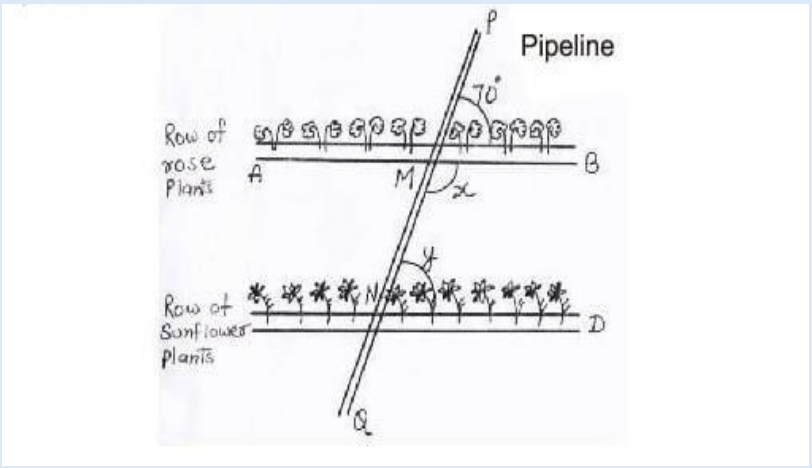


(a): What will be the measure of angle x marked in the figure? (1) (AO1)

(b): What will be the measure of ∠EGF marked as y? (2) (AO2)

(c): What will be the measure of reflex ∠EGF ? (AO2)

29. Once four students of class IX are selected in Eco club of the school for plantation work. They are Shreya, Khushi, Vaibhav and Sushant. Shreya and Vaibhav planted a row of rose plants as shown in figure with line AB. Now Khushi and Sushant want to plant another row of sunflower plants parallel to rose plants row. Also there is a pipeline PQ passing through AB & CD. Based on the above information, answer the following questions-



(a): At what angle with PQ should Khushi and Sushant plant the row CD to make it parallel to row AB?(2) (AO2)

(b): What will be the value of x?(1) (AO1)

(c): What will be the value of y?(1) (AO1)

SOLUTIONS OF CHAPTER – 6: LINES AND ANGLES

MULTIPLE CHOICE QUESTIONS

1: C. 2: C. 3: D. 4: C.

5: B. 6:C 7: A 8: B

ASSERTION AND REASON QUESTIONS

9: D. 10: A. 11: B. 12: A

2 MARKS QUESTIONS

13.Here, $(x + 3)^0 + (x + 20)^0 + (x + 7)^0 = 180^0$ because $(x + 3)^0$, $(x + 20)^0$, $(x + 7)^0$are forming straight angle. (1)

$3x + 30^0 = 180^0$

$3x=150^0$

$x = 150^0/3 = 50^0$ (1)

14. $x + y + w + z = 360^0$ (angles at a point)

$x + y = w + z$ (given) (1)

$(x + y) + (x + y) = 360^0$

$2(x + y) = 360^0$

$x + y = 1/2\ x(360^0) = 180^0$ (1)

15. $a + b = 180^0$ (Linear pair) ... (I)

$a - b = 80^0$ (Given) ……(II) (1/2)

adding (I) and (II), we get

$2a = 260^0$

$a = 260^0/2 = 130^0$. (1)

Putting value of a in (I), we get. $b = 50^0$. Hence, $a = 130^0$, $b = 50^0$ (1/2)

16. $\angle POR + \angle ROQ = 180^0$ (Linear pair)

But, $\angle POR : \angle ROQ = 5 : 7$ (Given)

$\angle POR = 5/12\ x180^0 = 75^0$. (½)

and, $\angle ROQ = 7/12\ x\ 180^0 = 105^0$. (1/2)

Now, $\angle SOQ = \angle POR = 75^0$ (Vertically opposite angles) (1/2)

and, $\angle POS = \angle ROQ = 105^0$ (Vertically opposite angles) (½)

\17. ∠AOC+ ∠BOC = 180 deg (Linear pair)

So, 1/2 ∠AOC+ 1/2 ∠BOC = 1/2 x 180º = 90º (Halves of the same thing are equal to one another) (1)

i.e., ∠QOC+ ∠POC = 90º(OQ bisects ∠AOC and OP bisects ∠BOC) (½)

Or ∠POQ = 90º. (½)

3 MARKS QUESTIONS

18: . Ray OS stands on line ∠POQ,

∠POS + ∠SOQ = 180º

x + ∠SOQ = 180º

∠SOQ = 180° - x. (½)

Ray OR bisects ∠POS,

∠ROS = ½ POS = x/2 (½)

Similarly,

∠SOT = ½ ∠SOQ = ½ (180º - x) (½)

= 90º - x/2 (½)

So,

∠ROT = ∠ROS + ∠SOT = x/2 + 90°- x/2 (½)

= 90º (½)

19. From the figure, angle

∠ROS = ∠QOS- ∠ROQ

∠ROS= ∠QOS - 90º (OR ⊥ QO)....(I) (1)

Also, ∠ROS = ∠ROP- ∠POS

or, ∠ROS =90º - ∠POS (OR ⊥ PQ)....(II) (1)

Adding (I) and (II),

a∠ROS+ ∠ROS= ∠QOS - 90º + 90º - ∠POS

2∠ROS = ∠QOS - ∠POS

∠ROS = ½ (∠QOS - ∠POS). (1)

20. Given: Two lines AB and CD, intersecting at a point O. (½)

To prove: ∠AOD = ∠BOC and ∠AOC = ∠BOD (½)

Proof: ∠AOD + ∠AOC=180º (Linear pair)...(I) and ∠AOC+ ∠BOC = 180º (Linear pair).....(II) (1)

So, from (1) and (2), we have:

∠AOD = ∠AOC (½)

Also, ∠AOD+ ∠BOD = 180º (Linear pair)....(III) So, from (1) and (3),

∠AOD + ∠AOC= ∠AOD+ ∠BOD

i.e. ∠AOC = ∠BOD (½)

Hence proved

21. ∠BOD = ∠AOC (vertically opposite angles) (½)

∠BOD = 40º (given)

∠AOC = 40º

∠AOC+ ∠BOE = 70º (given)

40º + ∠BOE = 70º

∠BOE = 70º - 40º = 30º. (1)

But, ∠DOB + ∠BOE+ ∠EOC = 180º (Angles formed on a straight line)

40º +30º + ∠EOC = 180º

∠EOC = 180º - 40º - 30º = 110º. (1)

Reflex ∠EOC = 360º - 110º= 250º. (½)

22.Let y = 3k and z = 7k

Also, AB II CD and CD || EF

SO, AB || EF

So, x = z (Alternate interior angles) (½)

x = 7k

Also, x + y = 180º(Interior angles on same side of transversal)

7k + 3k = 180º. (½)

k = 18º. (½)

So, x = 7 x 18º = 126º (½)

y = 3 x 18º = 54º (½)

z = 126º. (½)

5 MARKS QUESTIONS

23. Draw MC || PQ || RS. (1)

Now, ∠XMC= ∠PXM = 50º (Alternate interior angles). (1)

and, ∠YMC = 180º - 120º = 60º (Interior angles on the same side of the transversal) (1)

So, ∠XMY= ∠XMC+ ∠YMC = 50º + 60º = 110º (1)

So, x - 20º = 360º - 110º = 250º

x = 250º + 20º = 270º. (1)

24. Through T, draw a line parallel to PQ or RS (1)

as ∠PQT + ∠QTM = 180º (Co-interior angles) (1)

Also, RS II TM

∠MTS + ∠RST = 180º (Co-interior angle) (1)

So, ∠PQT+ (∠QTM + ∠MTS) + ∠RST = 180º + 180º = 360º. (1)

Or, ∠PQT+ ∠QTS+ ∠RST = 360º. (1)

25. EF || CD and EC is a transversal (½)

∠DCE+ ∠FEC = 180º (co-interior angles) (1½)

∠DCE + 140º = 180º

∠DCE = 180º - 140º = 40º

∠BCD = ∠ABC (alternate interior angles)

∠BCD = 60º. (1½)

∠BCE + ∠DCE = 60º

∠BCE + 40º = 60

∠BCE = 60º - 40º = 20º

∠BCE = 20º. (1½)

CASE BASED QUESTIONS (4 MARKS EACH)

26. Solution:

Finding the values of x:

Since the angles on one side of the intersection are supplementary (sum up to 180°):

$2x+3x=180°$. (1)

Solving for x:

$5x=180° \Longrightarrow x=36°$

Thus, $x = 36°$. (1)

Finding the measures of the vertically opposite angles:

The vertically opposite angles are 2x and 3x.

Substitute $x = 36°$:

$2x=2(36°)=72°$

$3x=3(36°)=108º$. (1)

Proving the other pair of opposite angles are equal:

Vertically opposite angles are always equal.

Thus, the other pair of opposite angles would also be 72° and 108° (due to the symmetry of vertical angles). (1)

27. Solutions:

The sum of all angles in a triangle is 180∘. Therefore:

$2x+x+3x-10∘+20∘-30∘=180∘$

$6x-20∘ =180∘$. (1)

$6x = 200º$

$x = 33.33º$. (1)

Substituting the value of x

into the expressions for the angles:

$\angle A = 56.66º$

$\angle B = 53.33º$

$\angle C = 69.99º$. (1)

Since all angles are less than 90º, the triangle is acute. (1)

28. Finding x:

$x + 60^o = 180^o$.

$x = 120^o$. (1)

Finding y:

Draw a line From G parallel to AB or CD

$y = 50^o + 60^o$ (alternate interior angles)

$y = 110^o$

Finding reflex ∠EGF:

ref ∠EGF = $360^o - 110^o$

$= 250^o$. (1)

29.Finding angle between PQ and CD:

to make CD parallel to AB,

PQ will be transversal lines

angle between PQ and CD = ∠PMB = 70^o (corresponding angles)

Or $180^o - 70^o = 110^o$ (if we measure angle towards left). (2)

Finding x:

$x = 180^o - 70^o$. (Linear pair of angles)

$= 110^o$. (1)

Finding y:

$y = 180^o - x = 180^o - 110^o = 70^o$. (Co-interior angles are supplementary). (1)

CHAPTER – 7: TRIANGLES

MULTIPLE CHOICE QUESTIONS

1. Two circles are congruent. If the radius of one circle is 3cm.what is the radius of the other circle (AO1)

   (a)3cm (b)6cm (c)1.5 cm (d)1 cm

2. In triangles ABC & PQR if ∠A=∠R, ∠B=∠P and AB=RP, Then which one of the following congruence condition applies .(AO2)

   (a) ASA (b) SAS (c) SSS (d) RHS

3. Which of the following is not a criterion for congruence of triangles (AO1)

   (a) SAS (b) ASA (c) SSA (d) SSS

4. In triangle ABC, if AB=BC and ∠B = 70°, ∠A will be: (AO2)

   (a)700 (b) 1100 (c) 550 (d) 1300

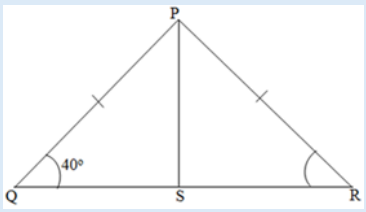
5. The angles opposite to equal sides of a triangle are: (AO1)

   (a) Equal (b) unequal (c)complementary (d)supplementary

6. In ΔABC, BC = AB and ∠B = 80°. Then ∠A is equal to (AO2)

   (a) 80º (b) 40º (c) 100º (d) 50º

7. In the given figure, PS is the median then ∠QPS?(AO2)



   (a) 40º (b) 50º (c) 100º (d) 90º

8. In triangles ABC and DEF, AB = FD and ∠A = ∠D. The two triangles will be congruent by SAS axiom if: (AO1)

   (a) BC = EF (b) AC = DE (c) AC = EF (d) BC = DE

ASSERTION -REASON QUESTIONS

Direction : In the following questions as statement of assertion(A) is followed by a statement of reason(R) . Mark the correct choice as:

a) Both assertion(A) and reason(R) are true and reason (R) is the correct explanation of assertion(A).
b) Both assertion (A) and reason (R) are true but reason(R) is not the correct explanation of assertion (A).

c) Assertion(A) is true but reason (R) is false.
d) Assertion(A) is false but reason (R) is true.

9. Assertion: IF $\Delta ABC \cong \Delta RPQ$, Then BC=QR

   Reason: Corresponding parts of two congruent triangles are equal (AO1)

10. Assertion: In ΔABC and ΔPQR, AB = PQ, AC = PR and $\angle BAC = \angle QPR$ then $\Delta ABC \cong \Delta PQR$

    Reason): Both the triangles are congruent by SSS congruence. (AO1)

11. Aassertion;

    In triangles ABC and PQR, $\angle A = \angle P$, $\angle C = \angle R$, and AC = PR. The two triangles are congruent by ASA congruence.

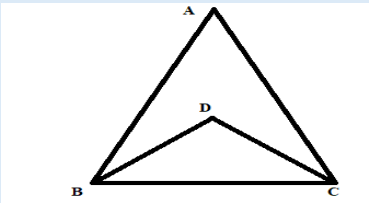
    Reason: If two angles and included side of a triangle are equal to the corresponding angles and side of the other triangle then the triangles are congruent by ASA congruence criteria. (AO1)

12. Assertion: In ΔABC, AB = AC , and $\angle B = 50^0$ then $\angle C$ is 50^o.

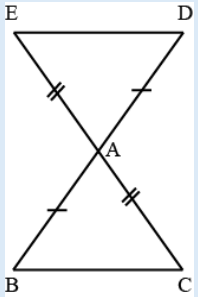
    Reason: In a triangle, angles opposite to equal sides are equal. (AO1)

2 MARKS QUESTIONS

13. In figure below ΔABC &ΔDBC are two triangles on the same base BC such that AB=AC &DB=DC. Prove that $\angle ABD = \angle ACD$(AO2)

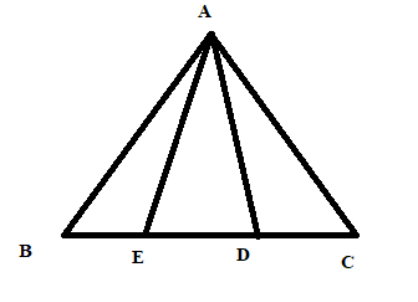


14. "If the two sides and an angle of one of the triangles are equal to the two sides and an angle of another triangle, then the two triangles should be congruent." Is this statement true? If so, why?(AO1)
15. It is given that $\Delta ABC \cong \Delta RPQ$. Is it true to state that BC = QR? Why? (AO1)
16. Angles A, B & C of a triangle ABC are equal to each other. prove that ΔABC is equilateral (AO1)
17. In the figure, the sides BA and CA have been produced such that BA = AD and CA = AE, Prove that segment DE || BC. (AO2)

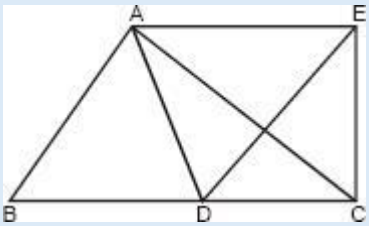


3 MARKS QUESTIONS

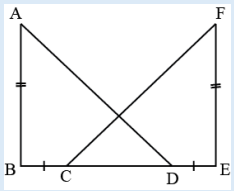
18. In the given figure AE=AD, $\angle BAE = \angle CAD$. Prove that AB=AC(AO2)



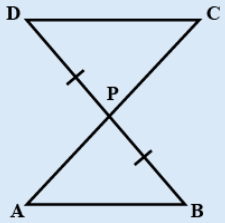
19. In the given figure, AB = AD, AC = AE and ∠BAD = ∠EAC, then prove that BC = DE. (AO2)



20. In the figure, AB⊥ BE and FE⊥ BE. If BC=DE and AB=EF, Prove that ΔABD≅ ΔFEC(AO2)



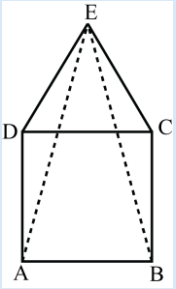
21. in the given figure, If AB||DC and P is the midpoint of BD, prove that P is also the midpoint of AC. (AO1)



22. In a right-angled triangle, one acute angle is double the other. Prove that the hypotenuse is double the smallest side (AO2)

5 MARKS QUESTIONS

23. In the adjoining figure, ABCD is a square and ΔEDC is an equilateral triangle. Prove that (i) AE=BE, (ii) ∠DAE=15^0

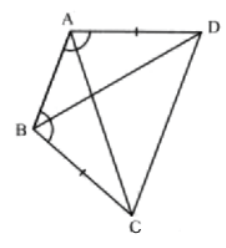


24. ABCD is a quadrilateral in which AD=BC and ∠DAB=∠CBA . Prove that

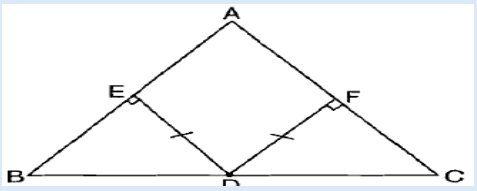
(i) △ABD≅△BAC

(ii) BD=AC

(iii) ∠ABD=∠BAC



25. ABC is a triangle and D is the mid-point of BC. The perpendiculars from D to AB and AC are equal. Prove that the triangle is isosceles.(AO1)



CASE STUDY QUESTIONS (4 MARKS EACH)

26.

Read the text carefully and answer the questions: In a forest, a big tree got broken due to heavy rain and wind. Due to this rain the big branches AB and AC: with lengths 5 m fell down on the ground. Branch AC makes an angle of $30^0$with the main tree AP. The distance of Point B from P is 4 m. You can observe that △ABP is congruent to △ACP.

(i) Show that △ACP and ABP are congruent (2mark)

(ii) Find the value of ∠ACP?(1 mark)

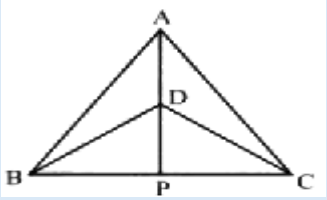
(iii) What is the total height of tree?(1 mark)

27. Sanjana and Anshu are two friends and both of them are fond of eating chips. one day they were eating triangles chips and suddenly Sanjana noticed that all the chips look alike and she recalled the chapter of triangles that had been taught by the teacher in the school. She decided to measure the sides of chips and she found that all the chips were of the same measurement 3cm,4cm &5cm.Based on the information given above information, answer the following questions

(i)which type of triangle were the chips
(ii)were the triangles chips congruent, if yes which property was used

(iii)If the chips are in right angled triangle shape, which type of congruence was used

28. A triangular shaped agricultural field ABC is divided by the farmer in four parts. In two parts of his field he wants to grow sugarcane and other two parts he wants to grow wheat. He want to grow wheat on the field division which are exactly same in shape and size, the same he wants to do for growing sugarcane $\triangle ABC$ and $\triangle DBC$ are two isosceles triangles on the same base BC and vertices A and D are on the same side of BC. If AD is extended to intersect BC at p



With reference to the given figure answer the following question

(i) If he decides to grow wheat in ΔABD, then which other triangle is of exact same shape &size

(ii) If he decided to grow sugarcane in ΔBDP, Then which other triangle is of exact same shape &size

(iii) The congruency in part (i) established by which criteria of congruency

29. A group of students is studying the properties of triangles. They came across the following scenario: Three friends, Ankit, Bhavna, and Chetan, were discussing their recent hiking trip. During their hike, they noticed a triangular-shaped lake. They observed the following:

1. The lake has three sides of different lengths.
2. The sum of the lengths of any two sides of the lake is greater than the length of the third side.
3. The largest angle of the lake is less than 90 degrees.
4. The smallest angle of the lake is greater than 30 degrees.

