
English
Medium

Unit -1

ARITHMETIC SEQUENCES

Score : 40
Time : 1½ hr

Each question from 1 to 4 carries 2 score. **(4 × 2 = 8)**

1. In the arithmetic sequence $\frac{1}{6}, \frac{2}{6}, \frac{3}{6}, \cdots$
   a) Which is its first integer term?
   b) Find the sum of first 12 terms.
2. The algebraic form of an arithmetic sequence is $x_n = 3n - 2$
   a) What is its common difference?
   b) Find its 10^{th} term.
3. The sum of the first 50 terms of the arithmetic sequence 7, 10, 13, ... is how much more than the sum of first 50 terms of the arithmetic sequence 5, 8, 11, ...?
4. The sum of first 'n' terms of an arithmetic sequence is $3n^2 + 2n$
   a) Find its first term.
   b) What is its common difference?

Each question from 5 to 7 carries 3 score. **(3 × 3 = 9)**

5. Consider the arithmetic sequence 5, 9, 13, ...
   a) Can the difference of any two terms be 60? Why?
   b) Is 100, a term in this sequence? Why?
6. Find the sum.
   a) 1 + 2 + 3 + ... + 40
   b) 3 + 6 + 9 + ... + 120
   c) 5 + 8 + 11 + ... + 122
7. The sum of first 31 terms in an arithmetic sequence is 620.
   a) Find its 16^{th} terms.
   b) What is the sum of 15^{th} and 17^{th} terms?
   c) Find the sum of first and 31^{st} terms?

Questions 8, 9 carries 4 score each. **(2 × 4 = 8)**

8. The sum of first 10 terms of an arithmetic sequence is 400 and the sum of first 5 terms is 150.
   a) What is the third term of this sequence?

b) Find its 8^{th} term.

c) What is its common difference?

d) Write its algebraic form.

9. The first and 11^{th} terms of an arithmetic sequence are 10 and 40 respectively.

a) What is its common difference?

b) Find its 6^{th} term.

c) Find the sum of first 11 terms.

Each question from 10 to 12 carries 5 score. **(3 × 5 = 15)**

10. The sum of first 'n' terms of an arithmetic sequence is $n^2 + 2n$

a) Write its first term and common difference.

b) Find the sum of first 20 terms.

c) Prove that, 1 added to the sum of first few terms of the arithmetic sequence 3, 5, 7, ... gives a perfect square.

11. Consider the sequence of natural numbers between 100 and 300, which leave remainder 2 on division by 3.

a) Which is the first number in this sequence?

b) Write the last number.

c) Find the number of terms in this sequence.

d) Find the sum of all numbers in this sequence.

12. Consider the following number pattern.

1

2 3 4

5 6 7 8 9

10 11 12 13 14 15 16

a) Write the next line

b) How many numbers are there in the 10^{th} line

c) Write the first and last numbers in the 10^{th} line.

d) Find the sum of all numbers in the 10^{th} line

Unit -1

ARITHMETIC SEQUENCES

ANSWER KEY

1. a) $\frac{6}{6} = 1$

   b) Sum = $\frac{1}{6} + \frac{2}{6} + \frac{3}{6} + \ldots\ldots + \frac{12}{6}$

   $= \frac{1}{6}(1 + 2 + 3 + \ldots\ldots + 12)$

   $= \frac{1}{6} \times \frac{12 \times 13}{2} = 13$

2. a) 3

   b) $x_{10} = 3 \times 10 - 2 = 28$

3. Difference of sums = 50 × 2

   = 100

4. a) 3 + 2 = 5

   b) 2 × 3 = 6

5. a) Since 60 is a multiple of the common difference 4, it can be the difference of two terms.

   b) 100 – 5 = 95

   Since 95 is not a multiple of 4, 100 cannot be a term in this sequence.

