केन्द्रीय विद्यालय संगठन

KENDRIYA VIDYALAYA SANGATHAN

आंचलिक शिक्षा एवं प्रशिक्षण संस्थान, चंडीगढ़

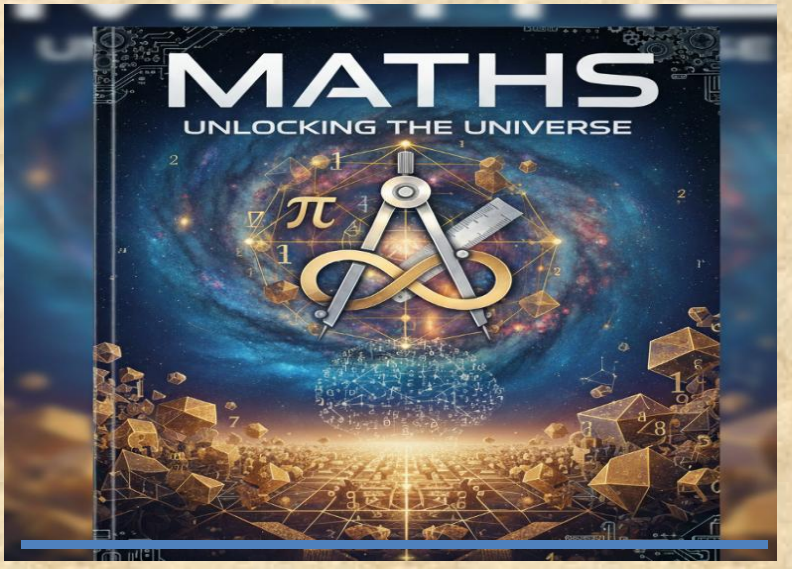
ZONAL INSTITUTE OF EDUCATION AND TRAINING, CHANDIGARH

तत् त्वं पूषन् अपावृणु
केन्द्रीय विद्यालय संगठन

MATERIAL ON CASE STUDY BASED QUESTIONS:
CLASS X

MATHEMATICS

(5 DAY WORKSHOP FROM 13.10.2025-17.10.2025)



FROM FUNDAMENTALS TO SKILLS

संरक्षक

श्री विकास गुप्ता, आई.ए.एस.

आयुक्त

केन्द्रीय विद्यालय संगठन,नई दिल्ली

Mr. VIKAS GUPTA, IAS
Commissioner
Kendriya Vidyalaya Sangathan,New Delhi

सुश्री चंदना मंडल

अपर आयुक्त (शैक्षणिक)

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Joint Commissioner (Training)
KVS HQ New Delhi

श्रीमती श्रुति भार्गव

उपायुक्त एवं निदेशक,

केन्द्रीय विद्यालय संगठन

आंचलिक शिक्षा एवं प्रशिक्षण संस्थान

SANJAY KUMAR
TRAINING ASSOCIATE MATHS
ZIET CHANDIGARH
(RESOURCE PERSON)

ASAN KUMAR
TGT MATHS
PM SHRI KENDRIYA VIDYALAYA
No.1 AMRITSAR CANTT
(RESOURCE PERSON)

Foreword

It gives me immense pleasure to present this *Competency-Based Question Bank* developed during the workshop organized by **ZIET Chandigarh** for **TGT (Mathematics)** teachers. This initiative aligns with the vision of the **National Education Policy (NEP) 2020**, which emphasizes a shift from rote learning to competency-based and application-oriented education.

The resource has been meticulously curated by a team of experienced and dedicated teachers, who have collaboratively prepared question bank that promote conceptual understanding, analytical thinking, and real-life application of mathematical ideas. Each question reflects an effort to align classroom assessment with clearly defined learning outcomes and competencies, ensuring that our students not only "know" mathematics but also "understand" and "apply" it meaningfully.

This Question Bank will serve as a valuable resource for teachers in planning assessments that truly reflect student competencies and support continuous, comprehensive, and joyful learning. It is also a testimony to the professional commitment and creative spirit of our teachers who continue to innovate and contribute to improving the quality of education in Kendriya Vidyalayas.

I extend my sincere appreciation to all the participants for their dedication and teamwork in bringing this important academic resource to fruition.