Based on this information, the students were asked to analyze the properties of the triangle formed by the lake. Let's see if you can answer the questions correctly:

(i) **The sum of the measures of the three angles of the lake's triangle**
(ii) Which type of triangle that lake was
(iii) Which type of angles are there in the lake

30. Engineers often use the familiar triangular shape for strength in bridge design.triangles are effective tools for architecture and are used in design of bridges,buildings and other structuresas they provide strength and stability.The triangle is common in all sorts of building supports &trusses.Following a re some questions on triangles

(i) In ΔABC &ΔACD, $\angle BAC=80^0$, $\angle ACDC=80^0$, AB=CD, AC=CA Which type of congruence rule used for this situation

(ii) If $\Delta PRQ \cong \Delta DEF, then\ DE = ?$

(iii) Is it possible to construct a triangle with length of sides as 5cm,4cm&8cm

SOLUTIONS OF CHAPTER – 7: TRIANGLES

1. Answer option (a) 3cm
2. Answer option (a) ASA
3. Answer option (c) SSA
4. Answer option:(c)55^0
5. Answer option (a) equal
6. Answer option(d) 50^0
7. Answer option(b) 50^0
8. Answer Option (b) AC=DE

ASSERTION -REASON QUESTIONS

9. Option d
10. Option c
11. Option a
12. Option a

2 MARK QUESTIONS

13. AB=AC

$\angle ABC=\angle ACB$

DB=DC

∠DBC=∠DCB

∠ABC−∠DBC=∠ACB-−∠DCB

∠ABD=∠ACD

14. No, the statement, “If the two sides and an angle of one of the triangles are equal to the two sides and an angle of another triangle, then the two triangles should be congruent.”, is false.

    Justification: Because by the congruency rule, The two sides and the included angle of one triangle are equal to the two sides, and the included angle of the other triangle, i.e., the SAS rule.

15. It is False that BC = QR. This is because BC = PQ as ΔABC ≅ ΔRPQ.

16. ∠A=∠B

    AC=BC (The sides opposite to equal angles are equal)

    ∠B=∠C

    AC=AB (The sides opposite to equal angles are equal)

    ∠A=∠C

    BC=AB (The sides opposite to equal angles are equal)

17. Side BA and CA of ΔABC are produced such that BA = AD are CA = AE. ED is joined.

    To prove : DE || BC

    Proof : In ΔABC and ΔDAE

    AB = AD (Given)

    AC = AE (Given)

    ∠BAC=∠DAE (Vertically opposite angles)

    ∴ΔABC≅ΔDAE (SAS axiom)

    ∴ ∠ABC=∠ADE (c.p.c.t)

    But these are alternate angles.

    DE||BC

3 MARKS QUESTIONS

18. . AE=AD, ∠AED=∠ADE

    180 −∠AED=180 −∠ADE

    ∠AEB=∠ADC (1)

    AE=AD, ∠BAE=∠CAD

ΔABE≅ΔACD ASA CONGRUENCE(1)

AB=AC (CPCT)

19. It is given that ∠BAD = ∠EAC

∠BAD + ∠DAC = ∠EAC + ∠DAC

∠BAC = ∠DAE

In ΔBAC and ΔDAE,

AB = AD (Given)

∠BAC = ∠DAE (Proved above)

AC = AE (Given)

∴ ΔBAC ≅ ΔDAE (By SAS congruence rule)

∴ BC = DE (By CPCT)

20. In the figure, AB⊥ BE, FE⊥ BE

Now, BC=DE.

Adding DC to both the sides, we get,

⇒BC+DC=DE+DC

⇒BD=CE

In ΔABD and ΔCEF.

BD=CE (Proved)

AB=FE (Given)

∠ABD=∠FEC (Each 90∘)

∴ ΔABD≅ ΔFEC by SAS congruence rule.

21. Given:- AB||DC

To prove : - P is midpoint of AC

Proof :- P is midpoint of DB.

Here DP=BP.

∴∠DCP=∠BAP.

and ∠DPC=∠APB

DP=BP

∴ now ΔDPC≅ΔAPB

∴∠CDP=∠PBA

∴AP=PC

∴AP+PC=AC [we know]

2AP=AC

[AP=AC2]

∴P is midpoint of AC

22. In ΔABD and ΔABC we have BD = BC [By construction]

AB = AB [Common] ∠ABD = ∠ABC = 90^0

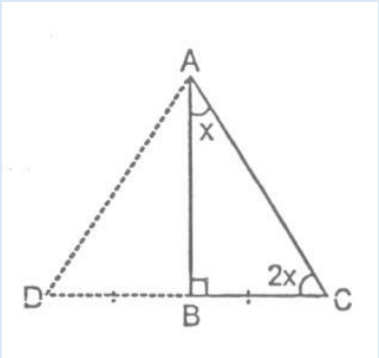
By SAS criterion of congruence we get ΔABD ≅ ΔABC

⇒ AD = AC and ∠DAB = ∠CAB [By cpct] ⇒ AD = AC and ∠DAB = x [∴∠CAB = x]

Now, ∠DAC = ∠DAB + ∠CAB = x + x = 2x

∴ ∠DAC = ∠ACD ⇒ DC = AD [Side Opposite to equal angles]

⇒ 2BC = AD [∵DC = 2BC] ⇒ 2BC = AC [AD = AC]



5 MARKS QUESTIONS

23. Given: ABCD is a square and EDC is an equilateral triangle. AD=BC=CD=DE=CE

To Prove: i) AE=BE

ii) ∠DAE=150

Construction: Join A to E and B to E.

Proof:

i) In △ADE and △BCE, we have

AD=BC(given)

∠ADE=∠BCE = 900+600

DE=CE(given)

Therefore, △ADE≅△BCE (By SAS rule)

AE=BE (CPCT)

ii) ∠DAE+∠ADE+∠DEA=180^0[Angle sum property]

⇒150^0+∠DAE+∠DEA=180^0

⇒∠DAE+∠DEA=180^0-150^0 [AD=ED, angle opposite to equal sides are equal, ∵∠DAE=∠DEA]

$\Rightarrow 2\angle DAE=30^0$

$\Rightarrow \angle DAE=15^0$

24. In $\triangle ABD$ and $\triangle BAC$,

AD=BC (Given)

$\angle DAB=\angle CBA$ (Given)

AB=BA (Common)

$\therefore \triangle ABD\cong\triangle BAC$ (By SAS congruence rule)

$\therefore$BD=AC (By CPCT)

And, $\angle ABD=\angle BAC$ (By CPCT)

21. Let DE and DF be the perpendiculars from D on AB and AC respectively.

In $\triangle$s BDE and CDF, DE=DF (Given)

$\angle BED=\angle CFD=90^\circ$

BD=DC ($\because$ D is the mid-point of BC)

$\therefore \triangle BDE\cong\triangle CDF$ (RHS)

$\Rightarrow \angle B=\angle C$ (cpct)

$\Rightarrow$ AC=AB (Sides opp. equal $\angle$s are equal)

$\Rightarrow \triangle ABC$ is isosceles.

CASE STUDY QUESTIONS (4 MARKS EACH)

26. In $\triangle ACP$ and $\triangle ABP$

AP is common,

AB=AC=5cm

and $\angle APC=\angle APB=900$

hence from R.H.S criteria $\triangle ACP\cong\triangle ABP$

(ii) In triangle APC

$\angle ACP=1800-900-300=60^0$

(iii) Height of tree is given by AP

In triangle ABP using Pythagoras' theorem,

$AP=\sqrt{5^2-4^2}$

AP=3 m

hence total height of tree is 3m.

27. (i) scalene triangle

(ii)yes,SSS congruence

(iii)RHS congruence

28. (i) ΔACD

(ii) ΔCDP

(iii)SSS congruence

29. (i)180^0

(ii) scalene

(iii) acute angled triangle

30. (i)SAS

(ii)PR

(iii)yes

CHAPTER- 8: QUADRILATERALS

MULTIPLE CHOICE QUESTIONS (1 MARKS EACH)

1. Three angles of a quadrilateral are 75^0 , 80^0 and 100^0. The measure of the fourth angle is… (AO1)

(a) 100^0 (b)105^0 (c) 180^0 (d) 80^0

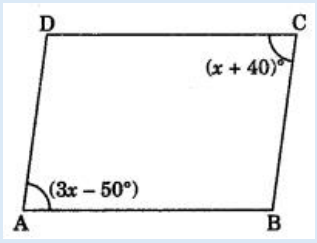
2. If the four angles∠A, ∠B, ∠C and ∠D of a quadrilateral ABCD are respectively in the ratio 6:9:8:7, then ABCD is a……. (AO2)

(a) kite (b) rectangle (c) trapezium (d) square

3. ABCD is a rhombus in which $\angle ACD = 50°$.Then $\angle ABC =$ …… (AO1)

(a) 100^0 (b)105^0 (c) 180^0 (d) 80^0

4. In the given figure, ABCD is a parallelogram in which a pair of opposite angles is given. The value of x is (AO1)

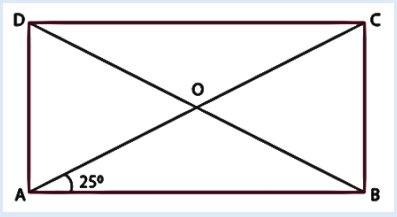


a) 40° b) 45° c) 50° d) 55°

5. The lines joining the mid-points of the adjacent sides of a quadrilateral enclose a _____. (AO2)

a) Square b) rectangle c) rhombus d) parallelogram

6. A diagonal of a rectangle is inclined to one side of the rectangle at 25°. The acute angle between the diagonals is ….. (AO2)



a) 55° b) 50° c) 40° d) 25°

7. Which of the following statements is not true? (AO1)

(a) A square is a rectangle (b) A rectangle is a square

(c) A parallelogram is a trapezium (d) A rhombus is a parallelogram

8.If the diagonals of a quadrilateral are equal and bisect at right angles, then the quadrilateral is a

(a) rhombus (b) rectangle (c) square (d) kite

ASSERTION AND REASONING QUESTIONS

In questions given below a statement of assertion(A) is followed by a statement of Reason (R). Choose the correct option.
A). Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
B). Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
C). Assertion is correct but Reason is incorrect.
D). Assertion is incorrect but Reason is correct.

9. Assertion (A):If the angles of a quadrilateral are $x, (x + 20), (x - 20)$ and $2x$,the measure of the smallest angle is 52^0
Reason(R): The sum of all four angle of a quadrilateral is 360^0. (AO2)

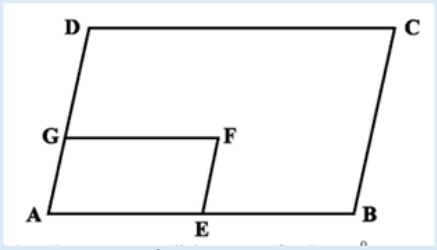
10. Assertion (A): If in a parallelogram, the diagonals are equal and intersect perpendicularly, it is a square.
Reason(R): In a square the diagonals are equal and intersect perpendicularly. (AO1)

11. Assertion: A parallelogram consists of two congruent triangles. (AO1)
Reason : Diagonals of a parallelogram bisect each other.

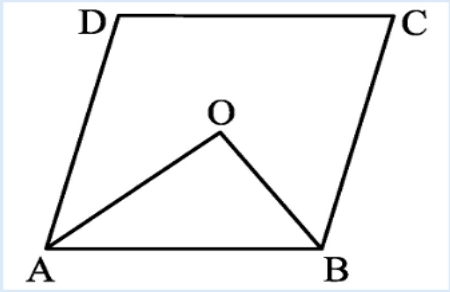
12. Assertion: In ΔABC, median AD is produced to X such that AD = DX. Then ABXC is a parallelogram.
Reason: Diagonals of a parallelogram bisect each other at right angles. (AO1)

2 MARKS QUESTIONS

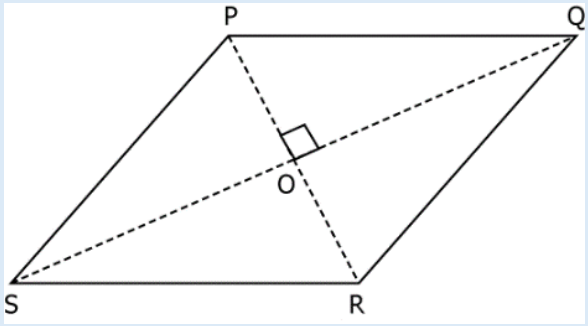
13. In the following figure ABCD and AEFG are parallelograms. If ∠DCB measures 50^0, determine the measure of….
(a)∠GFE (AO1)
(b) ∠FEB (AO1)



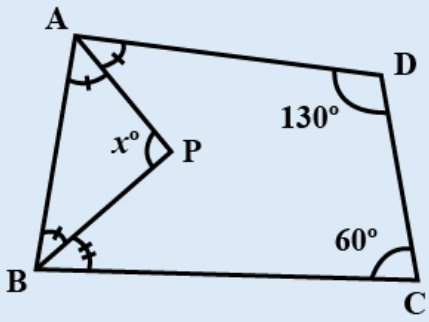
14. ABCD is a parallelogram. ∠ADC=100^0. Bisectors of ∠DAB and ∠ABC intersect at O. Find the value of reflex ∠AOB (AO2)



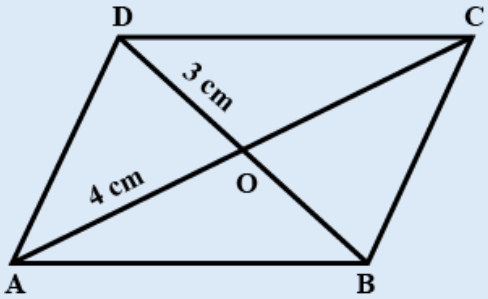
15.In the parallelogram shown below, PQ = 5 cm, SQ = 8 cm. Find the length of the diagonal PR. (AO1)



16.In quadrilateral ABCD, AP and BP are bisectors of $\angle A$ and $\angle B$ respectively, then find the value of x . (AO2)

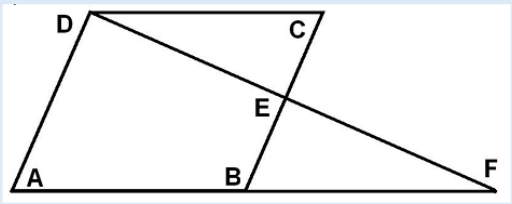


17. In the given figure, ABCD is a rhombus, OA= 4 cm and OD= 3 cm. Find the perimeter of the rhombus. (AO1)



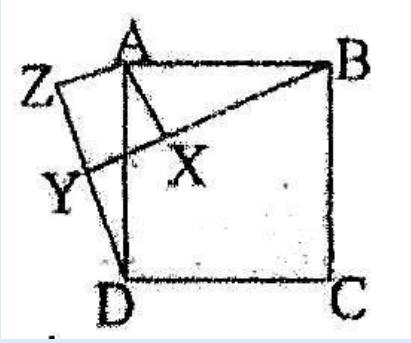
3 MARKS QUESTIONS

18.In the following figure ABCD is a parallelogram. AD=10 cm and DC = 6 cm. The bisector of angle D meets BC at E. DE and AB produced meet at F. Find the length of AF. (AO2)

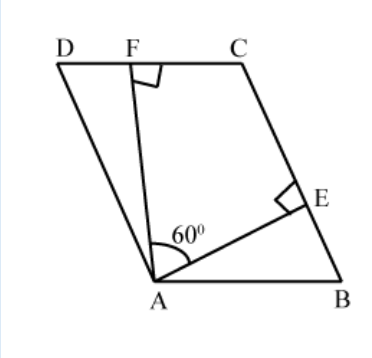


19. In the figure given below, X is point in the interior of square ABCD. AXYZ is also a square.

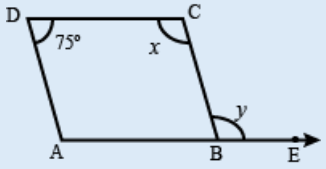
If DY = 3cm, AZ = 2cm then find the length of BY. (AO2)



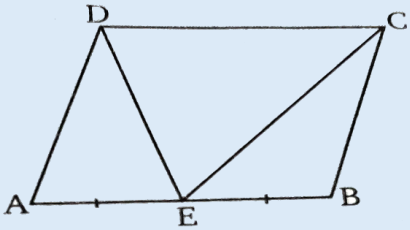
20. The angle between the two altitudes of a parallelogram through the vertex of an obtuse angle of the parallelogram is 60°. Find the angles of the parallelogram. (AO1)



21. ABCD is a parallelogram in which $\angle ADC$=75° and side AB is produced to point E as shown in the figure. Find x + y (AO1)

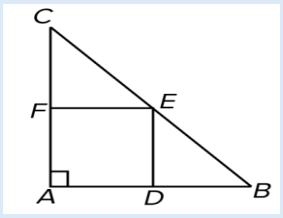


22.In the given figure, ABCD is a parallelogram; E is the mid-point of AB and DE bisects $\angle D$. Prove that BC=BE. (AO2)



5 MARKS QUESTIONS

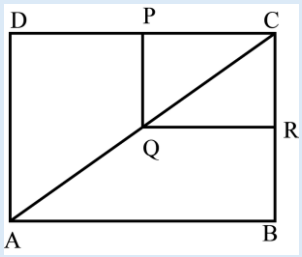
23. A square is inscribed in an isosceles right triangle so that the square and the triangle have one angle common. Show that the vertex of the square opposite the vertex of the common angle bisects the hypotenuse. (AO2)



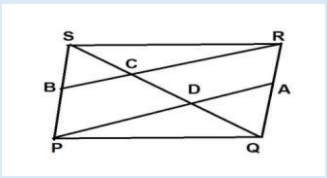
24.If ABCD is a rhombus, show that $AC^2+BD^2 = 4\ AC^2$ (AO2)

25.In the figure, ABCD and PQRC are rectangles and Q is the mid-point of AC.

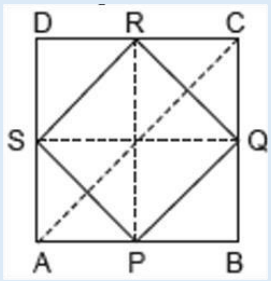
Prove that (i) DP = PC (ii) PR=$\frac{1}{2}$AC. (AO2)



26.In the figure, PQRS is a parallelogram in which A and B are midpoints of sides QR and PS respectively. PA and RB intersect diagonal QS at D and C respectively. If QS= 12 cm, then find the length of CD. (AO2)



27.Show that the quadrilateral formed by joining the mid-points of the sides of a square, is also a square. (AO2)



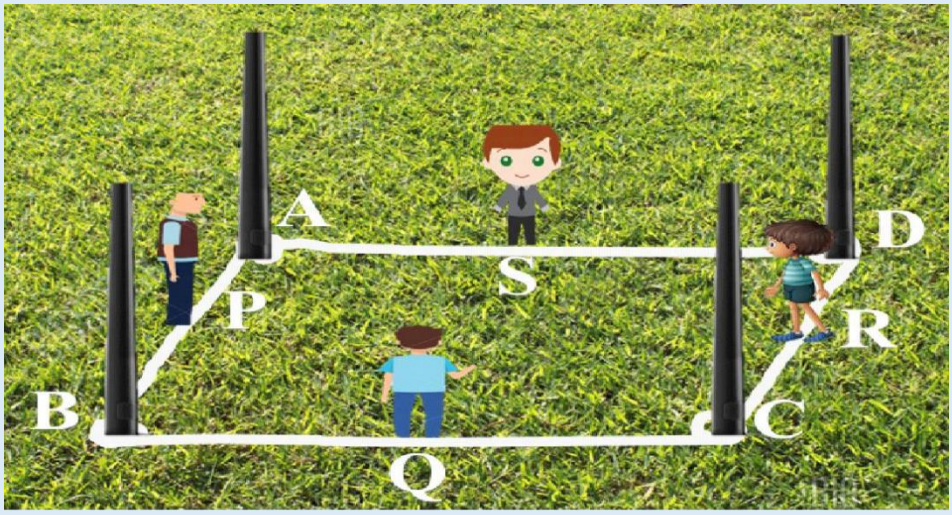
CASE BASED QUESTIONS (4 MARKS EACH)

28.PLAYING THROW BALL

In a village, four boys were playing in a ground. They planned to device a game using geometrical concepts. Ramesh took the lead and planned in the following manner:

Four poles were marked in the ground as A, B, C, D. With the help of a rope, the poles were joined to form a quadrilateral. Now, Ramesh selected four boys such as P, Q, R and S and placed in the mid-points of the rope paths...