6. a) 1 + 2 _ 3 + ... + 40 = $\frac{40 \times 41}{2}$ = 820

   b) 3 + 6 + 9 + ... + 120 = 3 (1+ 2 + 3 + ... + 40)

   = 3 × 820

   = 2460

   c) 5 + 8 + 11 + ... + 122 = 2460 + 40 × 2 = 2540

7. a) $x_{16} = \frac{620}{31} = 20$

   b) $x_{15} + x_{17} = 2 \times 20 = 40$

   c) $x_1 + x_{31} = 40$

8. a) $x_3 = \frac{150}{5} = 30$

   b) $x_3 + x_8 = \frac{400}{5} = 80$

$x_8 = 80 - 30 = 50$

c) Common difference = $\frac{50-30}{8-3} = \frac{20}{5} = 4$

d) First term = $x_3 - 2d$

$= 30 - 2 \times 4$

$= 22$

Algebraic form is

$x_n = dn + (f - d)$

$= 4n + (22 - 4)$

$= 4n + 18$

9. a) Common difference = $\frac{40-10}{11-1} = \frac{30}{10} = 3$

b) $x_6 = 10 + 5 \times 3 = 25$

c) Sum of first 11 terms = 11×25 = 275

10. a) First term = 1 + 2 = 3

Common difference = 2 × 1 = 2

b) Sum = $20^2 + 2 \times 20 = 440$

c) Sum of first 'n' terms of the arithmetic sequence 3, 5, 7, ... is $n^2 + 2n$

$n^2 + 2n + 1 = (n+1)^2$, Which is perfect sequence.

11. a) First number = 101

b) Last number = 299

c) Number of terms = $\frac{299-101}{3} + 1 = 66 + 1 = 67$

d) Sum = $\frac{67}{2}(101 + 299) = \frac{67}{2} \times 400 = 13400$

12. a) Next line is

17, 18, 19, 20, 21, 22, 23, 24, 25

b) Number of numbers in the 10th line = 19

c) First number in the 10th line = 82

Last number in the 10th line = 100

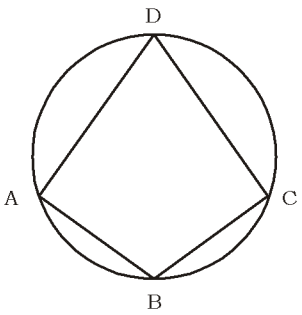
d) Sum $\frac{19}{2}(82 + 100) = 19 \times 91 = 1729$

Unit -2

CIRCLES

Score : 40
Time : 1½ hr

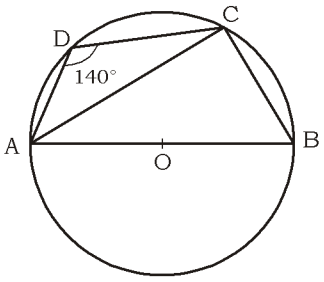
Each question from 1 to 4 carries 2 score. **(4 × 2 = 8)**

1. 

In the picture the measure of ∠ABC is two times of the measure of ∠ADC

a) Find the measure of ∠ADC

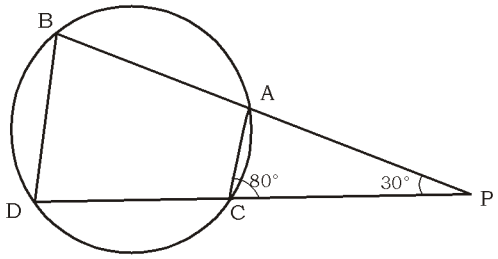
b) Find the measure of ∠ABC

2. 

In the picture 'O' is the centre of the circle. If ∠ADC =140°, then find

a) ∠ACB

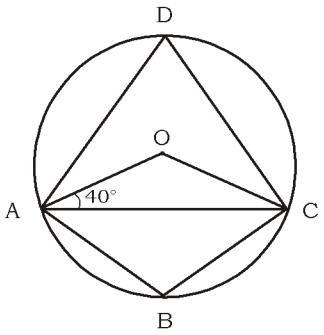
b) ∠BAC

3. 