(SHRUTI BHARGAVA)
Deputy Commissioner and Director
ZIET, Chandigarh

LIST OF PARTICIPANTS

S.No.	Name of Participant	Designation	Name of KV	Topic
1	POONAM YADAV	TGT MATHS	BHATINDA NO. 3	CHANDIGARH
2	SUMIT SHARMA	TGT MATHS	BHATINDA NO. 5	CHANDIGARH
3	SUSHIL SHARMA	TGT MATHS	FARIDKOT	CHANDIGARH
4	DINESH HEER	TGT MATHS	FEROZEPUR CANTT 1	CHANDIGARH
5	MONA KUMARI VAID	TGT MATHS	KAPURTHALA	CHANDIGARH
6	RITU THAKUR	TGT MATHS	PATIALA NO. 2	CHANDIGARH
7	JASBIR KAUR	TGT MATHS	SURANUSSI	CHANDIGARH
8	ANJU BALA	TGT MATHS	CHENANI	JAMMU
9	VIRENDER	TGT MATHS	JAMMU NO. 1	JAMMU
10	NITU SHARMA	TGT MATHS	JAMMU NO. 2	JAMMU
11	ATUL BHAGAT	TGT MATHS	SAMBA	JAMMU
12	RAGHUBIR SINGH	TGT MATHS	UDHAMPUR NO. 2	JAMMU
13	VINOD PUROHIT	TGT MATHS	D.DUN HBK NO 1	DEHRADUN
14	RAVINDRA SINGH RAWAT	TGT MATHS	D.DUN ONGC	DEHRADUN
15	BHUPENDRA SINGH	TGT MATHS	KASHIPUR	DEHRADUN
16	DHARMENDRA SINGH	TGT MATHS	F.R.I. DEHRADUN	DEHRADUN
17	J.S. RAWAT	TGT MATHS	UTTARKASHI	DEHRADUN
18	PRIYA	TGT MATHS	D.DUN ITBP (Ist SHIFT)	DEHRADUN
19	SUSHIL KUMAR	TGT MATHS	BIRPUR	DEHRADUN
20	APRAJITA BHATT	TGT MATHS	PAURI GARHWAL	DEHRADUN
21	SONAL CHAUDHARY	TGT MATHS	VIKASPURI	DELHI
22	DARSHANA KUMARI	TGT MATHS	MASJID MOTH (SHIFT-1)	DELHI
23	RAIS AHMAD	TGT MATHS	NO. 4 DELHI CANTT.	DELHI
24	ANIL KUMAR MEENA	TGT MATHS	NO. 2 DELHI CANTT.	DELHI

25	VIPIN GOYAL	TGT MATHS	VASANT KUNJ	DELHI
26	NEERAJ SHARMA	TGT MATHS	DWARKA SPG	DELHI
27	DEEPAK KUMAR	TGT MATHS	AGCR COLONY (SHIFT-II)	DELHI
28	RIMA KUMARI	TGT MATHS	SHALIMAR BAGH (SHIFT-II)	DELHI
29	HARSH BALA	TGT MATHS	No. 1 AMBALA CANTT	GURUGRAM
30	KAMLESH THAKUR	TGT MATHS	No.2 CHAMERA	GURUGRAM
31	MENKA	TGT MATHS	YOL CANTT.	GURUGRAM
32	POORNIMA TOMAR	TGT MATHS	JHAJJAR	GURUGRAM
33	DALJEET	TGT MATHS	HISAR CANTT.	GURUGRAM
34	MATBAR SINGH CHAUHAN	TGT MATHS	RECKONG PEO	GURUGRAM
35	BHINDER KUMAR	TGT MATHS	ALHILAL	GURUGRAM
36	ANKIT YADAV	TGT MATHS	No. 2 FARIDABAD	GURUGRAM

REAL NUMBERS

CASE STUDY-1

A sports testing camp is organized by K.V.S for volley ball kabaddi and cricket. Players from different vidyalayas reached in testing camp . Number of players participating volleyball, kabaddi and cricket are 36, 60 and 96 respectively. In camp boarding arrangement is made in such a way that in each room same number of student will stay and of same game.

(i)Find minimum number of room required (1)

(ii)Find No of rooms required for players of cricket (1)

(iii)Find maximum no of players in each room (2)

OR

Find L.C.M OF 36, 60 and 96 (2)

ANSWERS:

(i) 16 (ii) 8 (iii) 12 OR 1440

CASE STUDY-2

A morning walk may help our mental clarity and ability to focus throughout the day . A recent study found that older adults who started their days with a morning walk improved their cognitive function better than those who remained inactive to go morning walk. Two friends Ram and Sham go for morning walk together from same place. Their steps measure 72 cm and 84 cm respectively and they are walking with same speed.

i.Find no of steps taken by Ram after which they meet first time (1)

ii. Find no of steps taken by sham to cover minimum distance to meet first time (1)

iii. What is the minimum distance travelled when they meet at first time after starting the walk? (2)

OR

What is the length of the longest ruler that can exactly measure the length of steps of two friends? (2)

ANSWERS:

(i) 7 (ii) 6 (iii) 504cm OR 12cm

POLYNOMIALS

Case Study 1: Parabolic Arch for a Playground

A new playground has an entrance arch in the shape of a parabola, modeled by the equation y=−x2+6xy=−x2+6x. The arch starts and ends on the ground.

Q.1 At what points does the arch meet the ground (find the zeroes of the polynomial)? (1)

Q.2 What is the degree of this polynomial, and what does it tell you about the shape? (1)

Q.3 If the playground entrance must fit inside this arch, what is the width of the entrance? (2)

ANSWERS:

Q.1: x=0,6. Q.2: The degree is 2. This means the curve is a parabola

Q.3: 6 units

Case Study 2: Path of a Kicked Football

When a football is kicked, its path follows a quadratic Polynomial

$h(x) = -x^2+8x-12$, where h(x) is the height and x is horizontal distance.

Q.1.Find the zeroes (roots) of the polynomial representing the points where the ball hits the ground. (1)

Q.2 What does the negative coefficient of x2x2 signify for this context? (1)

Q.3 What is the maximum height reached by the football? (2)

ANSWERS:

Q.1: x=2,6

Q.2: It indicates the path opens downwards, signifying the ball reaches a peak and then returns to the ground.