After making this arrangement, they started playing throw ball in the order from P to Q; Q to R; R to S and finally from S to P.



On the basis of this arrangement, Ramesh asks the following questions to the other boys. Help them to answer the questions.(1+1+2)

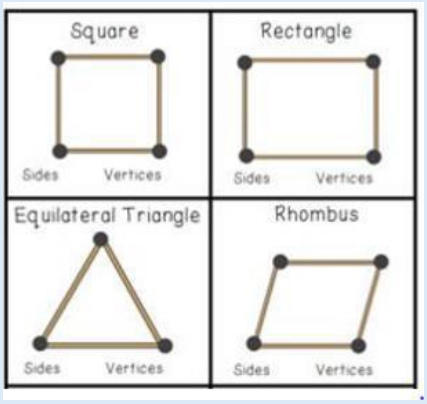
(i) Which geometrical shape is generated by PQRS ?(AO1)

(ii)If PQ = 10 m, what is the distance between the two poles A & C? (AO1)

(iii)Justify the shape generated by PQRS with a geometrical principle. (AO2)

29. ACTIVITY WITH STICKS

During Maths Lab activity, teacher gives four sticks of length 6 cm,and four sticks of length 4 cm to teach different types of quadrilaterals.



(i) A student formed a square using four sticks each measuring 6 cm. Find the length of the diagonal of the square formed?

(ii)Name the geometrical shapes can be formed using two sticks of 6cm and two sticks of 4cm

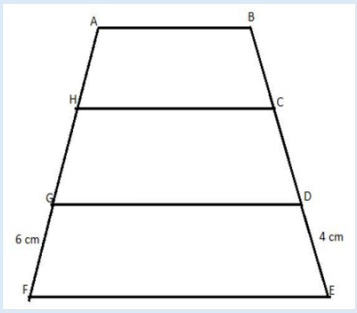
(iii) Name the quadrilateral can be formed using three sticks of 4cm length and a stick of 6cm length.

OR

iii) Among the different quadrilaterals formed using the given sticks,which one will have the greater perimeter

30.RITHUL'S CARD

Rithul wants to show gratitude towards his teacher by giving her a card made by him. He has three pieces of trapezium shape. He pasted one above the other as shown in the figure. These pieces are in a way such that AB ‖ HC ‖ GD ‖ FE. Also BC = CD = DE and GF= 6 cm.



(i) Name the shape formed when three pieces of trapezium pasted one above the other.(AO1)

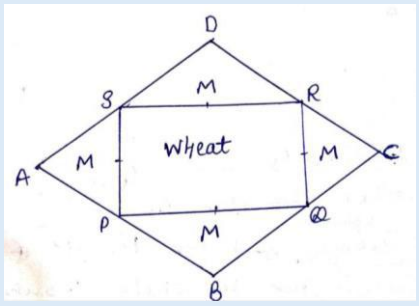
(ii)If ∠GFE= 70°, find ∠AHC. (AO1)

(iii) If we join AE ,the line intersects HC and GD at I and K respectively. If we join H and E, the line intersects GD at J. Given that HI=4 cm and FE =12 cm, find JK.(AO2)

31.CHANDU'S WHEAT FIELD

A farmer Chandu has agricultural field ABCD. It is in the shape of a rhombus and P, Q, R and S are the mid-points of the sides AB, BC, CD and DA respectively. The farmer wants to grow wheat in area

PQRS and Mustard in rest of the region.The farmer wants to fence the field with wire.He also wanted to fix metallic poles at the four corners of the rhombus shaped field and tie wire along its diagonals so that birds rest on the wire and help him by feeding on the pests.



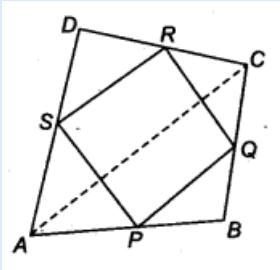
(i) Name the shape of field in which wheat is being grown.(AO1)

(ii)Find the diagonal AC if the side of the rhombus field is 20m and diagonal BD is 32m (AO2)

(ii) What is the total length of wire required for fencing and bird rest wire along diagonals if side of rhombus is 20 m?(AO2)

32. PAPER FOLDING

The Maths teacher gave students some coloured papers in the shape of a quadrilateral. She asked them to make a parallelogram from the quadrilateral ABCD by folding it. She made the following parallelogram.



(i) Which quadrilateral in the figure is the required parallelogram?(AO1)

(ii) Mention the condition to be satisfied by the points P,Q,R and S in order to form a parallelogram.(AO1)

(iii) State the theorem involved to prove that PQRS is a parallelogram. (AO1)

SOLUTION OF CHAPTER- 8: QUADRILATERALS

MULTIPLE CHOICE QUESTIONS

1. B
2. C
3. D
4. B
5. D
6. B
7. B
8. C

ASSERTION AND REASONING QUESTIONS

9. D
10. A
11. B
12. A

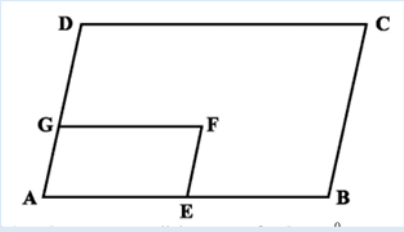
2 MARKS QUESTIONS

Ans:13 (a) ∠DAB = ∠DCB (opp. Angles of parallelogram ABCD)

∠DAB=50^0

∠DAB and ∠GAE represent the same angle.

∠GAE = ∠GFE (opp. Angles of parallelogram AEFG)



$\angle GFE = 50^0$

$\angle FEB = \angle GAE = 50^0$ (corresponding angles)

14.$\angle ADC = 100^0$ given

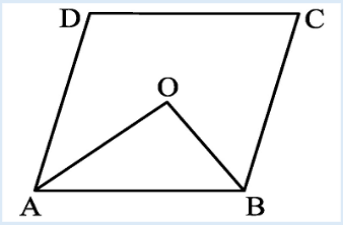
$\angle ADC = \angle ABC = 100^0$ (opp. Angles of parallelogram)

$\angle OBA = 50^0$ (BO is angle bisector, given)---------(1)

$\angle ADC + \angle DCB = 180^0$ (adjacent angles of parallelogram are supplementary)

$\angle DCB = 80^0$

$\angle OAB = 40^0$ ----------(2)



$\angle OBA + \angle OAB + \angle AOB = 180^0$ (angle sum property)

$50^0 + 40^0 + \angle AOB = 180^0$

$\angle AOB = 90^0$

Reflex $\angle AOB = 360^0 - 90^0 = 270^0$

15.PQ = 5 cm, SQ = 8 cm.(Given)

$OQ = \frac{1}{2}$ SQ $= 4$ cm(diagonals bisect each other.)

OP=3 cm (Pythagoras property)

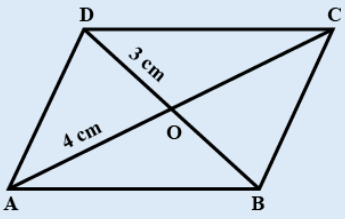
PR= 2×3 =6cm (diagonals bisect each other.)

16.In the quadrilateral $\angle A + \angle B = 170^0$ (angle sum property of Quadrilateral)

$\frac{1}{2}(\angle A + \angle B) = 85^0$

$\angle APB = x = 180^0 - 85^0 = 95^0$

17.



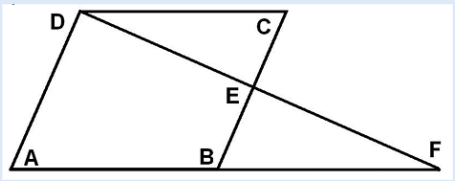
ABCD is a rhombus given

$\angle AOD = 90^0$

AD=5 cm (angle sum property of a triangle)

Perimeter of ABCD=4X5 =20 cm.

3 MARKS QUESTIONS



18. $\angle CDE = \angle ADE$ given

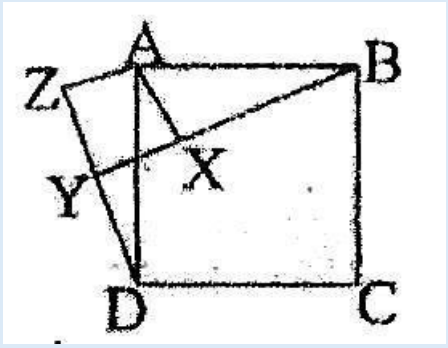
$\angle CDE = \angle BFE$ (alternate interior angles)

$\angle ADE = \angle BFE$

Therefore AD=AF

AD=AB+BF

BF= AD − AB =10 − 6 = 4cm



19. AD = $\sqrt{2^2 + 5^2}$=$\sqrt{29}$

AB = AD = $\sqrt{29}$ (ABCD is a square)

XB =$\sqrt{\sqrt{29}^2 - 2^2}$ =5

BY =5+2=7

20.In quadrilateral AFCE, 60° + 90° + 90° + ∠C = 360°(angle sum property of a quadrilateral),

∠C= 360°-240°=120°.

∠C = ∠A = 120° .

∠B=180^0 − ∠A= 60°

∠B = ∠D = 60°

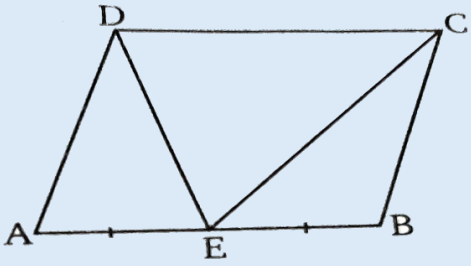
21. ∠x+75°= 180°(co-int angles),

∠x=180°-75° = 105°

∠x = ∠y = 105°(alternate int. angles)

∠x+∠y =210°

22.



Ans:$\angle CDE = \angle EDA$(given)---1, $\angle CDE = \angle AED$(Alt. ∠s)

From 1 & 2, $\angle EDA = \angle AED$. ∴ AD=AE---3

In ABCD, AD=BC----4, ⟹ AE=BC---5,

Also AE= BE (E is the mid point of AB, given)---6

From 5 & 6, BE = BC

5 MARKS QUESTIONS

23. Let, $\angle A$=90°, AB=AC, ∠B=$\angle C$= 45° ($\angle s$ opp. to equal sides)

In rt ΔBDE & ΔFCE,

∠CFE = ∠EDB =90°,

∠ C = ∠B = 45°

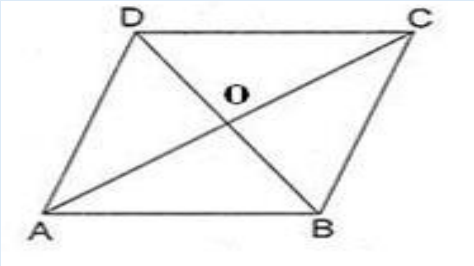
⟹ DE=EF (Sides square)

∴ By AAS, ΔDBE ≅ ΔFEC

∴ BE=CE (CPCT)

∴ E bisects BC.

24.



Diagonals of a rhombus bisect each other at rt. angles.

∴ OA = ½ AC, OB= ½ BD

∠AOB=90°

$\therefore AB^2 = OA^2 + OB^2$

$AB^2 = (\frac{1}{2}AC)^2 + (\frac{1}{2}BD)^2$

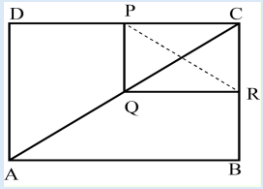
$AB^2 = \frac{1}{4}AC^2 + \frac{1}{4}BD^2$

$4AB^2 = AC^2 + BD^2$

25.Given: ABCD and PQRC are rectangles and Q is the mid-point of AC.

To prove :(i) DP=PC (ii) PR =1/2AC

Construction: Join diagonals AC which passes through Q and join PR.



Proof: (I) In ΔACD

Q is the mid-point of AC and QP ∥ AD (sides of rectangle)

∴P is mid-point of CD

∴DP=PC

× ∴ PR =QC

But Q is the mid -point of AC

∴ QC= PR=$\frac{1}{2}$AC.

Hence **PR=$\frac{1}{2}$AC.**

26. PS=QR (opp sides of ∥gm) , PB=AR (∵ ½ PS= ½ QR)

∴ PARB is a ∥gm, ∴ PA ∥ BR

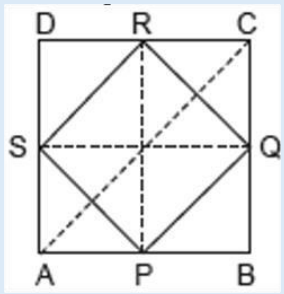
∵ B is mid pt of PS and BR ∥ PA ∴ C is the mid pt of SD.

∴ SC = CD. ∵ D is mid pt of QC ∴ QD=CD

Thus, SC=CD=QP. QS=12 cm

∴ CD= $\frac{1}{3}$ x QS= $\frac{1}{3}$ x 12 =4 cm

27.



Given:ABCD is a square. P, Q, R and S are the mid-points of sides AB, BC, CD and DA respectively.

Join AC, PR and SQ. In ABC, P and Q are mid-points of side AB and BC respectively.

PQ || AC and PQ = $\frac{1}{2}$ AC ...(i) (By mid-point theorem)

Similarly, in ΔADC, S and R are mid-points of sides AD and DC respectively.

RS || AC and RS = $\frac{1}{2}$ AC ...(ii) (By mid-point theorem)

From (i) and (ii), we get PQ || RS and PQ = RS.

Similarly, we can prove that RQ || PS and PS = RQ PQRS is a parallelogram. ...(iii)

In ΔPBQ and ΔQCR

BQ = QC (Q is mid-point of BC)

∠ B =∠ C = 90° (Each angle of square is 90°)

BP = CR (Halves of equal sides of square)

PBQ ≅ QCR (SAS congruence rule)

PQ = QR (CPCT) ...(iv)

From (iii) and (iv), we get

PQRS is a rhombus ...(v) (If adjacent sides of parallelogram are equal, then it is a rhombus)

Also, PBCR is a rectangle.

(As CR || PB, CR = PB and B = C = 90°) PR = BC

Similarly, DCQS is a rectangle. (As CQ || DS, CQ = DS and CD = QS

Now, BC and CD are equal (Equal sides of square)

PR = QS But these are diagonals of rhombus PQRS.

If diagonals of rhombus are equal, then it is a square. PQRS is a square.

CASE BASED QUESTIONS

28.(i) paralellogram

(ii) 20 m

(iii)PQ ∥ AC --------(1)

and PQ= $\frac{1}{2}$ AC ------(2)(MPT)

SR ∥ AC--------(3)

SR= $\frac{1}{2}$ AC--------(4)(MPT)

From (1) and (3) **PQ ∥ SR ------(5)**

From (2) and (4) PQ=SR--------(6)

From (5) and (6) PQRS is a parallelogram.

29. i) $6\sqrt{2}$ cm

(ii)parallelogram, rectangle and a kite

(iii)trapezium

(iv) a rectangle

30. (i) Trapezium

ii)70^0

iii)GK= 2 HI =8 CM.

GJ= $\frac{1}{2}$ FE = $\frac{1}{2} \times 12 = 6\ cm$

JK=$GK - GJ = 8 - 6 = 2\ cm$

31. **(i**) Rectangle

(ii)AB=20m

AD=20m (all sides of a rhombus are equal.

BD=32m (given)

OD=16

OA=$\sqrt{AD^2 - OD^2}$=$\sqrt{20^2 - 16^2}$=$\sqrt{400 - 256}$ =$\sqrt{144}$ =12m

AC= 24m

(iii)Perimeter of the rhombus =4 × 20m=80m.

AC=24m and BD= 32m

Total length of wire required =$80 + 24 + 32 = 136$m

32. **(i) PQRS**

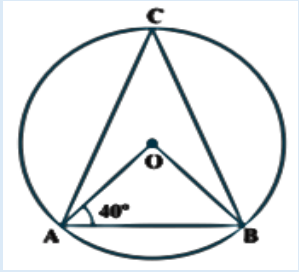
(ii) P, Q, R and S must be the midpoints of the sides AB, BC, CD and DA rspectively.

(iv) Midpoint theorem statement

CHAPTER- 9: CIRCLES

MULTIPLE CHOICE QUESTIONS

Q1. In the fig, if $\angle OAB = 40°$, then ∠ACB is: [AO2]

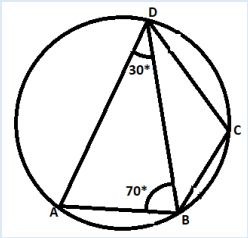


(A) 50° (B) 40° (C) 60° (D) 70°

Q2. AD is a diameter of a circle and AB is a chord. If AD = 34 cm, AB = 30 cm, the distance of AB from the centre of the circle is [AO2]

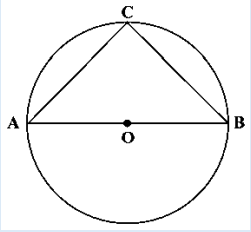
(A) 17 cm (B) 15 cm (C) 4 cm (D) 8 cm

Q3. In fig, if $\angle ABD = 70°$ and $\angle ADB = 30°$, then $\angle BCD$is: [AO1]



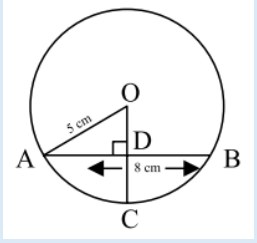
(A) 50° (B) 80° (C) 100° (D) 70°

Q4. In Fig, if AOB is a diameter of the circle and AC = BC, then ∠CAB is: [AO2]



(A) 50° (B) 80° (C) 45° (D) 90°

Q5. In fig, OA = 5 cm, AB = 8 cm and OD is perpendicular to AB. CD is equal to….: [AO2]



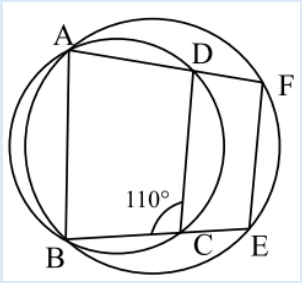
(A) 2 cm (B) 3 cm (C) 4 cm (D) 5 cm

Q6. AB and BC are chords of a circle such that AB = 12 cm, BC = 16 cm and AB is perpendicular to BC. The radius of the circle passing through the point A, B and C is:

[AO2]

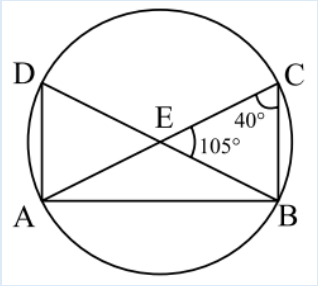
(A) 6 cm (B) 8 cm (C) 10 cm (D) 12 cm

Q7. In the given figure ABCD and ABEF are cyclic quadrilaterals. If ∠BCD = 110° then ∠BEF = ? [AO1]



(A) 110° (B) 55° (C) 90° (D) 70°

Q8. In the given figures, ∠ECB = 40° and ∠CEB = 105°, then ∠EAD = …. ? [AO1]



(A) 45° (B) 35° (C) 50° (D) 40°

ASSERTION AND REASON QUESTIONS

In questions given below a statement of assertion(A) is followed by a statement of Reason (R). Choose the correct option.
A). Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
B). Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
C). Assertion is correct but Reason is incorrect.
D). Assertion is incorrect but Reason is correct.