In the picture, extend the chords BA and DC, intersect at P. If ∠ACP = 80°, ∠BPD = 30°, then find

a) ∠PAC

b) ∠BDC

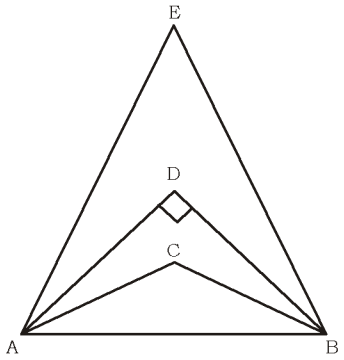
4. 

In the picture 'O' is the centre of the circle. If $\angle OAC = 40°$, then find

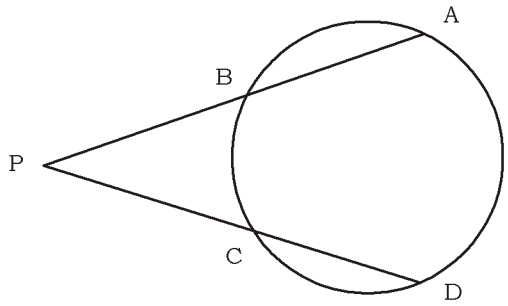
a) $\angle AOC$

b) $\angle ABC$

Each questions from 5 to 7 carries 3 score. **(3 × 3 = 9)**

5. 

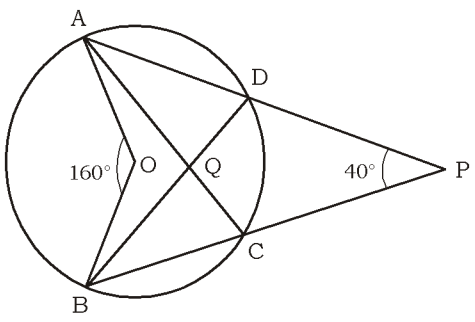
In the picture, if we draw a circle with diameter AB. What are the positions of the vertices C, D and E, inside the circle, outside the circle or on the circle? Why?

6. 

In the picture, extend the chords AB and DC, intersect at P. PA = 12cm, AB = 7cm, PC = 4cm find

a) Length of PB

b) Length of CD

7. 

In the picture, extend the chords BC and AD intersect at P.

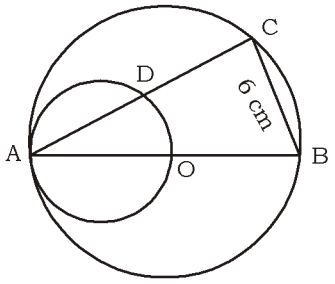
$\angle AOB = 160°$, $\angle CPD = 40°$ find

a) $\angle ACB$

b) $\angle AQB$

Each question from 8 to 10 carries 4 score. **(3 × 4 = 12)**

8. Draw the triangle of circumradius 3cm and two of its angles are 50° and 70°.

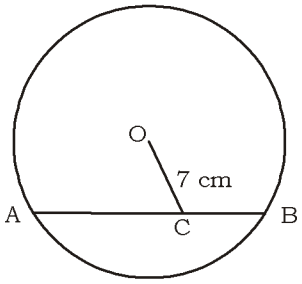
9. 

In the picture, O is the centre of the circle and radius of the smaller circle is 2.5cm.

Find (a) Length of AB

b) $\angle ACB$

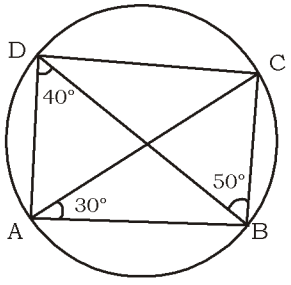
c) Length of AD

10. 

In the picture, O is the centre of the circle and line through 'O' cuts the chord AB into two parts AC and BC. AB = 20cm, AC = 17cm and OC = 7cm. What is the radius of the circle.

Questions 11 and 12 carries 5 score each. **(2 × 5 = 10)**

11. Draw the rectangle with length 6cm and breadth 3cm. Draw a square of the same area.

12. 

In the picture, $\angle BAC = 30°$, $\angle CBD = 50°$, $\angle ADB = 40°$. Calculate the angles of the quadrilateral ABCD.