Q.3: The maximum height is 4

LINEAR EQUATIONS IN TWO VARIABLES

CASE STUDY – 1

FOREST RESEARCH INSTITUTE, DEHRADUN

The Forest Research Institute (FRI) is a Natural Resource Service training institute of the Indian Council of Forestry Research and Education and is an institution in the field of forestry research in India for Indian Forest Service cadres and all State Forest Service cadres. It is located at Dehradun in Uttarakhand, and is among the oldest institutions of its kind. The Forest Research Institute campus hosts the Indira Gandhi National Forest Academy (IGNFA), the staff college that trains officers selected for the Indian Forest Service (IFS).

The main building area and the Museum is open for the visitors from 9:30 am to 5:00 pm daily. There is a nominal entry fee of ₹50 per person for adults and ₹15 for children. When checked on a weekend day at the cash counter, it was found that 620 tickets were sold and total amount of ₹26,100 was collected.

i. Let the number of children visited be x and the number of adults visited be y. Construct a linear equation on the basis of total entry tickets sold. (1)

ii. Construct a linear equation representing the total amount collected. (1)

iii. Find the number of children and adults visited on that particular day. (2)

Answers: (i) $x + y = 620$

(ii) $15x + 50y = 26100$

(iii) Number of children = 140; Number of adults = 480

CASE STUDY – 2

MUTUAL FUNDS

A mutual fund is an investment fund that pools money from many investors to purchase securities. Mutual funds are often classified by their principal investments: money market funds, bond or fixed income funds, stock or equity funds, or hybrid funds.

Raman invested a total of ₹60,000 in two different mutual funds: Fund A and Fund B. Fund A is a high risk growth fund with an expected annual return of 24% and Fund B is a more conservative bond fund with an expected annual return of 11%. Raman's total expected annual return from both investments is ₹9850.

i. Let the investment in Fund A is taken as ₹x and that in Fund B is ₹y. Construct a pair of linear equations for above situation. (1)

ii. How much money did he invest in Fund A? (2)

iii. Find his investment in Fund B. (1)

Answers: (i) $x + y = 60{,}000$; $0.24x + 0.11y = 9850$

(ii) x = ₹25,000

(iii) y = ₹35,000

QUADRATIC EQUATIONS

Case Study-1

A swimming pool length is 3 metre more than its breadth. If 1 metre wide path is all around the swimming pool and if the area of the swimming pool, including the path is 154 sq. m.

(a) If the breadth of the swimming pool is 'B' metre then what will be the outer length of the path. (1)

(b) Find the quadratic equation related to the given problem . (1)

(c) Find the length and breadth of the swimming pool and total area of the path. (2)

Answer :

(a) (B + 5) metres.

(b) $x^2 + 7x - 144 = 0$, where x is the breadth of the pool.

(c) Length = 12 m, Breadth = 9 m. and area of path = 46 sq.m.

Case Study-2

A farmer wishes to grow a 500 m^2 rectangular vegetable garden. Since he has with the only 70 m barbed wire, he fences three sides of the rectangular garden letting compound wall of his house act as the fourth side-fence, which is along the breadth of the rectangular vegetable garden.

(a) Represent given problem in quadratic form. (1)

(b) If length of the vegetable garden is 50 m, then find the breadth. (1)

(c) Find the actual length and breadth of the vegetable garden. (2)

Answers : (a) Let the length of one side be x m and other side be y m,

$x^2 - 35x + 250 = 0$

(b) Breadth = 500/50 = 10 m.

(c) Length = 25 m, Breadth = 20 m.

ARITHMETIC PROGRESSION

CASE STUDY-1: Heights in an AP

In a class, students are made to stand in a row such that the height of each student forms an AP. The first student is 150 m tall, and each next student is 15 cm taller than the pervious one.

Answer the following questions :

Q1.What is common difference of the AP? 1

Q2. What is the height of the 4^{th} student? 1

Q3.What is the height of the 10^{th} students? Show calculation. 2

ANSWER

Q1. The common difference (d) is the increase in height between each student, which is **15 cm**

Q2. a_4=195 cm

Q3. a_{10}=285 cm

CASE STUDY- 2: PLANTS IN A GARDEN

In a garden, the number of lily plants in each row forms an AP. The first row has 26 lilies, the second row has 22 lilies, the third row has 18 lilies, and so on.

Answer the following questions :

Q1. What is the common difference? 1

Q2. How many lilies will the 5th row have? 1

Q3. Find the number of rows needed until the number of lily plants per row becomes zero or negative. Show your reasoning. 2

ANSWER

Q1. The common difference (d) = 22 - 26 = -4

Q2. 10 lilies.

Q3. after 7 rows, number will be negative; in the 8th row.

CASE STUDY – 3:

Sports Training

A sports coach observes that an athlete increases his long-jump distance gradually during practice.
On the first day, he jumps 4.2 m, and every day his jump increases by 0.1 m.

Q1. Write the AP formed by the first 5 days of his jumps.
Q2. What is the 10th day jump distance?
Q3. What is the total distance covered by the athlete in 15 days?

ANSWERS:

Q1. 4.2, 4.3, 4.4……..