Q9. **Assertion (A):** The quadrilateral ABCD with ∠A = 90°, ∠B = 70°, ∠C = 95° and ∠D = 105° is not a cyclic quadrilateral.

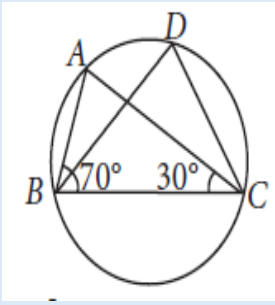
Reason (R): If the sum of a pair of opposite angles of a quadrilateral is 180, the quadrilateral is cyclic. [AO1]

A)

Q10. Assertion: AB and CD are two parallel chords of a circle whose diameter is AC. Then AB ≠ CD.
Reason: Perpendicular from the centre of a circle bisects the chord. [AO2]

Q11. **Assertion:** In the given figure, ∠ABC = 70° and ∠ACB = 30°. Then, ∠BDC = 80°.

Reason: Angles in the same segment of a circle are equal. [AO1]



A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.

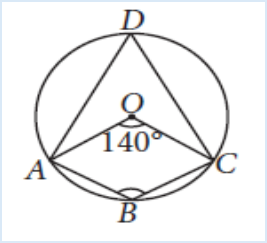
B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.

C) Assertion (A) is true but Reason (R) is false

D) Assertion (A) is false but Reason (R) is true

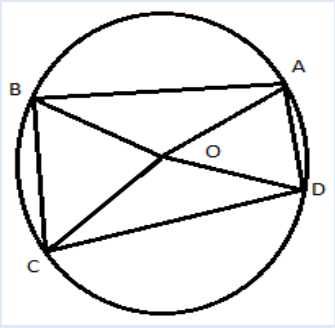
Q12. **Assertion:** In the given figure, O is the centre of circle. If ∠AOC = 140°, then ∠ABC =110°.

Reason: In cyclic quadrilateral, opposite angles are supplementary. [AO1]



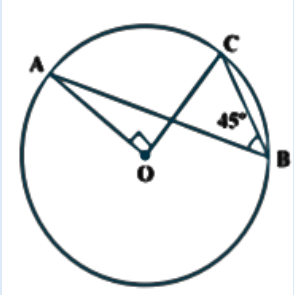
2 MARKS QUESTIONS

Q13. A sports academy has developed circular region as shown in the figure to create various sports culture and to train rural boys for Olympic purposes. Find the relation between ∠AOB and ∠COD, where O is the centre of the circle and both AB and CD are equal. [AO1]

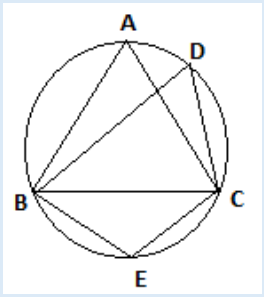


Q14. In a cyclic quadrilateral PQRS, if ∠P - ∠R = 50°, find ∠P. [AO2]

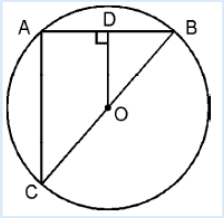
Q15. In Fig. ∠ABC = 45°, prove that OA ⊥ OC. [AO1]



Q16. In the figure, if ΔABC is an equilateral triangle then what will be the measure of ∠BDC and ∠BEC. [AO1]

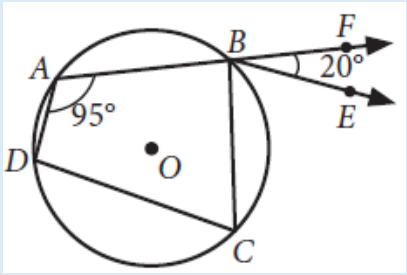


Q17. In the given figure, OD is perpendicular to the chord AB of a circle whose centre is O. If BC is a diameter, show that CA = 2OD. [AO2]

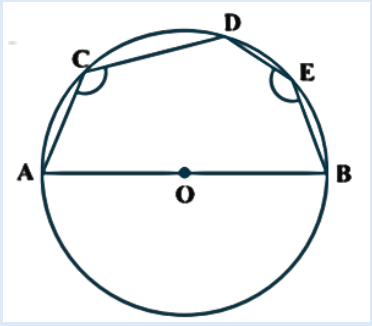


3 MARKS QUESTIONS

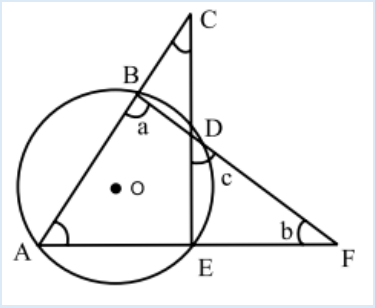
Q18. If ABCD is a cyclic quadrilateral in which AB is extended to F and BE || DC. If ∠FBE = 20° and ∠DAB = 95°, then what will be the measure of ∠ADC? [AO2]



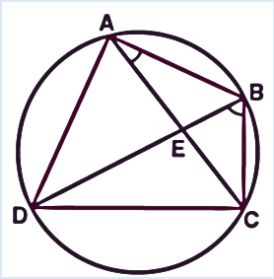
Q19. For a Board members meeting of a company they have arranged on a round table. The positions of different members are represented by the figure given below. In Figure, AOB is a diameter of the circle and C, D, E are any three points on the semi-circle. Find the value of ∠ACD + ∠BED.



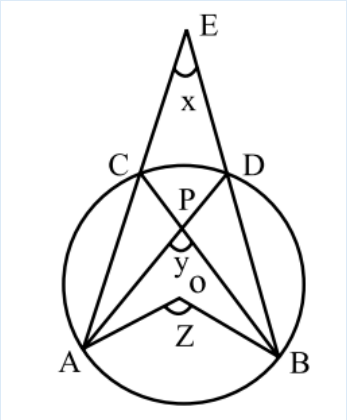
Q20. In the given figure, determine a, b and c if ∠BCD = 43° and ∠BAF = 62°. [AO1]



Q21. ABCD is a cyclic quadrilateral whose diagonals intersect at a point E. If ∠DBC = 70°, ∠BAC is 30°, find ∠BCD. Further, if AB = BC, find ∠ECD. [AO2]

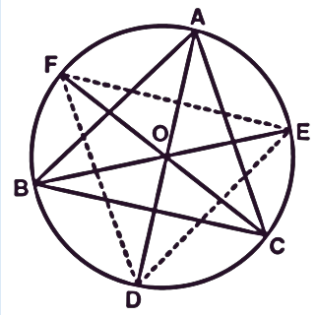


Q22. In the given figure, O is the centre of a circle. Prove that ∠x + ∠y = ∠z. [AO2]



5 MARKS QUESTIONS

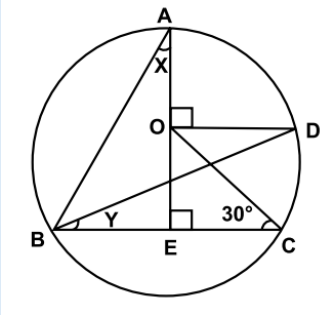
Q23. During Maths day celebration children were asked to make rangoli using geometrical shapes. One of the children make the design given below which further analysed by her math teacher as follows. Bisectors of angles A, B and C of a triangle ABC intersect its circumcircle at D, E and F respectively. Prove that the angles of the triangle DEF are 90° – (½)A, 90° – (½)B and 90° – (½)C. [AO2]



Q24. AB and AC are two chords of a circle of radius r such that AB = 2AC. If p and q are the distance of AB and AC from the centre, prove that $4q^2 = p^2 + 3r^2$. [AO2]

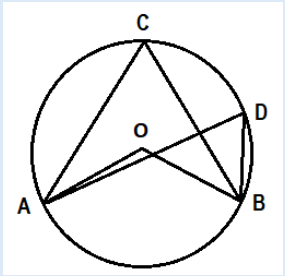
Q25.In figure, O is the centre of the circle, ∠BCO = 30°, AE ⊥ BC and DO ⊥ AE.

Find x and y. [AO2]



CASE BASED QUESTION (4 MARKS EACH)

Q26.A non-government organisation has a circular piece of land as shown in the figure .Under the mission of women empowerment the NGO wants to develop a vocational training institute for poor girls to provide tailoring skills, self-defence skill and computer programming. The listed vocational institutes are represented by point A, B and C respectively. Here O is the centre of the ground and Point D represent the main entrance of the circular land. In the figure ∠ADB is 30°



i) What will be the measure of angle formed by tailoring institute (A) and Self-defence institute (B) at the centre O. [AO2]

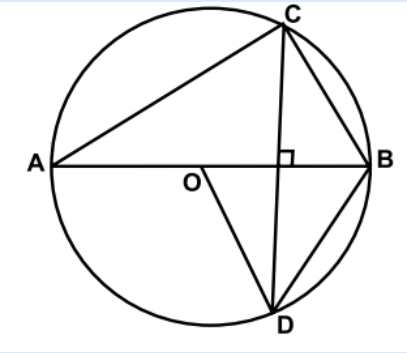
ii) What will be the measure of ∠ACB? [AO1]

iii) If ∠ADB is increased to 45° then what is the measure of reflex angle AOB? [AO2]

OR

What impression does the society receive through this activity? [AO2]

Q27. Shwetha went to the central park of her society which is circular in shape. There she observed a beautiful butterfly flying all around the park and sitting on different flowers. She marked its different positions and represented through the figure given below. In figure, O is the centre of the circular park, BD = OD and CD ⊥ AB.



i) What type of ΔOBD is? Justify [AO1]

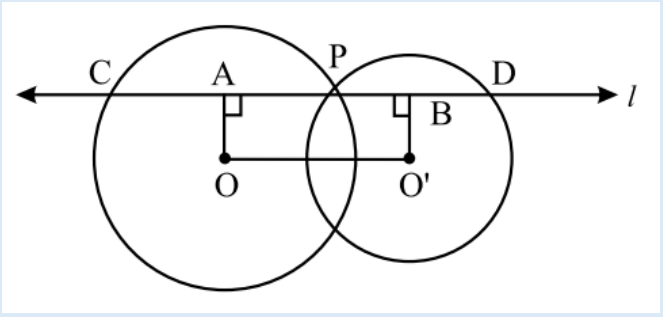
ii) What is the measure of $\angle AOD$? [AO2]

iii) What is the measure of $\angle CAB$? [AO2]

OR

iii) Is it possible for a parallelogram to be a cyclic quadrilateral? If yes specify the conditions. [AO2]

Q28.In order to spread awareness about physical health of growing children of Vikrant society, the society plans to organise a kho kho match. Raghav marked the positions of some players by the figure given below. Two circles whose centres are O and O′ intersect at P. Through P, a line l parallel to OO′, intersecting the circle at C and D is drawn.



i) What is the relation between CP and AP? [AO1]

ii) What is the relation between BP and DP? [AO1]

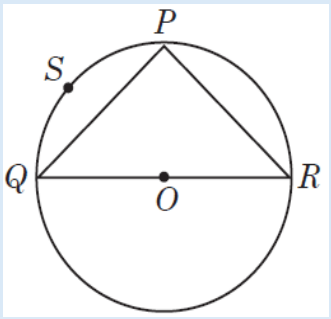
iii) Prove that the distance between player C and D is twice the distance between player O and O′. [AO2]

OR

iii) What impression does the society receive through this Match? [AO2]

Q29. Ankit visited a mall with his father. He sees that three shops are situated at P, Q, R as shown in the figure from where they have to purchase things according to their need. Distance between shop P and Q is 8 m, that of between shop Q and R is 10 m and between shop P and R is 6 m.

Considering O as the centre of the circle, answer the following questions.



i)What is the measure of ∠QPR ? [AO1]

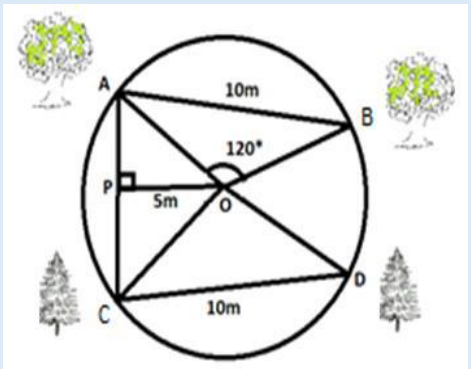
ii) What will be the length of the longest chord of the circle? [AO1]

iii) What will be the area covered by the triangular carpet placed in the triangular portion between three shops represented by **$\underline{\Delta}$PQR?** [AO2]

OR

iii) Is it possible to have an equilateral triangle circumscribed by a semicircle? Justify your answer. [AO2]

Q30. A farmer has a circular garden of radius 13m with centre O as shown in the picture. He has different types of plants and trees in his garden. In the garden, there are two Mango trees A and B at a distance of 10m. Also has Ashoka trees C and D at a distance of 10m. AB subtend $\angle AOB = 120^0$ at the centre O. The perpendicular distance of AC from centre is 5m.



i) What is the value of $\angle COD$? [AO1]
ii) What is the measure of AO? [AO1]
iii) What is the distance between Mango tree A and Ashoka tree C? [AO2]

Or

iii) What is the area of triangular part of the circular garden ie $\underline{\Delta}$AOB if, perpendicular distance from O to AB is 4m?

SOLUTIONS OF CHAPTER- 9: CIRCLES

MULTIPLE CHOICE QUESTIONS

Ans 1 A

Ans 2 D

Ans 3 C

Ans 4 C

Ans 5 A

Ans 6 C

Ans 7 A

Ans 8 B

ASSERTION AND REASON QUESTIONS

Ans 9 A

Ans 10 D

Ans 11 A

Ans 12 A

2 MARKS QUESTIONS

Solution 13. As given AB = CD

$\therefore \angle AOB = \angle COD$

Since, equal chords of a circle subtend equal angles at the centre

Solution 14. PQRS is a cyclic quadrilateral

$\therefore \angle P + \angle R = 180°$

Also $\angle P - \angle R = 50°$

$\Rightarrow 2\angle P = 230°$

$\Rightarrow \angle P = 115°$

Solution15. The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle

$\therefore \angle ABC = \frac{1}{2}\angle AOC$

i.e., $\angle AOC = 2\angle ABC = 2 \times 45° = 90°$

or $OA \perp OC$

Solution 16. ΔABC is an equilateral triangle

$\therefore \angle BAC = 60°$

Also, $\angle BDC = 60°$ [angles in the same segment are equal]

Now ABEC is a cyclic quadrilateral and ∠BAC = 60°

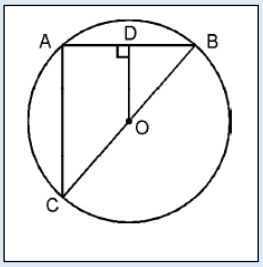
∴ ∠BEC = 180° - 60° = 120°

Solution 17. Given , OD ⊥ AB

∴ OD bisect AB or, D is the mid - point of AB

[The perpendicular drawn from the centre of the circle to a chord bisects the chord]

Also O is the centre



∴ OC = OB or, O is the mid - point of BC

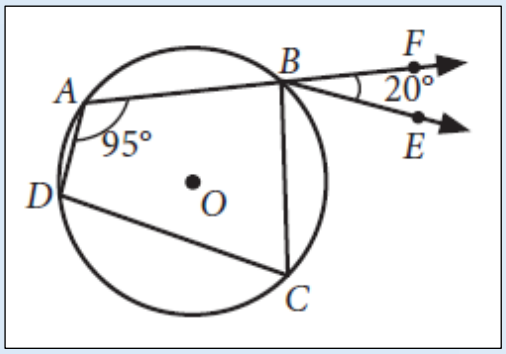
Now by using Mid-point theorem

OD = ½ CA

Or CA = 2 OD

3 MARKS QUESTIONS

Solution 18. ABCD is a cyclic quadrilateral



∴ ∠DAB +∠ DCB = 180°

Or ∠ DCB = 85°

As BE ‖ DC

∴ ∠EBC = ∠ DCB = 85° [Alternate pair]

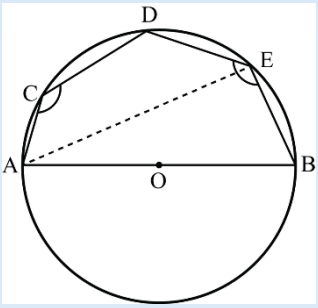
Now ABF is a straight line

∴ ∠ABC =180° - (85° + 20°) = 75°

Thus ∠ADC =180° - ∠ABC = 105° [ABCD is a cyclic quadrilateral]

Solution 19. Since the points A, C, D and E lie on the circle

ACDE is a cyclic quadrilateral



We know that the sum of opposite angles of a cyclic quadrilateral is 180 degrees.

∠ACD + ∠AED = 180° ---------- (1)

AB is the diameter of the circle

We know that the angle subtended by a diameter to the circle is a right angle

So, ∠AEB = 90° ---------- (2)

Adding (1) and (2),

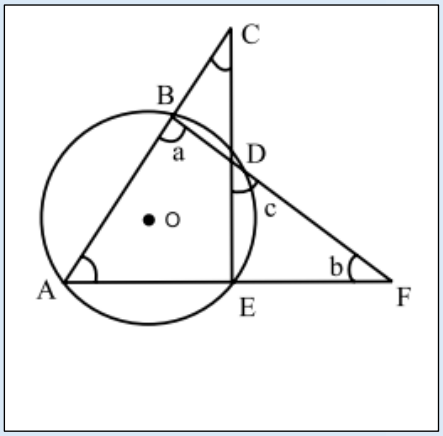
∠ACD + ∠AED + ∠AEB = 180° + 90°

From the figure,

∠BED = ∠AED + ∠AEB

Therefore, ∠ACD + ∠BED = 270°

Solution 20. In triangle AEC



∠AEC = 75° [angle sum property]

Now ABDE is a cyclic quadrilateral

∴ ∠a = 105°

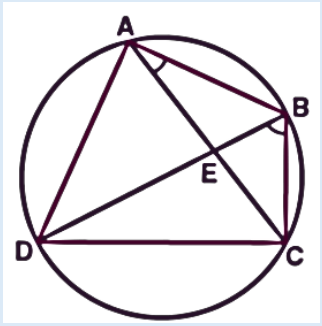
Now in triangle ABF

∠b = 13°

ABDE is a cyclic quadrilateral and BDF is straight line

∠c = 62°

Solution 21 Consider the chord CD,



As we know, angles in the same segment are equal.

So, ∠CBD = ∠CAD

∴ ∠CAD = 70°

Now, ∠BAD will be equal to the sum of angles BAC and CAD.

So, ∠BAD = ∠BAC + ∠CAD = 30° + 70°

∴ ∠BAD = 100°

As we know, the opposite angles of a cyclic quadrilateral sum up to 180 degrees.