Unit -2

CIRCLES

ANSWER KEY

1. a) $\angle ADC = x$

   $\angle ABC = 2x$

   $\angle ADC + \angle ABC = 180°$

   $x + 2x = 180°$

   $3x = 180°$

   $x = = \frac{180^0}{3} = 60°$

   $\therefore \angle ADC = 60°$

   b) $\angle ABC = 2 \times 60° = 120°$

2. a) $\angle ACB = 90°$ (Angle in the semicircle)

   b) $\angle ABC = 180° - 140°$ (Cyclic quadrilateral)

   $= 40°$

   $\angle BAC = 90° - 40° = 50°$

3. a) $\angle PAC = 180° - (80° + 30°)$

   $= 180° - 110°$

   $= 70°$

   b) $\angle BDC = 70°$

4. a) $\angle OCA = 40°$ (isosceles triangle)

   $\angle AOC = 180° - (40° + 40°)$

   $= 100°$

   b) $\angle ADC = \frac{100^0}{2} = 50°$

   $\angle ABC = 180° - 50° = 130°$

5. In the picture

   Since $\angle ACB > 90°$ the vertex C is inside the circle

   Since $\angle ADB = 90°$, the vertex D is on the circle

   Since $\angle AEB < 90°$, the vertex E is outside the circle.

6. a) PA = 12cm

   PB = 12 – 7 = 5cm

   b) PC = 4cm

$PA \times PB = PC \times PD$

$12 \times 5 = 4 \times PD$

$60 = 4 \times PD$

$\therefore PD = \frac{60}{4} = 15$

$CD = 15 - 4 = 11cm$

7. a) $\angle ACB = \frac{160^0}{2} = 80°$

b) $\angle QDP = 180° - 80° = 100°$

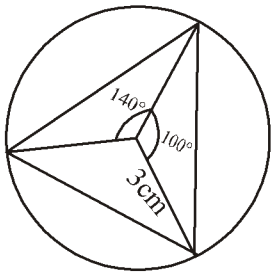
$\angle QCP + \angle CPD + \angle QDP + \angle CQD = 360°$ (quadrilateral)

$100° + 40° + 100° + \angle CQD = 360°$

$\angle CQD = 360° - 240°$

$= 120°$

$\angle AQB = 120°$ (opposite angles)

8. 

$2 \times 50° = 100°$

$2 \times 70° = 140°$

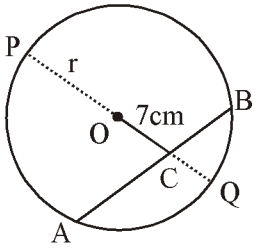
9. a) $AB = 4 \times 2.5 = 10cm$

b) $\angle ACB = 90°$

c) $AC^2 = 10^2 - 6^2 = 100 - 36 = 64$

$AC = \sqrt{64} = 8cm$

$\therefore AD = \frac{8}{2} = 4cm$

10. 

$AC = 17cm$

$BC = 20 - 17 = 3cm$

$PC = r + 7$

CQ = r – 7

PC × CQ = AC × BC

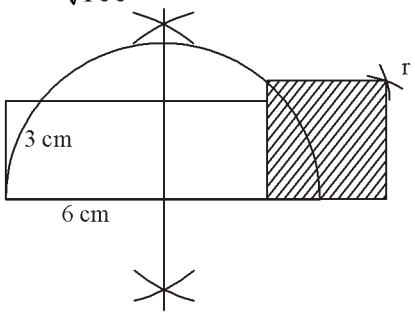
(r + 7) (r – 7) = 17× 3

r^2 – 49 = 51

r^2 = 51 + 49 = 100

r = $\sqrt{100}$ = 10 cm

11.