Q2. a_{10}= 5.1

Q3. S_{15}=73.5

CASE STUDY – 4: Ticket Counter

A bus ticket counter issues tickets where each ticket number follows an AP.
The first customer gets ticket 101, second gets 104, third gets 107, and so on.
Q1. Find the common difference.
Q2. Which customer will get ticket number 193?
Q3. What is the sum of ticket numbers given to the first 25 customers?

ANSWERS:

Q1. 3 Q2. Ticket number 193 will not be issued to any customer.

Q3. 3425

CASE STUDY – 5: Classroom Seating

A teacher arranges chairs in rows such that:

First row has 8 chairs, Second row has 10 chairs, Third row has 12 chairs, ...

Q1. Find number of chairs in the 15th row.

Q2. Find total number of chairs in 15 rows.

Q3. In which row will there be 38 chairs?

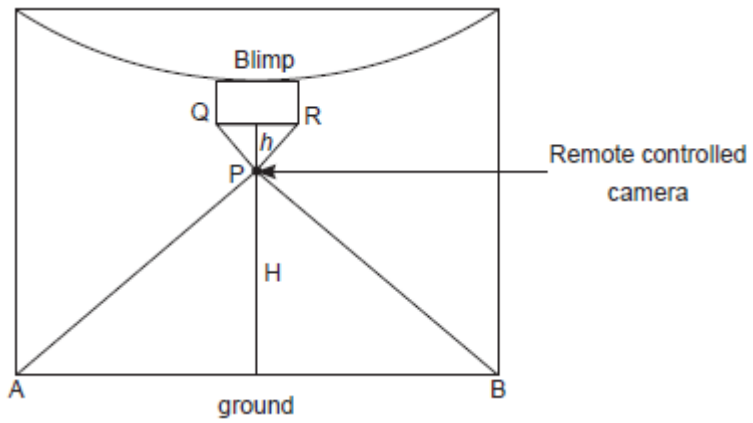
ANSWERS:

Q1. 36 Q2. 330 Q3. 16^{th} row

TRIANGLES

Case Study 1:

Similar triangles can be used for many different things in real life. It is used in aerial photography to see the distance from the sky to the ground. Aerial photography is the taking of photographs from an aircraft or other flying objects. Low-level aerial photos can be taken using a remote controlled camera suspended from a blimp.



In a figure, a remote controlled camera ‘P’ is used to take a photo that covers a distance AB which is proportional to base QR.

Here $\frac{QR}{AB} = \frac{h}{H}$

Using, similarity criterion, answer the questions based on it

i)If h = 3 cm, AB = 50 m, and QR = 8 cm, Find H. (1)

ii)Write scale factor of ΔPQR and DPBA, if h : H = 1 : 110. (1)

iii)If perimeter ΔPQR is 20 cm, then find the perimeter of ΔPBA in m.

(scale factor = 1: 110) (2)

OR

If perimeter of ΔPQR is 50 cm, then find the perimeter of ΔPBA

(scale factor 1 : 10x) (2)

ANSWERS

i) 18.75 m

ii) If triangles are similar, then their corresponding altitudes are proportional.
Hence ΔPQR :ΔPBA = h : H = 1 : 110

iii) 22m OR 500x

Case study- 2. (Height & Shadow)

A flag post is erected on the school ground. At a particular time of the day, the shadow of the flag post is 12 m long. At the same time, a student of height 1.5 m casts a shadow of 2 m.

i). Name the similarity criterion used. (1)

ii). Why are the triangles formed by the flag post and the student similar? (1)

iii). Find the height of the flag post. (2)

OR

iii). Write the ratio of heights of the flag post and the student. (2)

ANSWERS

i) AA (Angle–Angle) similarity criterion.

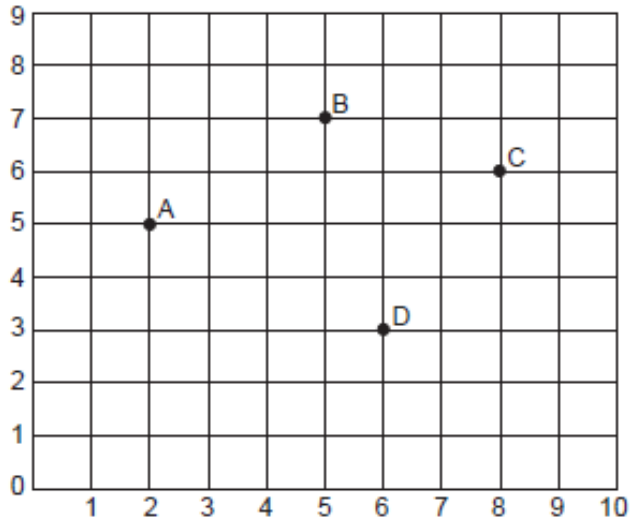
ii) Both triangles have one right angle and one equal angle due to same angle of elevation of the sun.

iii) 9 m OR 6:1

COORDINATE GEOMETRY

CASE STUDY-1

Students of a school are standing in rows and columns in their school playground to celebrate their annual sports day. A, B, C and D are the positions of four students as shown in the figure.



Based on the above, answer the following questions :

(i) Find the distance between A and C.

(ii) Find the coordinates of the mid-point of line segment AC.

(iii) If the sports teacher is sitting at the origin, then which of the four students is closest to him?

OR

If a point P divides the line segment AD in the ratio 1 : 2, then find the coordinates of P.