So,

∠BCD + ∠BAD = 180°

Since, ∠BAD = 100°

So, ∠BCD = 80°

Now consider the ΔABC.

Here, it is given that AB = BC

Also, ∠BCA = ∠CAB (Angles opposite to equal sides of a triangle)

∠BCA = 30°

also, ∠BCD = 80°

∠BCA + ∠ACD = 80°

So, ∠ACD = 50° and, ∠ECD = 50°

Solution 22. ∠ACB = ∠ADB (Angles in same segment)

∠z = 2∠ACB

⇒ ∠z = ∠ACB + ∠ADB

∠y = ∠ACB + ∠CAD

⇒ ∠z = ∠y – ∠DAC + ∠ADB

But, ∠ADB – ∠DAC = ∠x

⇒ ∠x + ∠y = ∠z

5 MARKS QUESTIONS

Solution 23. Here, ABC is inscribed in a circle with canter O and the bisectors of ∠A, ∠B and ∠C intersect the circumcircle at D, E and F respectively.

Now, join DE, EF and FD

As angles in the same segment are equal, so,

∠FDA = ∠FCA ————-(i)

∠EDA = ∠EBA ————-(ii)

Adding equations (i) and (ii) we have,

∠FDA + ∠EDA = ∠FCA + ∠EBA

Or, $\angle FDE = \angle FCA + \angle EBA = (½)\angle C + (½)\angle B$

We know, $\angle A + \angle B + \angle C = 180°$

So, $\angle FDE = (½)[\angle C + \angle B] = (½)[180° - \angle A]$

$\Rightarrow \angle FDE = [90 - (\angle A/2)]$

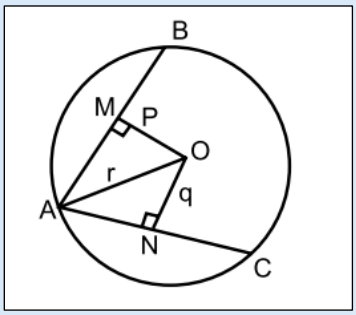
In a similar way,

$\angle FED = [90 - (\angle B/2)]$

And, $\angle EFD = [90 - (\angle C/2)]$

Solution 24. In $\Delta AMO\ OA^2 = OM^2 + AM^2$

$\Rightarrow = r^2 - p^2$ ($OM \perp AB$)



$(AB)^2 = 4r^2 - 4P^2$

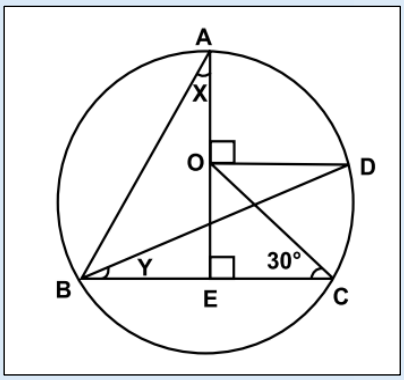
Similarly, $AC^2 = 4r^2 - 4q^2$

$AB^2 = 4AC^2$ ($\because AB = 2AC$)

$\Rightarrow 4r^2 - 4p^2 = 4(4r^2 - 4q^2)$

$\Rightarrow 4q^2 = p^2 + 3r^2$

Solution 25. $\angle EOC = 180° - 30° - 90° = 60°$



$\angle COD = 180° - 60° - 90° = 30°$

$\angle COB = 2\angle CBD$

$2y = 30°$

$\Rightarrow y = 15°$

Similarly, $\angle ABC = 1/2\ \angle AOC$

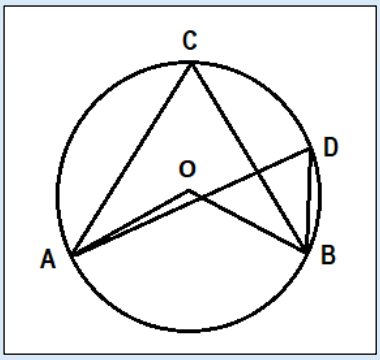
$\Rightarrow \angle ABC = 1/2\ (90° + 30°)$

$\Rightarrow \angle ABC = 60°$

CASE BASED QUESTION (4 MARKS EACH)

Solution 26. i) ∠AOB = 60°

As the angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle



ii) ∠ACB = 30°

Angles in the same segment of a circle are equal.

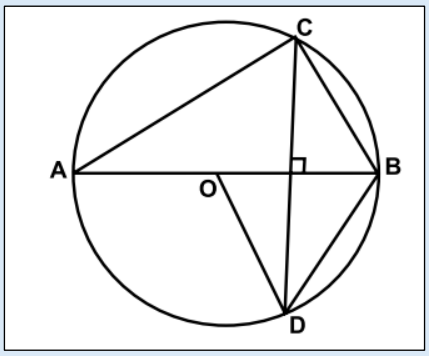
iii) If ∠ADB = 45°, then ∠AOB = 90°

and Reflex ∠AOB = 360° - 90° = 270°

OR

iii) Any relevant answer.

Solution 27. i) Since OB = OD = BD



⇒ ΔOBD is an equilateral triangle

ii) ΔOBD is an equilateral triangle

∴ ∠BOD = 60°

⇒ ∠AOD = 120° [linear pair]

iii) The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle,

Now ∠ACD = 1/2∠AOD = 60°

⇒ ∠CBA = 60°

Hence ∠CAB = 30° (Angle sum property)

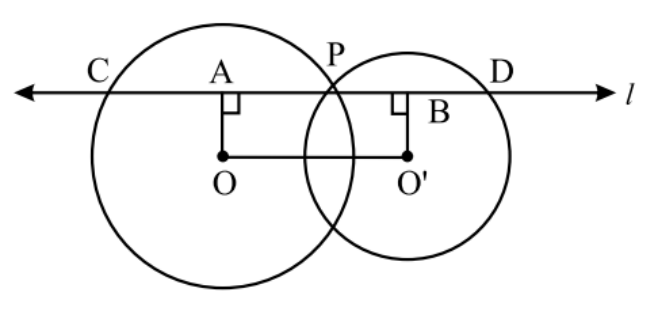
OR

iii) Yes, only in the case of rectangle and square. (or any other relevant answer)

Solution 28. i) As the perpendicular drawn from the centre of the circle to a chord bisects the chord.

CA = AP ⇒ CP = 2AP

ii) BP = BD ⇒ PD = 2 PB



iii) As ∠BPO = ∠ABO′ = 90°

ABOO′ is a rectangle

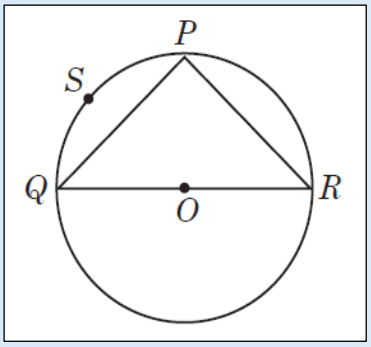
Thus AB = OO′ = AP + PB

Also CD = 2 AP + 2 PB = 2 [AP + PB] Thus CD = 2OO′

OR

iii) Any relevant answer.

Solution 29. i) ∠QPR = 90° [angle in the semicircle]



ii) Longest chord of the circle is diameter

. ∴ Diameter QR = 10m

iii) Area of triangular carpet = ½ base x height

= ½ PR x PQ = ½ x 6 x 8 = 24m²

OR

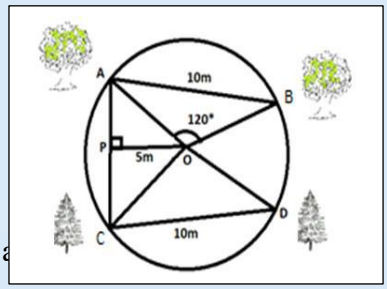
iii) No, as **angle** in the semicircle is always 90° whereas for an equilateral triangle all angle should be 60°.

Solution 30. i) Equal chords of a circle (or of congruent circles) subtend equal angles at the centre,

∴ ∠COD = 120°

ii) AO is radius ∴ AO = 13m

iii) Distance between mango tree A and Ashoka tree C = AC



In ΔAPO, $AP^2 = AO^2 - OP^2$

$AP^2 = 13^2 - 5^2 = 144 = 12^2$ ∴ AP = 12

Or AC = 2 AP = 24m

As the perpendicular drawn from the centre of the circle to a

OR

iii) Area of ΔAOB = ½ AB x height = ½ 10 x 4 = 20m

CHAPTER – 10: HERON'S FORMULA

MULTIPLE CHOICE QUESTIONS

1. The perimeter of an equilateral triangular shaped wooden block is 90cm.The area of the top of the wooden block is (AO1)
   (a)380.7cm^2 (b)225$\sqrt{3}$ cm^2 (c)220$\sqrt{3}$cm^2 (d)235$\sqrt{3}$cm^2
2. If a kite is in the shape of an isosceles triangle of base 8cm and each equal side 6cm is to be made, the area of the paper required to make the kite is (AO1)
   (a)10$\sqrt{2}$ cm^2 (b)8$\sqrt{5}$ cm^2 (c)$\sqrt{5}$ cm^2 (d)8 cm^2
3. An isosceles right triangle has an area 8cm^2. Its hypotenuse is (AO2)
   (a)$\sqrt{16}$ (b) $\sqrt{32}$ (c) $\sqrt{64}$ (d) $\sqrt{24}$
4. Number of times area changed when sides of triangle are doubled is (AO2)
   (b) Double (b) four times (c)eight times (d) no change in the area
5. If area of equilateral triangle is 25$\sqrt{3}$ cm^2. then its perimeter will be (AO2)
   (b) 10cm (b) 20cm (c)30cm (d)40cm
6. The edges of a triangular board are 6cm,8cm and 10cm.The cost of painting it at the rate of 9 paise per cm^2 is(AO2)
   (a)Rs.2.00 (b) Rs.2.16 (c)Rs.2.48 (d)Rs.3.00
7. The sides of an triangular park are in the ratio 25:17:12 and its perimeter is 540m. find the smallest side of the park (AO1)
   (a) 60m (b)45m (c)90m (d)120m
8. If the perimeter of an isosceles triangle is 32cm and the ratio of the equal side to its base is 3:2,then the area of the triangle is (AO2)
   (a)16$\sqrt{2}$cm^2 (b)20$\sqrt{2}$cm^2 (c) 30$\sqrt{2}$cm^2 (d)32$\sqrt{2}$cm^2

ASSERTION -REASONING TYPE QUESTION

In questions given below a statement of assertion(A) is followed by a statement of Reason (R). Choose the correct option.
A). Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
B). Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
C). Assertion is correct but Reason is incorrect.
D). Assertion is incorrect but Reason is correct.

9. Assertion: The cost of painting a triangular board having sides 14 cm,48cm, and 50 cm at the rate of Rs.5per cm^2 is Rs.1680

   Reason: The area of a right-angled triangle having base b& height h respectively is $\frac{1}{2}bh$ (AO1)

10. Assertion: The area of an equilateral triangle with each side a is $\Delta=\frac{\sqrt{3}}{4}a^2$

    Reason: The area of a triangle with sides a,b,& c is given by $\Delta=\sqrt{s(s-a)(s-b)(s-c)}$ (AO1)

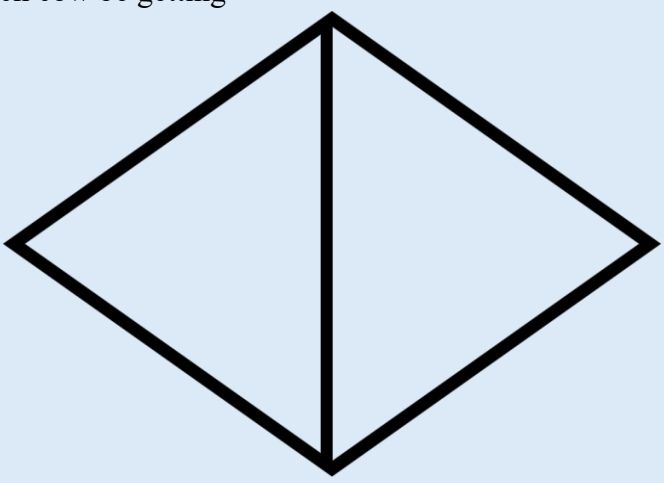
11. Assertion: The area of an isosceles triangle each of whose equal side is 13 cm and whose base is 24cm is 60cm^2
    Reason: The area of an isosceles triangle having base a and each equal side b is $\frac{b}{4}\sqrt{4a^2-b^2}$ (AO2)
12. Assertion: Heron's formula can be used to find area of scalene triangle only
    Reason: The area of a triangle with sides a,b,& c is given by
    $\Delta=\sqrt{s(s-a)(s-b)(s-c)}$ (AO1)

2 MARKS QUESTIONS

13. For a poster competition, students were provided equilateral triangular shaped drawing sheets. If the perimeter of the sheet is 90 cm. find the area of the drawing sheet. (AO2)
14. Find the area of a triangular board with base 8 cm and height 5.5cm (AO1)
15. If the area of an isosceles right angled triangle is 12.5cm^2,then find the length of its hypotenuse. (AO2)
16. If in a triangle (s - a), (s - b) and (s - c) are 150 m, 100 m and 20 m respectively, then find the sides a, b and c of the triangle, where s is the semi perimeter of the triangle (AO2)
17. Find the percentage increase in the area of a triangle if each side is doubled. (AO2)

3 MARKS QUESTIONS

18. The sides of a triangular field are 51m,37m, &20m.find the number of flower beds that can be prepared, if each bed is to occupy 9m^2 of space (AO2)
19. The base of a triangular field is $2\frac{1}{2}$ times its height, If the cost of turfing it at Rs.40 per 100 m^{2}is Rs.800. Fnd its base. (AO2)
20. A triangular park in a city has dimensions30m,26m&28m. A gardener has to plant grass inside it at Rs. 1.50 per m^2. find the amount to be paid to the gardener.(AO1)
21. The perimeter of a triangular field is 144m and the sides of the triangular field are in the ratio 3:4:5.Find the area of the triangular field (AO1)
22. A rhombus –shaped field has green grass for 18 cows to graze. If each side of the rhombus is 30m and its longer diagonal is 48m,how much area of grass field will each cow be getting (AO2)

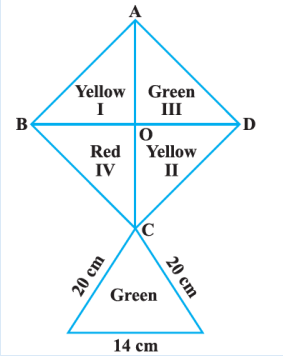


5 MARKS QUESTIONS

23. The perimeter of an isosceles triangle is 32 cm. The ratio of the equal side to its base is 3: 2. Find the area of the triangle. (AO1)

24. A field is in the shape of a trapezium whose parallel sides are 25 m and 10 m. The non-parallel sides are 14 m and 13 m. Find the area of the field. (AO2)

25. How much paper of each shade is needed to make a kite given in the figure, in which ABCD is a square with diagonal 44 cm. (AO2)



CASE BASED QUESTIONS (4 MARKS EACH)

26. A craft mela is organized by Welfare Association to promote the art and culture for tribal people. Fairs and festivals are the custodians of our great cultural heritage. The pandal is to be decorated by using triangular flags around the field. Each flag has dimensions 25 cm, 25 cm and 22 cm.

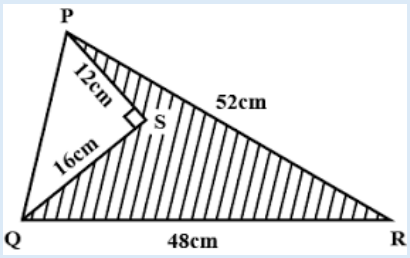
a. What is the semi-perimeter of the flag for the above mentioned dimensions? (AO1) (1 MARK)

b. What is the area of the flag?(Use $\sqrt{14}$ =3.74) (AO1) (2MARK)

c. Find the area of cloth required for making 300 such flags in m^2

d. (AO2) (1 MARK)

27. The given figure shows the triangular garden owned by Seetha. The smaller triangle is right angled at S. Seetha wants to plant coriander in smaller triangle and spinach in the remaining portion.



(A) What is the length of the side PQ? (AO1) (1 MARK)

(B) In how much area will she plant coriander? (AO2) (1 MARK)

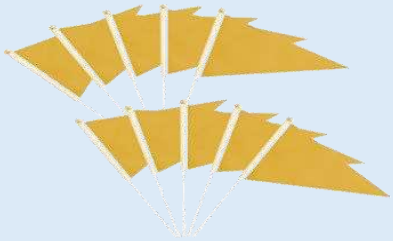
(C)In how much area will she plant spinach? (AO2) (2 MARK)

28. While selling clothes for making flags, a shopkeeper claims to sell each piece of cloth in the shape of an equilateral triangle of each side 10 cm while actually he was selling the same in the shape of an isosceles triangle with sides 10 cm, 10 cm and 8 cm.

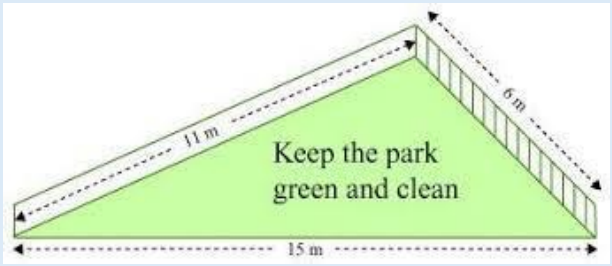
(A)Find the area of an equilateral triangular flag?

(B) If the shopkeeper sells 500 equilateral triangular flags, then find its area.

(C) Find the area of an isosceles triangular flag.



29. There is a slide in a park. One of its side walls has been painted in some colour with a message “KEEPTHE PARK GREEN AND CLEAN”. The sides of the wall are 15 m, 11 m and 6 m

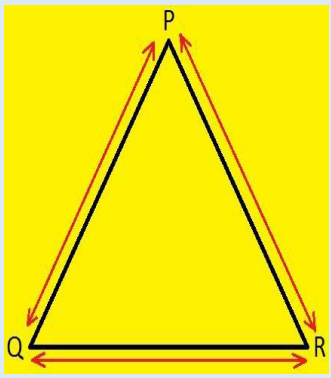


(a)Write Herons formula to find the area of triangular region that is coloured. (AO1) (1 MARK)

(b)What does s in the formula stand for? (AO1) (1 MARK)

(c)Find the area of the triangular region. (AO1) (2 MARK)

30. Rahul is fond of sceneries. He has decorated his home with many beautiful sceneries in various shapes. One of his friends visited his house and was impressed to see the triangular sceneries there. The dimensions of each triangular frame are 40 cm, 50 cm and 50 cm.