ANSWERS:

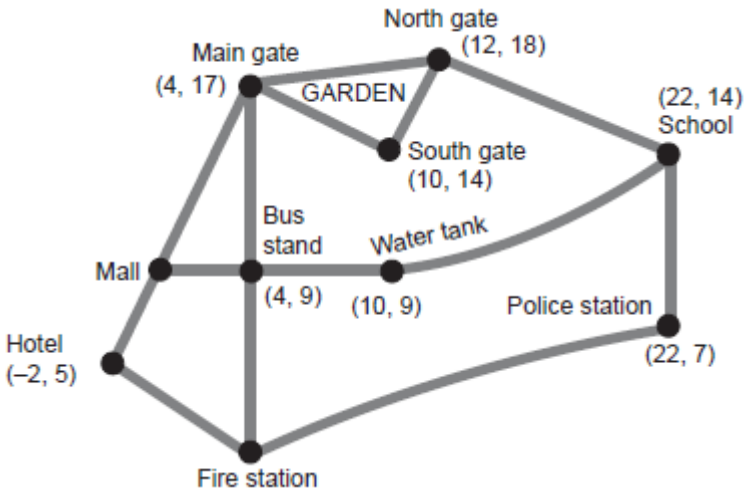
i)√37

ii) (5, 11/2)

iii) A OR (10/3, 13/3)

CASE STUDY-2

Answer the questions based on the information given. Shown below is a map of Giri's neighbourhood.



Giri did a survey of his neighbourhood and collected the following information.

• The hotel, mall and the main gate of the garden lie in a straight line.

• The distance between the hotel and the mall is half the distance between the mall and the main gate of the garden.

• The bus stand is exactly midway between the main gate of the garden and the fire station.

• The mall, bus stand and the water tank lie in a straight line.

(i) What is the X -coordinate of the mall's location?

(ii) What are the coordinates of the fire station?

(iii) What is the shortest distance between the water tank and the school?

OR

How much more is the shortest distance of the school from the water tank than the distance of the school from the police station?

ANSWERS:

i)0

ii) (4,1)

iii) 13 units OR 6 units more

INTRODUCTION TO TRIGONOMETRY

CASE STUDY -1

Suresh wants to construct a right-angle triangular garden in his house. In the garden at the side of base of length 15 m he placed some plants and at the perpendicular side of length 8 m he grows some trees.

i. If Suresh grow grass in all over the garden, what's its area? (1)

ii. At the side of hypotenuse Suresh wants to fix a boundary of steel, Calculate the length of boundary? (1)

iii. If the triangular garden is PQR and right angle at Q then, Find the value of sinP and cosR in triangular garden? (2)

OR

iv. Verify the identity $\sin^2\Theta + \cos^2\Theta = 1$ (2)

Answers

i. 60 m^2

ii. 17 m

iii. sinP = 1517 and cosR = 1517

CASE STUDY-2

An architecture is designing a series of support cables for a unique, triangular canopy structure. The design involves cables meeting at specific angle for maximum stability.

i) What is the measure of the angle (let's call it ∅) for which tan∅ = 1? (1)

ii) If the cable from a right -angled triangle with an angle $= 30^\circ$, find the value of $\tan 30^\circ . \cot 30^\circ$ (1)

iii) Calculate the value of $\frac{2tan30^0}{1-tan^2 30^0}$. (2)

Answers

i. 45°

ii. $\sqrt{3}$

iii. 1

APPLICATIONS OF TRIGONOMETRY

CASE STUDY-1

A drone is hovering vertically above a hospital gate at point H at a height of 120m.An ambulance is approaching the hospital along a straight highway.When the ambulance is at point A, the angle of depression from the drone to the ambulance is 45^0.After 20 seconds, when the ambulance reaches point B, the angle of depression becomes 60^0.

i.Represent the above situation with the help of a diagram. **(1)**

ii.Find the distances of the ambulance from the hospital gate at points A and B. **(1)**

iii.Find the speed of the ambulance in km/hr.

OR

Find the time it will take for the ambulance to reach the hospital gate H from point B, if it continues at the same speed. **(2)**

ANSWERS:

(i) For correct diagram

(ii) For A : 120m ; For B : 69.36m

(iii) 9.13km/hr OR 27.34 sec

CASE STUDY-2

A weather balloon is floating at a constant height of 80m above the ground. An observer stands on the ground at a point A. At a certain instant, the angle of elevation of the balloon from point A is 30^0.After the observer walks 40m closer to the ballon along a straight line,the angle of elevation becomes 45^0.

i.Represent the above situation with the help of a diagram.

ii.Find the horizontal distance of the balloon from the observer initially.

iii.Find the height of the balloon .

OR

Find how far the observer must stand from the balloon for the angle of elevation to become 60^0.

ANSWERS:

(i) For correct diagram (ii) Initially distance = 138.6m

(iii) Height of the balloon = 80m

OR

For angle 60^0, observer must stand at a distance = 46.2m

CIRCLES

Case Study 1: Amusement Park Ride

An amusement park has a giant wheel with seats attached at equal distances around a circular rim. The support pillar passes exactly through the center of the wheel. There are two parallel tracks on the ground from where spectators watch the ride.A and B are two seats on the wheel forming a chord AB.The distance from the center O to the chord AB is given as 12 m and the radius of the wheel is 20 m.

Answer the following:

1. Which term correctly describes the pillar passing through O and connecting the wheel top to bottom? (1)
2. Find the length of chord AB . (1)
3. The distance of chord AB from center is decreased. What happens to the chord length? Explain. (2)

ANSWERS:

1)diameter of the circular wheel

2) 32 m

3)When the distance of a chord from the centre decreases, the length of the chord increases.

Case Study 2: School Playground

During annual sports day, cones are placed in a circular track so athletes run around the boundary. A flagpost touches the track boundary at P. This point P forms a right angle (90°) at center O with another point Q on the boundary. PQ is a chord. Radius of the track = 14 m.

Answer the following:

1. A line that touches a circle at exactly one point is called: _____ (1)
2. OP = OQ = 14 m. The measure of ∠POQ = 90°. Find the length PQ. (2)
3. Explain why OP ⊥ tangent at P. (1)

ANSWERS:

1) ⊤angent 2) $14\sqrt{2}$

3) The radius of a circle at the point of contact is perpendicular to the tangent at that point. Since OP is a radius and P is the point of contact, therefore

$OP \perp$ tangent at P

Case Study 3: Water Fountain

A circular fountain in a park has a metal fence outside touching the boundary at one point only. A gardener stands at point A and sees the fence touching the boundary at point P. AP = 10 m, radius OP = 8 m.

Answer the following:

1. Identify the line AP: (1)

2. Find the distance OA. (2)

3. What is the relationship between the tangent and radius? (1)

ANSWERS:

1) Tangent 2) 12.81 m

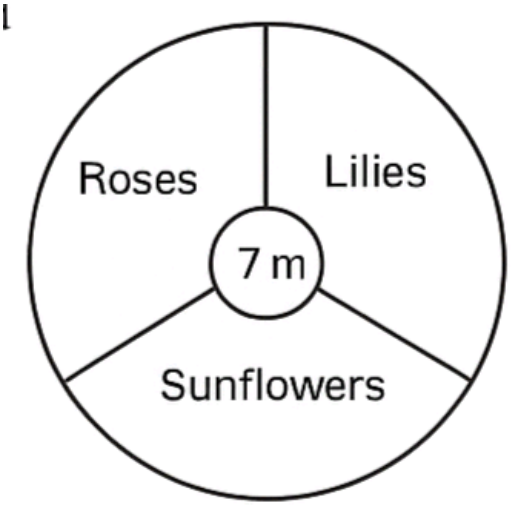
3) The radius of a circle is perpendicular to the tangent at the point of contact.

$OP \perp AP$

AREA RELATED TO CIRCLES

Case Study 1: Circular Garden with Fountain

A housing society has developed a circular garden of radius 21 m. At the centre of the garden, there is a circular fountain of radius 7 m. The remaining part of the garden is divided into three equal sectors, each subtending an angle of 120° at the centre. These sectors are planted with different types of flowers — roses, lilies, and sunflowers. The management committee plans to decorate the outer boundary of the garden with fencing and also build a walking path around the fountain. (Take π = 22/7)



Answer the following questions:

a) Find the area of one flower bed. (1)

b) Find the area of the fountain. (1)

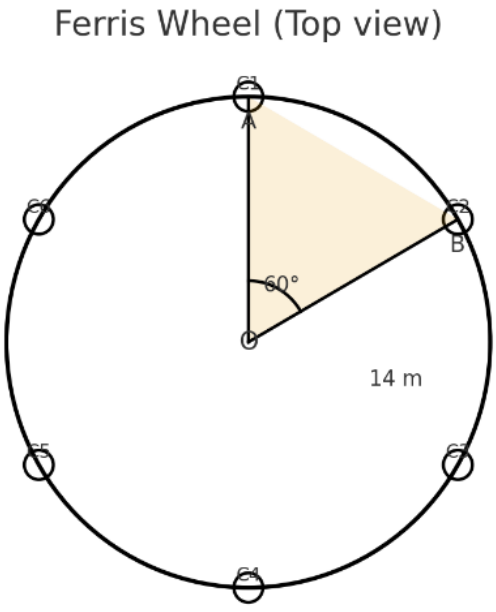
c) Find the area of the garden available for planting flowers. (2)

OR

d) If the walking path around the fountain (within radius 7 m to 9 m) is to be tiled at ₹85 per m², find the total cost of tiling. (2)

Case Study 2: Ferris Wheel at a Fair

During a city fair, a Ferris wheel is built in the shape of a perfect circle of radius 14 m. The wheel has 6 cabins fixed at equal distances along its rim, so that each cabin subtends a central angle of 60° at the centre O. Engineers need to calculate the arc length, sector area, and segment area between two adjacent cabins to determine material usage for LED decoration panels.C1, C2, C3 ,C4,C6 are cabin.



Answer the following questions:

a) Find the area of the sector formed by two adjacent cabins. (1)

b) Find the length of the arc between the two cabins. (1)

c) Find the area of the triangular region OAB formed by joining the two cabins A, B to the centre. (2)

OR

c) If each minor segment is to be covered with LED panels costing ₹100 per m^2, find the total cost for all 6 segments. (2)

SURFACE AREAS AND VOLUMES

CASE STUDY-1

A hemispherical container of radius 30 cm is put on 4 cuboidal shaped bricks in order to cook paneer for a cooking competition. Nata, a cook, didn't know how much paneer would be enough for making the dish, so she bought pieces of paneer from a nearby shop of dimensions (10cm x 8cm x 6cm). She wanted to put the paneer which is 1/4th the volume of the container.