Based on the above information answer the following questions:

(i) What is the total length of frame of scenery? (AO1) (1 MARK)

(ii) If the area of an equilateral triangle is $5\sqrt{3}$cm^2, find the length of each side of the triangle. (AO1) (1 MARK)

(iii)Find the area of the wall covered by two triangular scenery? (AO1) (2MARK)

SOLUTONS OF CHAPTER – 10: HERON'S FORMULA

MULTIPLE CHOICE QUESTIONS

1. Answer option (b) $225\sqrt{3}$ cm^2

2. Answer option (b) $8\sqrt{5}$ cm^2

3. Answer option (a) $\sqrt{16}$

4. Answer option:(b) four times

5. Answer option c 30cm

6. Answer option(b)2.16

7. Answer option(d)120m

8. Answer Option (d) $32\sqrt{2}$cm^2

ASSERTIONS AND REASON QUESTIONS

9. ANSWER Option a

10. ANSWER Option a

11. ANSWER Option c

12. ANSWER Option d

2 MARKS QUESTIONS

13. S=$\frac{90}{2}$=45cm

a=$\frac{90}{3} = 30cm$

Area of triangular sheet=$\sqrt{s(s-a)(s-b)(s-c)}$

=$\sqrt{45(45-30)(45-30)(45-30)}$

=$\sqrt{45 \times 15 \times 15 \times 15}$

=15× 15$\sqrt{3}$=225$\sqrt{3}$cm^2

14. Area of triangular board = $\frac{1}{2}bh = \frac{1}{2} \times 8 \times 5.5 = 22cm^2$

15. Area of isosceles right-angled triangle=$\frac{1}{2}bh$=$\frac{1}{2}bb$=$\frac{1}{2}b^2 = 12.5$ cm^2

$b^2 = 12.5 \times 2 = 25$

b=5cm h=5cm

hypotenuse=$\sqrt{b^2+h^2}$=$\sqrt{5^2+5^2}$=$\sqrt{25+25}$=$\sqrt{50}$=5$\sqrt{2}$cm

16. s- a = 150 m

s-b = 100 m

s- c = 20 m we know a+b+c = 2s…….(i)

s-a+s-b +s-c = 150+100+20

3s –(a+b+c) = 270

3s – 2s = 270 (from eq 1) S = 270 Now s -a = 150 270- a = 150

a = 120 m Similarly b = 170 m & c=250m

17. a, b and c are the sides of the triangle respectively.

So the sides of the new triangle become 2a, 2b and 2c.

Now as we know that the perimeter of the triangle is the sum of all sides.

Therefore (s = a + b + c)

And the new perimeter becomes,

S’ = (2a + 2b + 2c) = 2(a + b + c) = 2s.

So the new area (A’) of the triangle becomes

⇒A′=$\sqrt{2s(2s-2a)(2s-2b)(2s-2c)}$

Now simplify it we have,

⇒A′=$\sqrt{16s(s-a)(s-b)(s-c)}$16

$=4\sqrt{s(s-a)(s-b)(s-c)}$

Now from equation (1) new area of the triangle becomes,

$\Rightarrow A'=4A \Rightarrow A'=4A$

So the increase in area is the subtraction of new area and previous area.

Therefore increase in area = A' – A

= 4A – A = 3A.

Therefore the percentage increase in area $=\frac{3A}{A}\times 100=300$ %.

So the percentage increase in the area of a triangle if each side is doubled is 300%.

So this is the required answer.

3 MARKS QUESTIONS

18. Area of triangular field=$\sqrt{s(s-a)(s-b)(s-c)}$

$=\sqrt{54\times(54-51)(54-37)(54-20)}=\sqrt{54\times 3\times 17\times 34}=$
$\sqrt{3\times 3\times 3\times 2\times 3\times 17\times 17\times 2}=306\text{m}^2$

Number of flowerbeds= $\frac{area\ of\ the\ triangular\ field}{space\ occupied\ by\ each\ flowerbed}=306/9=34$

19. height=x cm base=$\frac{5}{2}$x

area of triangle=$\frac{1}{2}$bh=$\frac{1}{2}\times\frac{5}{2}x\times x=\frac{5}{4}x^2$

$$\frac{5}{4}x^2=2000$$

$$=2000\times 4/5=1600$$

$$x^2=40m$$

Base of the triangle=$\frac{5}{2}$x=$\frac{5}{2}\times 40=100$m

20. Area of triangular field=$\sqrt{s(s-a)(s-b)(s-c)}$

$=\sqrt{42(42-30)(42-26)(42-28)}$
$=\sqrt{42\times 12\times 16\times 14}=\sqrt{2\times 3\times 7\times 2\times 3\times 2\times 2\times 2\times 2\times 2\times 2\times 7}$
$=16\times 7\times 3=336\text{m}^2$.
Amount to be paid to gardener=1.50×336= Rs504

21. $3x+4x+5x=12x=144$

$x=\frac{144}{12}=12$

$a = 3x = 36m$ $b = 4x = 48$ $c = 5x = 60$

S = $\frac{a+b+c}{2}$=$\frac{36+48+60}{2} = 72$

Area of triangular field=$\sqrt{72(72-36)(72-48)(72-60)}$

=$\sqrt{72 \times 36 \times 24 \times 12}$==$\sqrt{36 \times 2 \times 36 \times 12 \times 2 \times 12}$=36×12×2=864m^2

22. Area of rhombus shaped field=2 area of one triangle=2$\sqrt{s(s-a)(s-b)(s-c)}$

=2$\sqrt{54(54-48)(54-30)(54-30)}$

=2$\sqrt{54 \times 6 \times 24 \times 24}$=2$\sqrt{9 \times 6 \times 6 \times 12 \times 2 \times 12 \times 2}$

=2×3×6×12×2=864m^2.

Area of grass for 18 cows=864m^2

Area of grass for 1 cow=$\frac{864}{18}$=48m^2

5 MARKS QUESTIONS

23. Solution: According to the question,

The perimeter of the isosceles triangle = 32 cm

It is also given that,

Ratio of equal side to base = 3 : 2

Let the equal side = 3x

So, base = 2x

Perimeter of the triangle = 32

3x + 3x + 2x = 32

8x = 32

x = 4.

Equal side = 3x = 3×4 = 12

Base = 2x = 2×4 = 8

The sides of the triangle = 12cm, 12cm and 8cm.

Let a = 12, b = 12, c = 8

s = (a + b + c)/2

⇒ s = (12 + 12 + 8)/2

= 32/2 = 16.

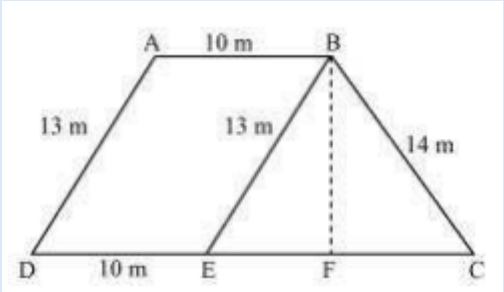
Area of the triangle = √(s(s-a)(s-b)(s-c))

= √(16(16-12)(16-12)(16-8))

= √(16×4×4×8)

= 32√2 cm^2

24.First, draw a line segment BE parallel to the line AD. Then, from B, draw a perpendicular on the line segment CD.



Now, it can be seen that the quadrilateral ABED is a parallelogram. So,
AB = ED = 10 m
AD = BE = 13 m
EC = 25 – ED = 25 – 10 = 15 m
Now, consider the triangle BEC,
Its semi perimeter (s) = (13+ 14 + 15)/2 = 21 m

By using Heron's formula,

Area of ΔBEC =

$$\sqrt{s(s-a)(s-b)(s-c)}$$

$$\left(\sqrt{21 \times (21-13) \times (21-14) \times (21-15)}\right) m^2$$

$$\left(\sqrt{21 \times 8 \times 7 \times 6}\right) m^2$$

= 84 m^2

We also know that the area of ΔBEC = (½) × CE × BF

84 cm^2 = (½) × 15 × BF

=> BF = (168/15) cm = 11.2 cm

So, the total area of ABED will be BF × DE, i.e. $11.2 \times 10 = 112\ m^2$

$\therefore$ Area of the field = $84 + 112 = 196\ m^2$

25. According to the figure,

AC = BD = 44cm

AO = 44/2 = 22cm

BO = 44/2 = 22cm

From ΔAOB,

$AB^2 = AO^2 + BO^2$

$\Rightarrow AB^2 = 22^2 + 22^2$

$\Rightarrow AB^2 = 2 \times 22^2$

$\Rightarrow AB = 22\sqrt{2}$ cm

Area of square = $(Side)^2$

$= (22\sqrt{2})^2$

$= 968\ cm^2$

Area of each triangle (I, II, III, IV) = Area of square /4

= 968 /4

$= 242\ cm^2$

To find area of lower triangle,

Let a = 20, b = 20, c = 14

s = (a + b + c)/2

$\Rightarrow$ s = (20 + 20 + 14)/2 = 54/2 = 27.

Area of the triangle = $\sqrt{[s(s-a)(s-b)(s-c)]}$

$= \sqrt{[27(27-20)(27-20)(27-14)]}$

$= \sqrt{[27\times7\times7\times13]} = 131.14\ cm^2$

Therefore,

We get,

Area of Red = Area of IV= $242\ cm^2$

Area of Yellow = Area of I + Area of II

$= 242 + 242$

$= 484\ cm^2$

Area of Green = Area of III + Area of the lower triangle

$= 242 + 131.14$

$= 373.14\ cm^2$

CASE BASED QUESTIONS (4 MARKS EACH)

26. (a)S = $\frac{a+b+c}{2} = \frac{25+25+22}{2} = \frac{72}{2}$ = 36cm

(b)Area of the flag =$\sqrt{s(s-a)(s-b)(s-c)}$ =$\sqrt{36(36-25)(36-25)(36-22)}$

=$\sqrt{36 \times 11 \times 11 \times 14} = 66\sqrt{14}$ = 66×3.74=246.84cm^2

(c)area of cloth required for making 300 such flags=300×246.84=74052cm^2=7.4052m^2

27. (a)length of side PQ=$\sqrt{b^2+h^2}$=$\sqrt{16^2+12^2}$=$\sqrt{256+144}$=$\sqrt{400}$=20cm

(b) Area =$\frac{1}{2}bh$=$\frac{1}{2} \times 16 \times 12$=96cm^2

(c)Area of full triangle =$\sqrt{s(s-a)(s-b)(s-c)}$

=$\sqrt{60(60-52)(60-48)(60-20)}$

=480 cm^2

Area of the region, where spinach is planted=480-96=384 cm^2

28. (a) The area of an equilateral triangle with each side 10 cm is Δ=

$\frac{\sqrt{3}}{4} \times 10 \times 10 = 25\sqrt{3}$cm^2

(b) The area of 500 equilateral triangles=500×25$\sqrt{3}$=12500$\sqrt{3}cm^2$

(c)the area of an isosceles triangular flag = $\sqrt{s(s-a)(s-b)(s-c)}$

=$\sqrt{14(14-10)(14-10)(14-8)}$=$\sqrt{14 \times 4 \times 4 \times 6}$=8$\sqrt{21}\ cm^2$

29. a) $\sqrt{s(s-a)(s-b)(s-c)}$

b) S = semiperimeter =$\frac{a+b+c}{2}$

(c)Area= $\sqrt{s(s-a)(s-b)(s-c)}$

=$\sqrt{16(16-11)(16-15)(16-6)}$=$\sqrt{16 \times 5 \times 1 \times 10}$=20$\sqrt{2}\ m^2$

30. i) Total length of frame of scenery=40+50+50=140cm

$ii)$ $\frac{\sqrt{3}}{4}a^2 = 5\sqrt{3}$cm^2, a=2$\sqrt{5}$cm

(iii)Area =2 $\sqrt{s(s-a)(s-b)(s-c)}$

=2$\sqrt{70(70-40)(70-50)(70-50)}$=200$\sqrt{21}\ cm^2$

CHAPTER -11 : SURFACE AREA AND VOLUME

MULTIPLE CHOICE QUESTIONS

1. If volume and surface area of a sphere is numerically equal, then its radius is (AO1)

a) 2units b) 3units c) 4 units d) 5units

2.A hemispheric dome of radius 3.5 m is to be painted at a rate of ₹600 per m^2. What is the cost of painting it? (Take $\pi = \frac{22}{7}$) (AO1)

a) ₹46200 b) ₹45000 c) ₹47260 d) ₹48375

3.A vessel of conical shape of radius 14cm and slanted height 20cm is to be coloured. What is the cost of painting at a rate of ₹2/cm^2? (Take $\pi = \frac{22}{7}$). (AO1)

a) ₹1540 b) ₹1660 c) ₹1760 d) ₹1500

4.A triangle having sides equal to 7cm, 24cm and 25cm forms a cone when revolved about 24cm side. What is the volume of a cone formed? (AO2)

a) 1225cm^3 b) 1232cm^3 c) 4000cm^3 d) 3696cm^3

5.The curved surface area of the cone of slant height $\frac{X}{2}$ is 2πx. Then area of its base is (AO2)

a) $4\pi sq.units$ b) $4\pi x^2 sq.units$ c) πx^2 sq.units d) 16πsq.units

6. A cone, and a hemisphere stand on equal bases and have the same height. The ratio of their volumes is (AO2)

a) 2:1 b) 1:2 c)1:1 d)1:3

7. A conical pit of top diameter 3.5m is 12m deep. What is its capacity in kilo litre. (AO2)

a) 38.5Kl b) 48.5Kl c) 39.5Kl d) 47.5Kl

8.If the surface area of a sphere of radius "R" is equal to the curved surface area of a hemisphere of radius "r", what is the ratio of R/r? (AO2)

a) $\frac{1}{2}$ b) $\frac{1}{\sqrt{2}}$ c) 2 d) $\sqrt{2}$

ASSERTION AND REASON QUESTIONS

In the following questions 9,10,11 and 12 a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

9.**Assertion(A)** : If the radius of a sphere is tripled, then the ratio of the volume of the original sphere to that of the new is 1 : 27.

Reason (R): Volume of a sphere with radius r is $4\pi r^3$ **(AO1)**

10 **Assertion(A)**:If the height of a cone is 24 cm and diameter of the base is 14 cm, then the slant height of the cone is 15 cm. **Reason** (R): If r be the radius and h be the height of the cone, then slant height=$\sqrt{h^2 + r^2}$ **(AO1)**

11. **Assertion:** The volume and surface Area of a sphere are related to each other by radius.

Reason : Relation between Surface Area S and Volume V is $S^3 = 36\pi V^2$ **(AO2)**

12.**Assertion (A)**: An edge of a cube measures r cm. If the largest possible right circular cone is cut out of this cube, then the volume of the cone is $\frac{1}{6}\pi r^3$

Reason (R): Volume of the cone is given by$\frac{1}{3}\pi r^2 h$, where r is the radius of the base and h is the height of the cone. **(AO2)**

2 MARKS QUESTIONS

13.A spherical ball is divided into two equal halves. Given that the curved surface area of each half is 56.52 cm^2, what will be the volume of the spherical ball? (AO1)

14. A sphere of maximum volume is cut out from a solid hemisphere of radius 6 cm. Find the volume of the cut out sphere. (Take π=3.14) (AO2)

15.A hollow sphere of outer radius of 4 cm and thickness of 3 cm is to be made from metal. What is the total amount of metal required (in cm^3) to make the sphere?

(Take π =22/7) (AO2)

16. A conical tent is to accommodate 11 persons. Each person requires 4 square metres of the space on the ground and 20 cubic metres of air to breath, then find the height of the cone? (AO2)

17. A semi-circular sheet of metal of radius 14 cm is bent to form an open conical cup. Find the capacity of the cup. (AO2)

3 MARKS QUESTIONS

18.Find out the amount of water (in litres) displaced by a solid spherical ball of diameter 4.2cm when completely immersed in water? (AO2)

19. Using equal volume of clay, Anant made a right circular cone of height 48 cm and base radius 12 cm and Varsha made a sphere. Find the radius and curved surface area of the

sphere Varsha made? (AO2)

20.This is the picture of an ice-cream cone. The radius of the cone is 4 cm and the height is 15 cm.An ice-cream seller keeps ¼ of it empty. What is the volume (in cm^3) of the empty part of the cone? (AO1)

21. A heap of rice is in the form of a cone of base diameter 24 m and height 3.5 m. How much canvas cloth is required to just cover the heap? (AO1)

22. If the radius and height of a cone are both increased by 10%, then Calculate the percentage of increase in the volume of the cone? (AO2)

5 MARKS QUESTIONS

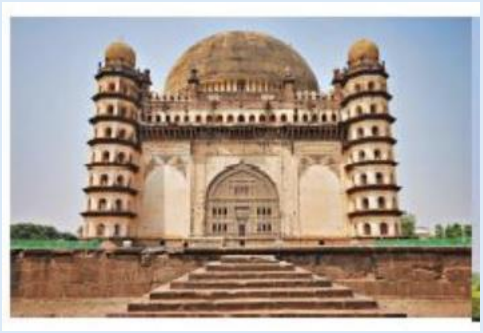
23.Metal spheres, separately of radius 2 cm, are loaded into a rectangular box of the required internal dimensions 16 cm × 8 cm × 8 cm. When 16 spheres are compacted, the box is loaded with preservative liquid. Find the volume of this liquid. Give your answer to the nearest integer. [Use π =3.14] (AO2)

24. If h, S and V denote respectively the height, curved surface area and volume of a right circular cone, then show that $3\pi V h^3 - S^2 h^2 + 9V^2 = 0$ (AO2)

25. Rampal decided to donate canvas for 10 tents conical in shape with base diameter 14 m and height 24 m to a centre for handicapped person's welfare. If the cost of 2 m wide canvas is Rs. 40 per meter, find the amount of money Rampal spent for donation (AO1)

CASE BASED QUESTIONS (4 MARKS EACH)

26. Mathematics teacher of a school took her 9th standard students to show Gol Gumbaz. It was a part of their Educational trip. The teacher had interest in history as well. She narrated the facts of Gol Gumbaz to students. Gol Gumbaz is the tomb of king Muhammad Adil Shah, Adil Shah Dynasty. Construction of the tomb, located in Vijayapura , Karnataka, India, was started in 1626 and completed in 1656. It reaches up to 51 meters in height while the giant dome has an external diameter of 44 meters, making it one of the largest domes ever built. At each of the four corners of the cube is a dome shaped octagonal tower seven stories high with a staircase inside.



(i)What is the curved surface area of hemispherical dome ? (AO1)

(ii) What is the circumference of the base of the dome ? (AO1)

(iii) Find the cost of polishing hemispherical dome if the cost of polishing1 m2 is Rs. 270? (AO2)

27.DK Jain runs a company that makes ball bearings. The bearings are shipped in boxes that are then loaded onto trucks. Each bearing has a diameter of 18 mm.