Then the gravy is added in the container which fills it up to 2/3 of its volume. And pieces of paneer were added to it .

Question 1: What is the volume of the hemispherical container ?

(Use $\pi = 22/7$) (1)

Question 2: If Nata wants to put paneer that is 1/4th the volume of the container, how many pieces of paneer should she add? (1)

Question 3: After adding gravy up to 2/3 of the container's volume, and paneer upto $1/4^{th}$ the volume of the container, find the total volume of the paneer dish? (2)

ANSWERS

1. 56571.43 cu cm or 1188000/21 cu cm

2. 29 pieces

3. 51857.74 cu cm

CASE STUDY-2

On a school trip with our Mr. Sanjeev, travelling by metro, I started seeing math everywhere. The metros shaped like half cylinders caught my eye. Mrs. Sanjeev got us thinking about how much material we'd need for them.

Then, my friends and I noticed the LED light panels. They looked like thin rectangular boxes with slightly curved tops, making us consider surface area. This trip really showed us how "Surface area and volume" concepts are present in our surroundings (transport objects, buildings etc.). Also like station pillars and even water bottles. Semi-Cylindrical Luggage Rack and many others like this.

1. What is the formula for the lateral surface area of a semi-cylinder? (1)

2. If a semi-cylindrical luggage rack has a length of 100 cm and a radius of 30 cm, what is the area of the rectangular base only? (1)

3. A semi-cylindrical metal sheet has a length of 2 meters and a diameter of 1 meter. Find the total surface area of the sheet, including the curved top and the flat base. (2)

ANSWERS

1. πrh 2. 6000 sq cm 3. π + 2 sq m

Case Study-3: The Bullet

A group of students is working on a project to create models of different objects. One student, Rohan, decides to make a model of a bullet. He observes that a bullet can be represented as a combination of a right circular cylinder and a right circular cone. The specific dimensions of his model are as follows:

· The cylindrical part has a height of 2.8 cm and a radius of 3.5 cm.

· The conical part has a height of 3.5 cm and is mounted on the cylindrical part, sharing the same circular base of radius 3.5 cm.

Based on this information, answer the following questions:

Q1: What is the total volume of the bullet model that Rohan has created? (1)

Q 2: Rohan wants to paint the entire surface of the bullet model.To calculate the cost of painting, he first needs to find the total surface area. Find total surface area of the bullet. (1)

Q 3: If Rohan doubles the radius of the bullet model but keeps the heights of the cone and cylinder the same, find ratio between the original volume of bullet to new volume of the bullet. (2)

OR

Q3. During a review, Rohan's teacher suggests that the bullet would look more realistic if the conical part was a hemisphere of the same radius. If Rohan replaces the cone with a hemisphere of radius 3.5 cm, what will be the new total volume of the model? (2)

Answer

(1)152.7 cm^3

(2) 154.5 cm^2

(3) 1:4 OR. 196.35 cm^3

Case Study-4: The Community Garden Irrigation

The residents of Greenfield Society decided to create a community garden. To water the garden, they connected a water pump to a cylindrical pipe. The water flows through this pipe to fill a raised garden bed.The specifications of the irrigation system are as follows:

· The cylindrical pipe has an internal radius of 2 cm.

· Water is flowing through the pipe at a speed of 7 meters per second.

· The garden bed is a rectangular pit with dimensions 10 m x 6 m.

· The pit needs to be filled with water up to a height of 21 cm.

Based on this information, answer the following questions:

Q1: Find the volume of water that flows out of the pipe in one hour. (1)

Q2: Find the volume of water required to fill the garden bed to the desired level. (1)

Q3: How much time(in minutes) will it take to fill the garden bed completely?

OR (2)

Q3:If the society decides to use a pipe with double the radius, and the water flows at the same speed, how much time will be needed to fill the same garden bed? (2)

ANSWERS

1. 31680000 cm^3

2. 12.6 m^3

3. 23.86 minutes OR 5.9 minutes

STATISTICS

Case Study 1: Study Hours and Academic Performance

A teacher of Class X conducted a survey among 40 students to study the relation between their weekly study hours and performance in mathematics. The teacher grouped the data (in hours) and found the following frequency distribution. It is believed that consistent study habits directly impact students' conceptual clarity and exam results.

Class Interval (Hours)	Frequency
0–5	4
5–10	6
10–15	10
15–20	8
20–25	7
25–30	5

Answer the following questions:

Q1. Find the class mark of the class interval 10–15. (1)

Q2. What is the cumulative frequency of the class interval 15–20? (1)

Q3. Estimate the mean number of study hours using the assumed mean method.

OR

Find the median study hours. (2)

Answers:

(1)12.5

(2) 28

(3) Mean = 15.25 hours OR Median = 15 hours

Case Study 2: Temperature Analysis of a City

A meteorological department maintained temperature records of a city for 50 consecutive days to study climatic trends. They observed that as temperature increased, the number of pleasant days decreased. The collected temperature data was organized in the following grouped frequency table to analyze average conditions.

Class Interval (°C)	Frequency
10–15	5
15–20	9
20–25	12
25–30	15
30–35	6
35–40	3

Answer the following questions:

Q1. What is the class size of the given data? (1)

Q2. Find the modal class of the data. (1)

Q3. Calculate the mode using the mode formula for grouped data.

OR

Find the mean temperature using the assumed mean method. (2)

Answers:

(1) 5

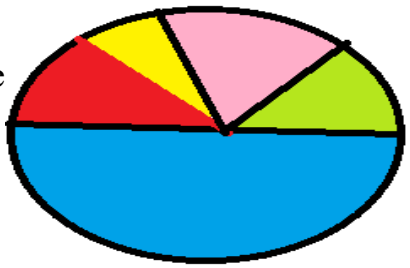
(2) 25–30

(3) Mode = 26.25°C OR Mean = 24.9°C

PROBABILITY

CASE STUDY-1

1. In a survey on holiday 120 people were asked to state which type of transport they used on their last holiday. the following pie chart shows the result of the survey Ship



(red colour 33°), Aeroplane (Yellow), Train (pink,) Bus (Green colour 36°) Car (Blue colour 177°)

observe the pie chart and the answer the following questions

i. if one person is a selected at a random find the probability that he she travelled by bus or ship?

ii. which is the most favorite mode of transport and how many people use to it?

iii.a person is elected at a random if the problem will it that he did not use train is 4/5 find the number of people who use train.

OR

the probability that randomly selected person used aeroplane is 7 / 60 find the revenue collected by air company at the rate of 5000 per person.

Answer

i.23/120

ii. 59

iii. 24 or 7000

CASE STUDY-2

There are 60 students in class 10th of a school of which 45 are girls and 15 boys. the class teacher has to select one student as a monitor. she writes the name of each student on a separate card and then mix these cards after putting them in a box. she then draws a card at random from the box based on the above information answer the following questions

a. what is the probability that the name of the selected card is of a girl?

b. what is the probability that the name on the selected card is of a boy student?

c. if there is one name Shivani written on a card what is the probability of her selection?

Or

what is the probability that one out of Lakshya Mukesh or Vikas is selected?

Answers

a. 3/4 b. 1/4 c. 1/60 Or 1/20

Case Study 3: The Lucky Draw at Annual Day

During the Annual Day Celebration at St. Mary's School, the teachers organized a lucky draw for students. A beautifully decorated box contained 10 name slips — 4 belonged to boys and 6 to girls. The Principal decided to pick one slip at random to reward the winner with a surprise gift hamper. Students were excited, whispering and cheering for their names to be called. Everyone had an equal chance of winning since the slips were identical in shape, size, and color.

1. Find the probability that a girl wins the lucky draw. (1)
2. Find the probability that a boy's name is not picked. (1)
3. If two slips are drawn with replacement, find the probability that both selected names belong to girls. (2)

ANSWERS

1.P(girl) = 0.6.

2. P(boy's name is not picked) = 1 - P(boy) = 0.6.

3.With replacement: P(both girls) = 0.36.

Case Study 4: Riya's Chocolate Jar

Riya has a habit of saving her favorite chocolates in a glass jar. One Sunday, she noticed that the jar had 5 Dairy Milk, 3 Kit Kat, and 2 Perk chocolates. Later, her little brother Aryan entered the room, closed his eyes, and decided to pick one chocolate at random. Riya wondered: "What are the chances he'll take my favorite Dairy Milk?"

1. Find the probability that he picks a Kit Kat. (1)

2. Find the probability that he does not pick a Perk. (1)

3. If Aryan picks two chocolates one after another without replacement, find the probability that both are Dairy Milk. (2)

ANSWERS

1. P (Kit Kat) = 0.3 2. P(not Perk) = 1 - P(Perk) = 0.8.

2. P (both Dairy Milk) = (5/10) × (4/9) = 2/9

Case Study 4: Rolling a Die

A fair six-faced die is rolled once. The outcomes on the die are numbered 1 to 6. Riya wants to find the probability of getting an even number or a number greater than 4.

Based on the given information, answer the following questions:

1. Write all possible outcomes for this experiment?

2. How many favorable outcomes are there for getting an even number?

3. How many favorable outcomes are there for getting a number greater than 4?

4. Find the probability of getting an even number or a number greater than 4.

Answer:

Sample space S = {1, 2, 3, 4, 5, 6}

Even numbers = {2, 4, 6} → 3 outcomes

Numbers greater than 4 = {5, 6} → 2 outcomes

Union of both = {2, 4, 5, 6} → 4 outcomes

P(Even or >4) = 4/6 = 2/3

Case Study 5: Colored Balls in a Bag

A bag contains 3 red, 4 blue, and 5 green balls. One ball is drawn at random from the bag.

Answer the following questions:

1. What is the total number of balls in the bag?

2. What is the probability of drawing a red ball?

3. What is the probability of drawing a ball that is not green?

4. Are these events mutually exclusive? Explain.

Answer:

Total balls = 3 + 4 + 5 = 12

P(Red) = 3/12 = 1/4

P(Not Green) = 7/12

Yes, drawing red and green balls are mutually exclusive events since both cannot occur simultaneously.