(i) Each box can hold $3888\pi\ cm^3$ of ball bearings. How many ball bearings can a box hold? (AO1)

(ii) Each ball bearing has a mass of 4 gm. Determine the. mass of each box. (AO1)

(iii) The maximum mass a truck can carry is 11000 kg. What is the maximum number of boxes that can be loaded into a truck? (AO2)

28. Mathematics teacher of a school took his 9th standard students to show Taj Mahal. It was a part of their Educational trip. The teacher had interest in history as well. He narrated the facts of Taj Mahal to the students. Then the teacher said in this monument one can find combination of solid figures. There are 4 pillars which are cylindrical in shape. Also, 2 domes at the back side which are hemispherical. 1 big domes at the centre. It is the finest example of the symmetry. (Use $\pi = 22/7$)

(i) Find the volume of air in the hemispherical dome at the centre if base radius is 7 m?(AO1)

(ii) Write the formula to calculate the curved surface area of hemispherical dome? (AO1)

(i) How much cloth material will be required to cover 2 small domes each fradius 4.2metres? (AO2)

29. Once four friends Rahul, Arun, Ajay and Vijay went for a picnic at a hill station. Due to peak season, they did not get a proper hotel in the city. The weather was fine so they decided to make a conical tent at a park. They were carrying 300 m^2 cloth with them. They made the tent with height 8 m and diameter 12m. The remaining cloth was used for the floor. (Use $\pi = 3.14$)

(i)What is the slant height of the tent? (AO1)

(iii)How much cloth used for the tent? (AO1)

(iii) How much Cloth was used for the floor? (AO2)

30. Mathematics teacher of a school took her 9th standard students to show Red fort. It was a

part of their Educational trip. The teacher had interest in history as well. She narrated the facts of Red fort to students. Then the teacher said in this monument one can find combination of solid figures. There are 2 pillars which are cylindrical in shape. Also 2 domes at the corners which are hemispherical.7 smaller domes at the centre. Flag hoisting ceremony on Independence Day takes place near these domes.

i) How much cloth material will be required to cover 2 big domes each of radius 2.5 metres? (AO1)

ii) How much is the volume of a hemisphere if the radius of the base is 3.5 m? (AO1)

iii) What is the ratio of sum of volumes of two hemispheres of radius 1 cm each to the volume of a sphere of radius 2 cm? (AO2)

SOLUTIONS OF CHAPTER -11: SURFACE AREA AND VOLUME

1 b). 3units 2.a) ₹46200. 3.c) ₹1760. 4.b)1232cm^3

5. d) 16πsq.units 6.b)1:2 7.a)38.5Kl 8.b) $\frac{1}{\sqrt{2}}$

ASSERTION AND REASON QUESTIONS

9 c) 10.d) 11. a) 12.d)

2 MARKS QUESTIONS

13.Curved surface area of of half of the spherical ball = 56.52 cm^3

(1/2) $4\pi r^2 = 56.52$ $\quad 2 \times 3.14 \times r^2 = 56.52$

$r^2 = 56.52/6.28$ $\quad r^2 = 9$ $\quad r = 3$ cm

Volume of spherical ball $= \frac{4}{3}\pi r^3$

$= (4/3) \times 3.14 \times 3 \times 3 \times 3 = 113.04\ cm^3$

14.Radius of the sphere of maximum volume can be cut out from the solid hemisphere is 3

Volume of that sphere $= \frac{4}{3}\pi r^3 = \frac{4}{3} \times 3.14 \times 3^3 = 113.04 cm^3$

15. Outer radius R = 4cm

Inner radius r = outer radius – thickness = 4 – 3. r = 1cm

This means that the sphere is hollow and volume of metal required $= \frac{4}{3}\pi(4^3 - 1^3) = 264 cm^3$

16. Required area of the base of cone = 11×4=44 m^2

and required volume of cone =11×20=220 $m^3 \Rightarrow \frac{1}{3}\pi r^2 h$=220⇒1/3×44×h=220⇒h=15 m

∴ Height of cone = 15 m

17. Radius of semi - circular piece =14 cm.

Circumference of semi - circle = $\pi r = \frac{22}{7} \times 14$=44 cm

∴ Circumference of base of cone =44 cm⇒2πR=44cm⇒R=$\frac{44 \times 7}{2 \times 22}$=7cm

Radius of semi - circular sheet = slant height of conical cup ⇒l=14cm

Now, h=$\sqrt{196 - 49} = \sqrt{147} = 7\sqrt{3}$cm

∴ Capacity of cup $= \frac{1}{3}\pi r^2 h$ =1/3×22/7×7×7×7$\sqrt{3}$=622.37cm^3

3 MARKS QUESTIONS

18. Radius of spherical ball=2.1cm,Volume of water displaced=Volume of sphere

$= \frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} X2.1X2.1X2.1 = 38.81 cm^3$ $\quad \frac{38.81}{1000} = 0.03881 litres$

19.Volume of right circular cone=volume of sphere

$\frac{1}{3}\pi r^2 h = \frac{4}{3}\pi R^3 \quad \frac{1}{3}\pi \times 12^2 \times 48 = \frac{4}{3}\pi \times R^3 \quad \rightarrow R = 12cm$

20.Volume of (1/4)th of ice cream cone $=\frac{1}{4} \times \frac{1}{3} \times 3.14 \times 4 \times 4 \times 15 = 62.8cm^3$

21.slant height$l = \sqrt{h^2 + r^2} = \sqrt{12^2 + 3.5^2} = 12.5cm$

canvas cloth is required to just cover the heap$=\pi rl = \frac{22}{7} \times 3.5 \times 12.5 = \frac{3300}{7}m^2$

22. Let V1 and V2 be the volumes of original and new cones respectively. r and h are radius and height of original cone.

$$\therefore \quad V_1 = \frac{1}{3}\pi r^2 h, V_2 = \frac{1}{3}\pi\left(r + \frac{10r}{100}\right)^2\left(h + \frac{10h}{100}\right) = \frac{1331}{1000}\left(\frac{1}{3}\pi r^2 h\right)$$

$\therefore$ Required increased percentage in volume

$$= \left(\frac{\text{New volume} - \text{Original volume}}{\text{Original volume}}\right) \times 100\%$$

$$= \frac{V_2 - V_1}{V_1} \times 100\% = \left(\frac{1331}{1000} - 1\right) \times 100\% = 33.1\% = 33\% \text{ (approx.)}$$

5 MARKS QUESTIONS

23.Radius of each sphere, r = 2 cm

Volume of 16 spheres = 16 × 4/3 πr³

= 16 × 4/3 × 3.14 × 2³ = 535.89 cm³

The volume of the given rectangular box = 16 × 8 × 8 = 1024 cm³

In order to find the volume of the liquid that is filled in a rectangular box,

The volume of the given liquid = (Volume of the given rectangular box) – (Volume of the given 16 spheres)

⇒ Volume of the given liquid = 1024 – 535.89

= 488.11 cm³ Thus, the volume of this liquid is 488.11 cm³

24.

Let r and l be the radius and slant height of the cone.

$\therefore \quad S = \pi rl = \pi r\sqrt{r^2 + h^2}$ and $V = \frac{1}{3}\pi r^2 h$

Now, $3\pi Vh^3 - S^2h^2 + 9V^2$

$= 3\pi\left(\frac{1}{3}\pi r^2 h\right)h^3 - (\pi r\sqrt{r^2 + h^2})^2 h^2 + 9\left(\frac{1}{3}\pi r^2 h\right)^2$

$= \pi^2 r^2 h^4 - \pi^2 r^2 h^2 (r^2 + h^2) + \pi^2 r^4 h^2$

$= \pi^2 r^2 h^4 - \pi^2 r^4 h^2 - \pi^2 r^2 h^4 + \pi^2 r^4 h^2 = 0$

25. Radius of conical tent, r=7m height of the tent, h=24m

The slant height of tent, $(l) = \sqrt{h^2 + r^2} = \sqrt{24^2 + 7^2} = \sqrt{576 + 49} = 25\ m$ Area of tent $= \pi rl$

$$= \frac{22}{7} \times 7 \times 25 = 550\ m^2$$

Total area of 10 tents $= 10 \times 550 = 5500\ cm^2$

Cost of 2 m wide canvas = Rs 40

$$\text{Total cost of canvas} = 5500 \times \frac{40}{2} = 1,10,000 \text{ Rupees}$$

CASE BASED QUESTIONS (4 MARKS EACH)

26. (i)The curved surface area of hemispherical dome $= 2 \times 3.14 \times 22 \times 22 = 3039.52m^2$

(ii) the circumference of the base of the dome$2\pi r = 2 \times 3.14 \times 22 = 138.16m$

(iii) Find the cost of polishing hemispherical dome if the cost of polishing1 m2 is Rs. 270=3039.52X270=Rs.820670.40

27.(i)Capacity of the box=3888π cm^3

No: of ball bearings it can hold=$\frac{Capacity\ of\ the\ box}{volume\ of\ 1\ ball\ bearing} = \frac{3888\pi}{\frac{4}{3}\pi r^3}$

Radius of ball bearing=0.9cm. No: of ball bearings=4000

(ii)Mass of 4000 Ball bearings=4000x4=16000gm or 16kg

(iii) The maximum mass a truck can carry is 11000 kg.

maximum number of boxes that can be loaded into a truck=$\frac{11000}{16} = 687.5 = 687$

28. The volume of air in the hemispherical dome at the centre=$\frac{2}{3}\pi r^3 = \frac{2}{3} \times \frac{22}{7} \times 7^3 =$ $718.67m^3$

(ii)Formula of curved surface area=$2\pi r^2$

(iii) Cloth material required to cover the two small hemispherical domes=$2 \times \left(2 \times \frac{22}{7} \times 4.2^2\right) = 221.76cm^2$

29.Area of cloth=$300m^2$ $height = 8m, Radius = 6m$

(i)Slant height=$\sqrt{h^2 + r^2}$ =$\sqrt{8^2 + 6^2}$=10m

(ii)Cloth used for the tent=$\pi rl = 3.14 \times 6 \times 10 = 188.4m^2$

(iii)Cloth used for the floor=300-188.4=111.6m^2

30.(i) cloth material will be required to cover 2 big domes each of radius 2.5 metres=$2 \times 2\pi r^2 = 4 \times \frac{22}{7} \times 2.5 \times 2.5 = 78.57m^2$

(ii)volume of a hemisphere if the radius of the base is 3.5 m=$\frac{2}{3} \times \frac{22}{7} \times (3.5)^2 = 89.83m^3$

(iii) the ratio of sum of volumes of two hemispheres of radius 1 cm each to the volume of a sphere of radius 2 cm=$\frac{2 \times \frac{2}{3}\pi \times 1^3}{\frac{4}{3}\pi \times 2^3} = 1:8$

CHAPTER -12: STATISTICS

MULTIPLE CHOICE QUESTIONS

1. The difference between the maximum observation and minimum observation is called …….. (AO1)

(a) Class size (b) class mark (c) range (d) class interval

2. The mean of first five whole numbers is ……. (AO1)

(a) 1 (b) 2 (c) 3 (d) 5

3. The class mark of 90 – 110 is …..…. (AO1)

(a) 105 (b) 100 (c) 95 d) 200

4. The mode of 4, 6, 5, 9, 3, 2, 7, 7, 6, 5, 4, 9, 4 is ……. (AO1)

(a) 9 (b) 7 (c) 6 (d) 4

5. The median of the observations 3, 5, 12,10, 7, 11, 4, 3, 8 is…. (AO1)

(a) 7 (b) 0 (c) 11 (d) 5

6. In a histogram, each rectangle is constructed with base as ….. (AO1).

(a) Frequency (b) class interval (c) range (d) class mark

7. Which of the following is not a measure of central tendency? . (AO1)

(a)Mean (b)Median (c)Mode (d)Range

8.The mean of the first n odd natural numbers is n itself. Then n is ….. (AO2)

(a) 1 (b) 2 (c) 3 (d) Any natural number

ASSERTION AND REASONING QUESTIONS

In questions 9 TO 12 a statement of assertion(A) is followed by a statement of Reason (R). Choose the correct option.

A). Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

B). Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C). Assertion is correct but Reason is incorrect.

D). Assertion is incorrect but Reason is correct.

9. ASSERTION(A):If the mean of five observations x, x+2, x+4, x+6 and x+8 is11, then mean of last three observations is 13.

REASON (R): Mean of observations $= \frac{\text{Sum of all obsevations}}{\text{Number of observstions}}$. (AO1)

10. ASSERTION(A):The range of first 5 multiples of 2 is 6

REASON (R):Range= maximum value - minimum value

11. ASSERTION (A):The median of the observations 3, 5, 12,10, 7, 11, 4,1, 3, 8 is 6.

REASON (R):When the number of observations is odd,the median is the value of the$[\frac{n+1}{2}]$ th observation. (AO2)

12. ASSERTION(A):The mode of 4, 6, 7,5, 9, 3, 2, 7, 7, 6, 5, 4, 9, 7,4 is 7.

REASON (R): The mode is that value of the given number of observations which divides it into exactly two parts.

2 MARKS QUESTIONS

13. The mean of 12 numbers is 20, If each number is divided by 5, then find the new mean. (AO2)

14. If the mean of six observations y, $y + 1$, $y + 4$, $y + 6$, $y + 8$, $y + 5$ is 13, find the value of y. (AO2)

15. The Number of books issued by the school library to 13 students in an academic year are:

25, 19, 24, 23, 29, 31, 19, 20, 22, 26, 17, 35, 21.

Find the median no. of books issued for the above data. (AO1)

16. The width of each of nine classes of a frequency distribution is 2.5. The lower limit of lowest class is 10.6. Find the upper class limit of the highest class. (AO2)

17. The class marks of a frequency distribution are 104, 114, 124, 134, 144, 154, and 164. Find the class size and class intervals. (AO2)

3 MARKS QUESTIONS

18. The air distances of four cities from Delhi (in km) are given. …. (AO1)

CITY	Kolkata	Mumbai	Chennai	Hyderabad
DISTANCE FROM DELHI IN KM	1340	1100	1700	1220

Draw a bar graph to represent the above data.

19. Draw a histogram to represent the data given below….(AO1)

CLASS INTERVAL	8-13	13-18	18-23	23-28	28-33	33-38	38-43
FREQUENCY	320	780	160	540	260	100	80

20.In a study of diabetic patients in a village, the following observations were noted

AGE IN YEARS	10-20	20-30	30-40	40-50	50-60	60-70
NUMBER OF PATIENTS	2	5	12	19	9	4

Represent the above data by a frequency polygon …. (AO1)

21. The mean weight of a class of 34 students is 46.5 kg. If the weight of the new boy is included, the mean is rises by 500 g. Find the weight of the new boy (AO2)

22. The marks obtained by 15 students in an examination are given below;

125, 130, 130, 120, 141, 146, 162, 163, 169, 173, 179, 188, 192, 195, 199.

Form a frequency distribution table with class interval of length 20. …. (AO1)

5 MARKS QUESTIONS

23. The ages (in years) of 360 patients treated in a hospital on a particular day are given below

AGE IN YEARS	10-20	20-30	30-40	40-50	50-60	60-70
NUMBER OF PATIENTS	90	40	60	20	120	30

Draw a histogram and a frequency polygon on the same graph to represent the above data…. (AO1)

24. Following table gives the distribution of students of sections A and B of a class according to the marks obtained by them.

SECTION- A		SECTION- B	
MARKS	FREQUENCY	MARKS	FREQUENCY
0-15	5	0-15	3
15-30	12	15-30	16
30-45	28	30-45	25
45-60	30	45-60	27
60-75	35	60-75	40
75-90	13	75-90	10

Draw frequency polygons on the same graph to represent the above data. …. (AO1)

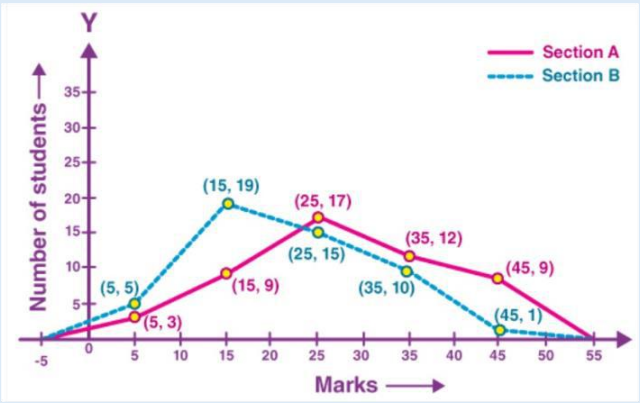
25.Draw a histogram to represent the following data. …. (AO2)

Class interval	10-14	14-20	20-32	32-52	52-80
frequency	5	6	9	25	21

CASE BASED QUESTIONS (4 MARKS EACH)

26. The following table gives the distribution of students in two sections according to the marks obtained by them.

Section A		Section B	
Marks	Frequency	Marks	Frequency
0 - 10	3	0 - 10	5
10 - 20	9	10 - 20	19
20 - 30	17	20 - 30	15
30 - 40	12	30 - 40	10
40 - 50	9	40 - 50	1



The marks of the students of both sections were represented on the same graph by two frequency polygons. Observe the two polygons and answer the questions.

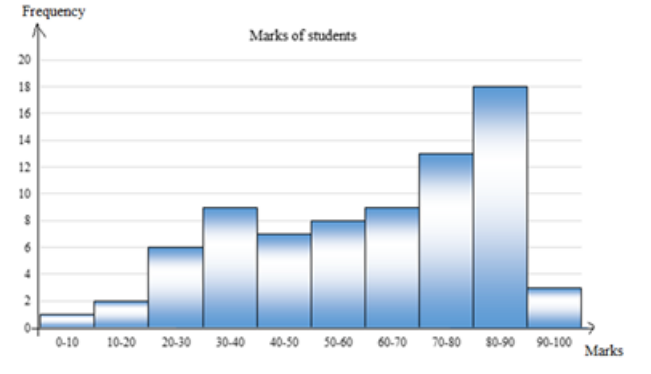
(i) For the class mark 25 which section performed well? (AO1)

(ii) For which class marks section B performed better than section A? (AO1)

(iii) For which class marks section A performed better than section B? (AO1)

(iv) Which section performed better overall? (AO2)

27. Kumar is a Mathematics teacher in Hyderabad. After Periodic test 1, he asks students to collect the mathematics marks of all the students of Class IX- A, B and C. He prepares the frequency distribution table using the collected marks and draws Histogram using the table as shown in figure



(i) What is the width of the class? (AO1)

(ii)What is the total number of students in the Histogram? (AO1)

(iii)How many students scored less than 50% marks? (AO1)

(iv)What is the range of the collected marks? (AO1)

28. A group of students decided to make a project . They are collecting the heights (in cm) of their 50 girls of Class IX-A, B and C of their school. After collecting the data, they arranged the data in the following frequency distribution table form:

Height in cm	Number of students
135-140	5
140-145	6
145-150	17
150-155	11
155-160	7
160-165	4
Total	50

Based on the information, answer the following questions:

(i) Write the lower limit of the class with highest frequency. (AO1)
(ii) How many students of the height 150 cm and below are there? (AO1)
(iii) How many students of the height more than 145 cm but less than 155 are there? (AO1)
(iv) Write the class mark of the class with lowest frequency. (AO1)

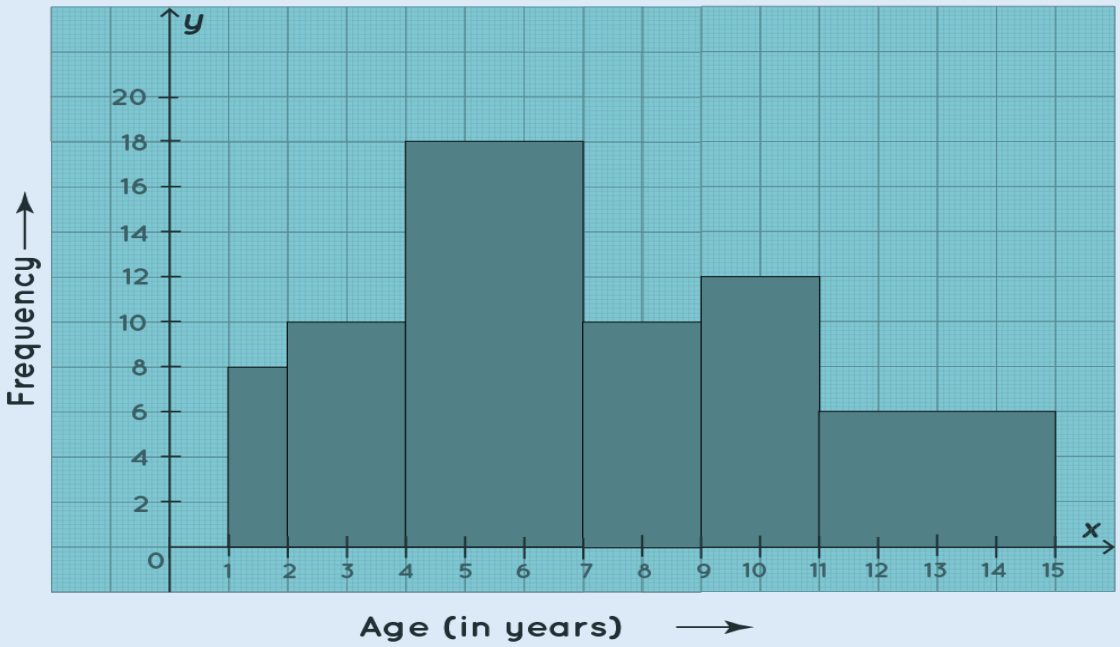
29.State government is planning to improve the facilities in government maintained parks.A random survey is done on the number of children belonging to different age groups who play in government parks and the information is given in the form of a histogram given below.

(i) How many children of age group 9-11 are playing in the government parks? (AO1)

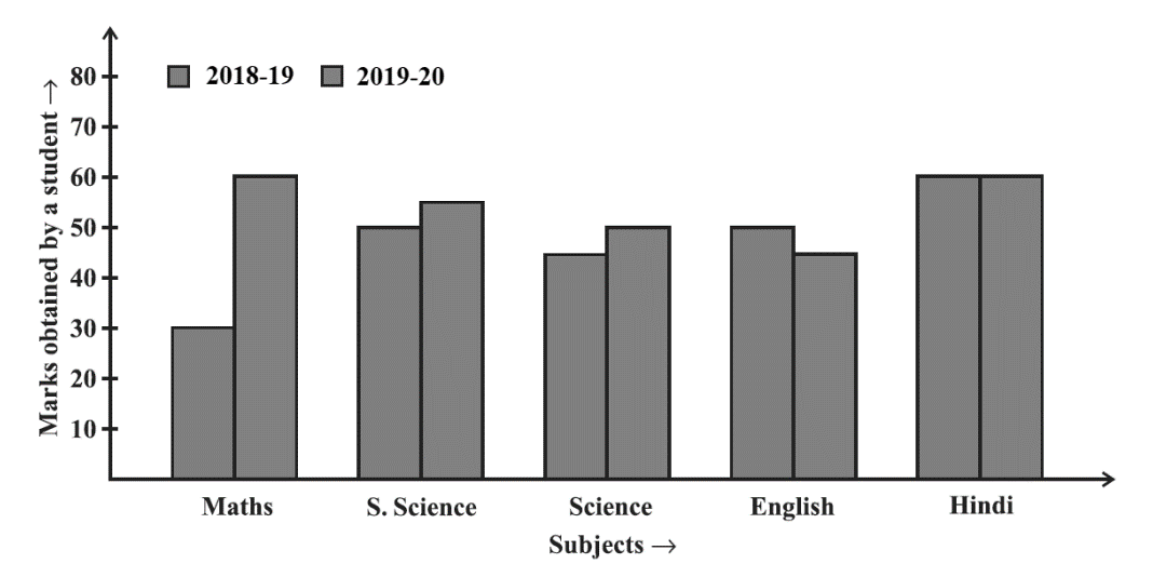
(ii) which age group has the least frequency? (AO1)

(iii) which age group children has highest frequency? (AO1)

(iv)How many children of age 4 years or less go to government parks? (AO1)



30.The Class teacher of Class X preparing result analysis of a student. She compares the marks of a student obtained (out of 100) in Class IX (2018-19) and Class X (2019-20) using the double bar graph as shown below



Read the above graph and answer the questions.

(i)In which subject was the performance at par? (AO1)

(ii)What was the difference of marks in Maths Subject? (AO1)

(iii) In which subject the performance of 2018-19 was better than that of 2019 - 20? (AO1)

(iv)In which subject has the performance deteriorated? (AO1)

SOLUTIONS OF CHAPTER -12: STATISTICS

MULTIPLE CHOICE QUESTIONS

1. C
2. B
3. B
4. D
5. A
6. B
7. D
8. D

ASSERTION AND REASONING QUESTIONS

9. A
10. D
11. B
12. C

2 MARKS QUESTIONS

13. Number of observations =12
    Mean =20
    Sum of observations=12X20=240
    Sum of observations after dividing by 5=240÷5=48.
    New mean= 48÷12=4

14. $13 = (y + y + 1 + y + 4 + y + 6 + y + 8 + y + 5) / 6$

    $13 = (6y + 24)/6$

    $(13 \text{ X } 6) = 6y + 24$

    $(13 \text{ X } 6) - 24 = 6y$

    $(13 \text{ X } 6) - (6 \text{ X } 4) = 6y$

    $6(13 - 4) = 6y$

    $y = 9$

15. Let's arrange the data given in ascending order –

    17, 19, 19, 20, 21, 22, 23, 24, 25, 26, 29,31,35.

    n= 13, so it's an odd number.

    Median $=(\frac{n+1}{2})$ th observation

    $=(\frac{13+1}{2})$ = (14/2)th observation = 7th observation = 23

16. Width of each of the nine classes=2.5

    Total width of the nine classes=9 × 2.5= 22.5

    The lower limit of lowest class = 10.6.

The upper class limit of the highest class =lower limit of lowest class + Total width of nine classes =10.6+22.5=33.1

17.(104+114)÷ 2 = 109

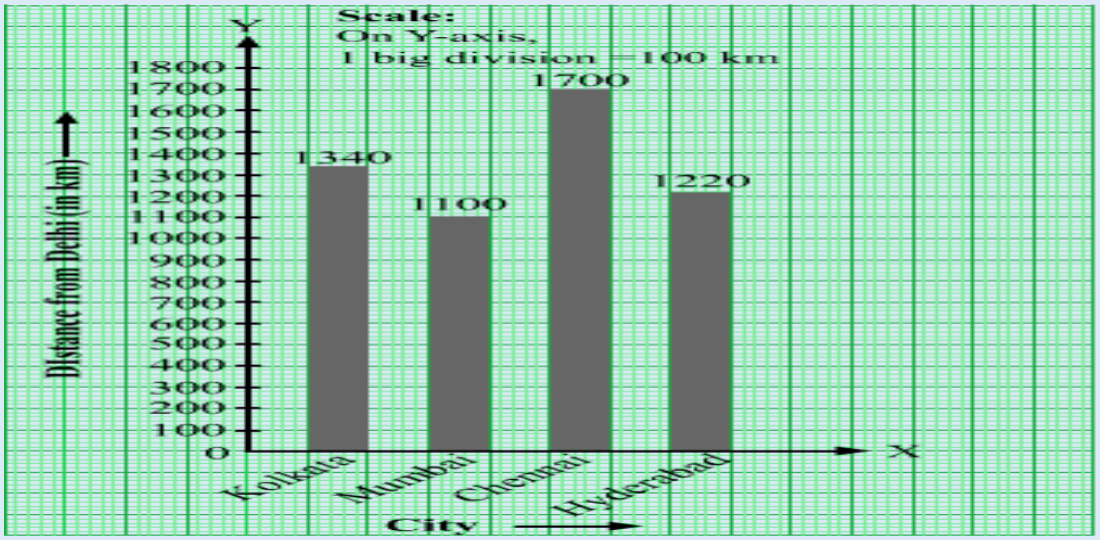
(114+124)÷ 2= 119

The class size=119-109=10

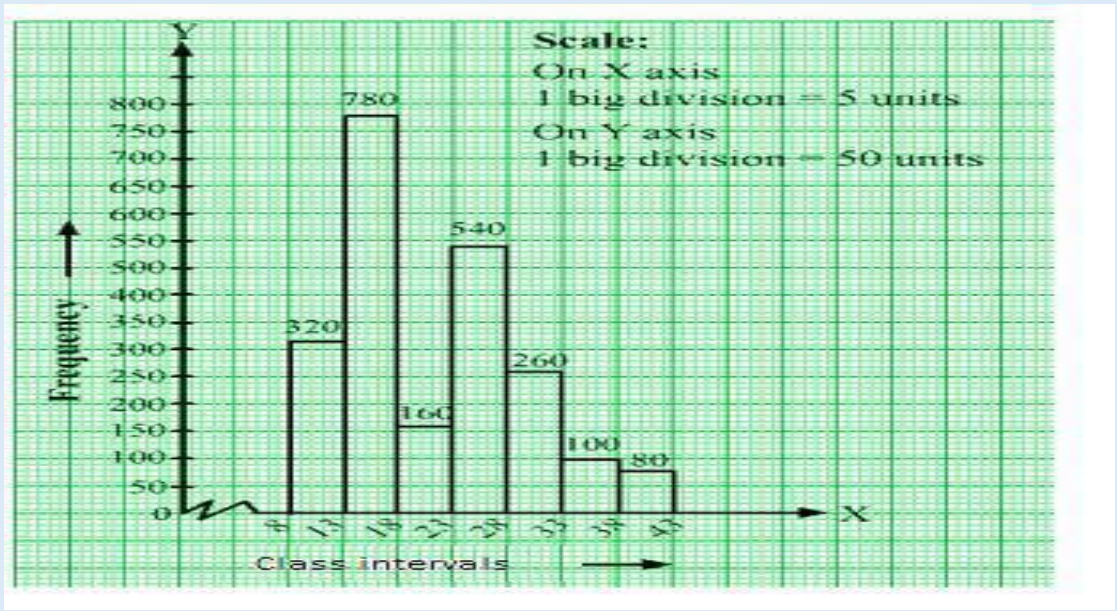
The classes are 99-109, 109-119,119-129,129-139, 139-149, 149-159, and 159-169.

3 MARKS QUESTIONS

18.



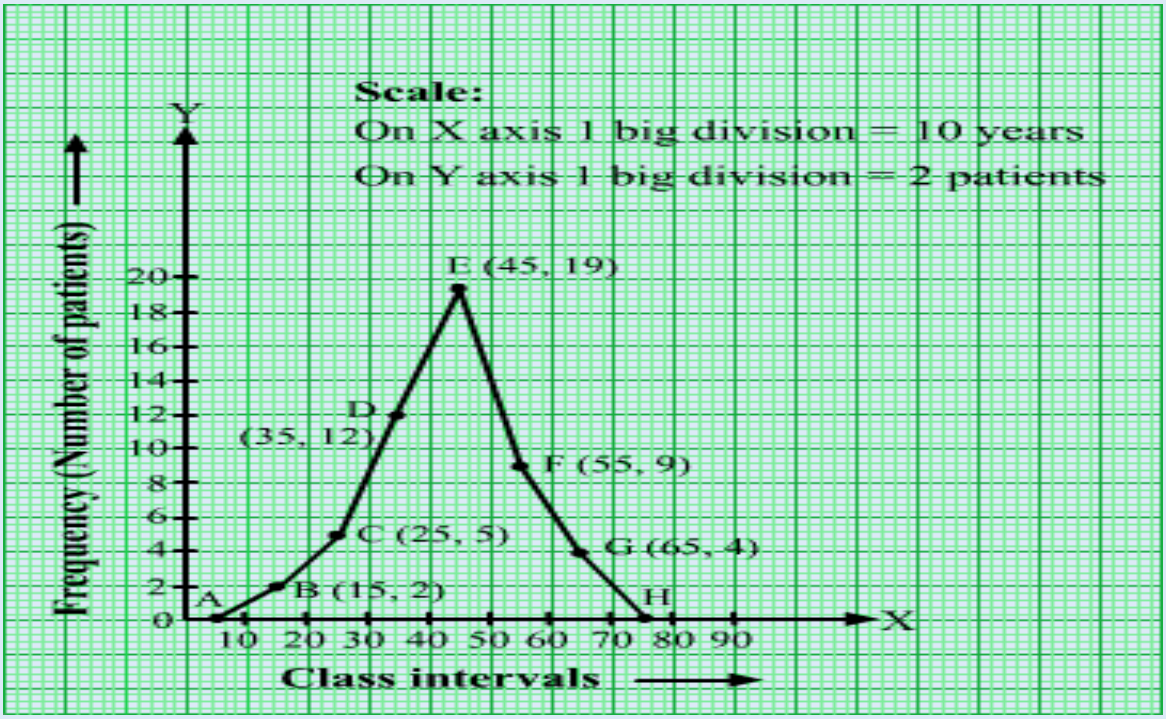
19.



20. We take two imagined classes—one at the beginning (0–10) and other at the end (70–80) each with frequency zero.

With these two classes, we have the following frequency table:

AGE IN YEARS	CLASS MARK	FREQUENCY
0-10	5	0
10-20	15	2
20-30	25	5
30-40	35	12
40-50	45	19
50-60	55	9
60-70	65	4
70-80	75	0



21.The mean weight of 34 students = 46.5

Sum of the weight of 34 students = (46.5 X 34) = 1581

Change or increase in the mean weight when the weight of a new boy is added = 0.5

So, the new mean = (46.5 +0.5) = 47

So, let the weight of the new boy be y.

So, (sum of weight of 34 students + weight of new boy) ÷ 35 = 47

(1581+ y)÷ 35 = 47

1581 + y = 1645

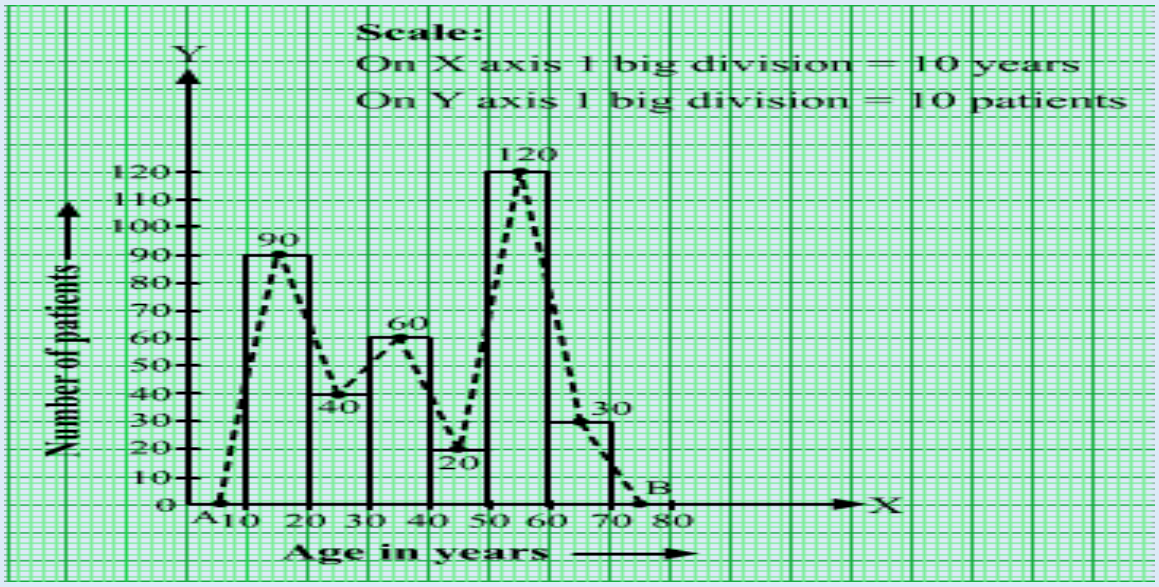
y = 1645 – 1581 = 64

22.

Class interval	Tally marks	Frequency
120-140	||||	4
140-160	||	2
160-180	||||\	5
180-200	||||	4
Total		15

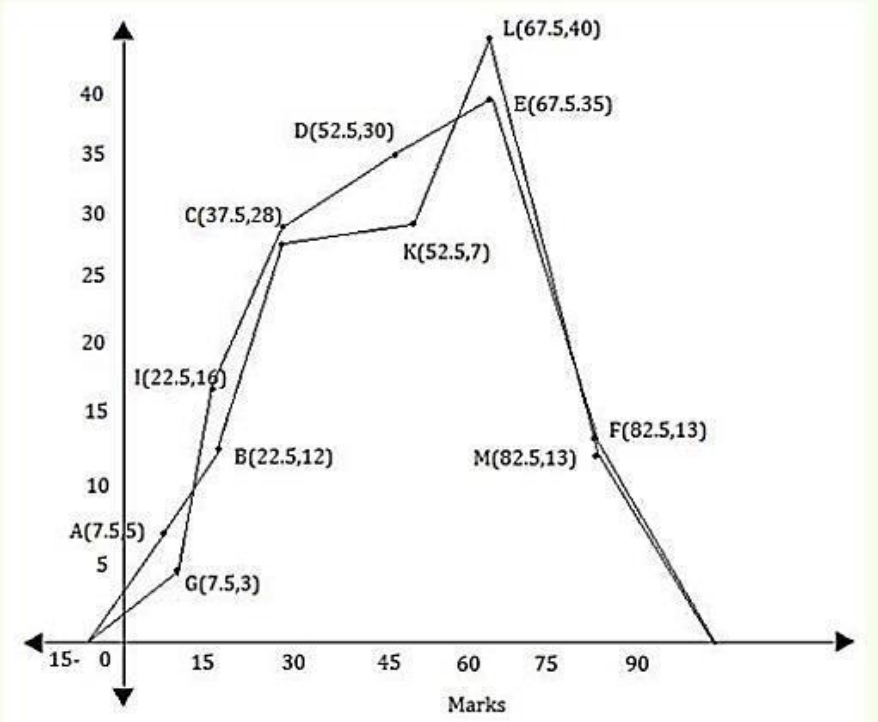
5 MARKS QUESTIONS

23.



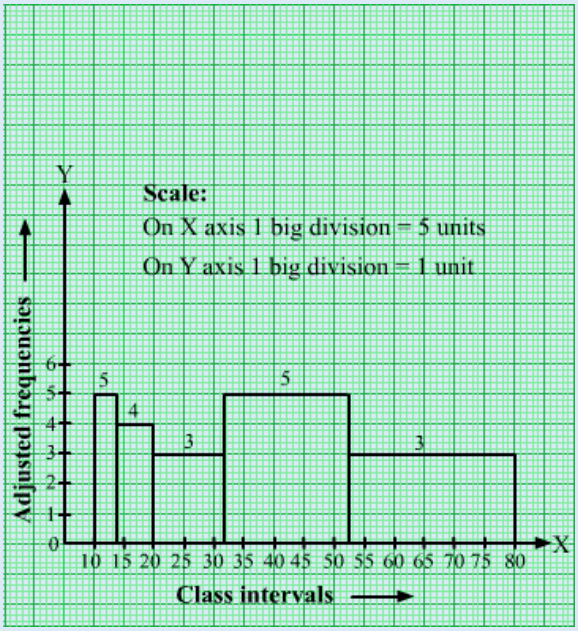
24.

		Section-A	Section-B
marks	Class marks	frequency	frequency
0-15	7.5	5	3
15-30	22.5	12	16
30-45	37.5	28	25
45-60	52.5	30	27
60-75	67.5	35	40
75-90	82.5	13	10



25.

Class interval	frequency	Adjusted frequency
10-14	5	$\frac{4}{4}\times 5 = 5$
14-20	6	$\frac{4}{6} \times 6 = 4$
20-32	9	$\frac{4}{12} \times 9 = 3$
32-52	25	$\frac{4}{20} \times 25 = 5$
52-80	21	$\frac{4}{28} \times 21 = 3$



CASE BASED QUESTIONS (4 MARKS EACH)

26 (i)Section A (ii) 5and 15

(iii) 25,35 and 45 (iv) Section A

27. (i)20 (ii) 76

(iii)25 (iv) 100

28. (i)145 (ii) 28

(iii)28 (iv) 162.5

29. (i)12 (ii) 11-15

(iii)4-7 (iv) 18

30. (i)HINDI (ii) 60-30=30

(iii)ENGLISH (iv) ENGLISH

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