12. ∠DAC = ∠DBC = 50° (Angles in the same arc)

∴ ∠A = 30° + 50° = 80°

∠A + ∠C = 180° (cyclic quadrilateral)

∠C = 180° – ∠A = 180° – 80° = 100°

∠BDC = ∠BAC = 30° (Angles in the same are)

∴ ∠D = 40° + 30° = 70°

∠B + ∠D = 180° (Cyclic quadrilateral)

∠B = 180° – ∠D = 180° – 70° = 110°

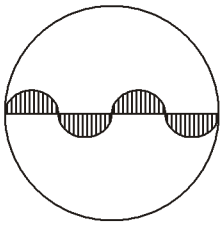
Unit 3

MATHEMATICS OF CHANCE

Score : 40
Time : 1½ hr

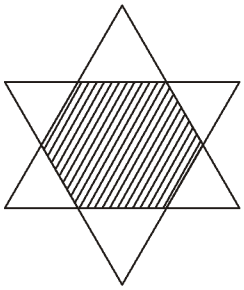
Each question from 1 to 4 carries 2 score. **(4 × 2 = 8)**

1. In a box there are 7 black balls and5 white balls. One ball is taken from the box without looking. Find the probability that it may be
   a) a black ball
   b) a white ball

2. 

   In the figure, all the four shaded semicircles have same area. We put a dot in the figure, without looking in to it. Find the probability of being the dot is in the shaded semicircles.

3. A regular hexagon is formed by two overlapping equilateral triangles as shown in the figure. A dot is put in the figure without looking in to it.



   a) If we cut a regular hexagon in to equilateral triangles of same side as that of it, how many equilateral triangle will we get?
   b) What is the probability of being the dot inside the shaded region.

Questions 4 and 5 carries 3 score each. **(2 × 3 = 6)**

4. a) How many days are there in a leap year
   b) Find the probability of getting 53 Mondays in a leap year.

5. In a box there are some red beads and blue beads. Total number of beads in the box is 24. If a bead is taken from it, without looking, the probability of getting a red bead is $\frac{1}{3}$. Find.
   a) The probability of getting a blue bead
   b) The number of red beads
   c) The number of blue beads

Questions 6 and 7 carries 4 score each. **(2 × 4 = 8)**

6. Natural numbers from 1 to 30 are written in paper slips and put in a box. One slip is taken from the box without looking.

   a) Find the probability of getting a multiple of 3.

   b) Find the probability of getting a prime number.

7. In class 10A there are 30 boys and 20 girls and in 10B class there are 25 boys and 25 girls. One student is to be selected from each class.

   a) In how many different ways we can select a pair of students, one from each class.

   b) What is the probability of both being boys?

   c) What is the probability of getting one boy and one girl?

   d) What is the probability of getting atleast one girl?

Unit -3

MATHEMATICS OF CHANCE

ANSWER KEY

1. Total number of ball = 7 + 5 = 12

   a) Probability of getting a black ball = $\frac{7}{12}$

   b) Probability of getting a white ball = $\frac{5}{12}$

2. Let 'r' be the radius of the semicircle.

   Area of 4 semicircles $= 4 \times \frac{1}{2}\pi r^2 = 2\pi r^2$

   Radius of larger circle = 4r

   Area of larger circle $= \pi(4r)^2 = 16\pi r^2$

   Required probability $= \frac{2\pi r^2}{16\pi r^2} = \frac{1}{8}$

3. a) 6

   b) $\frac{6}{12} = \frac{1}{2}$

4. a) 366 days

   b) 366 days = 52 weeks + 2 days. In 52 weeks there are 52 Mondays. The balance 2 days may be (Sunday, Monday), (Monday, Tuesday), (Tuesday, Wednesday), (Wednesday, Thursday), (Thursday, Friday), (Friday, Saturday), (Saturday, Sunday). Probaility of getting 53 Mondays= $\frac{2}{7}$

5. a) $1 - \frac{1}{3} = \frac{2}{3}$

   b) Number of red beads = $\frac{1}{3} \times 24 = 8$

   c) Number of blue beads = $\frac{2}{3} \times 24 = 16$

6. Total numbers = 30

   a) Multiple of 3 – 3, 6, 9, 12, 15, 18, 21, 24, 27, 30

   Required probability = $\frac{10}{30} = \frac{1}{3}$

   b) Prime number = 2, 3, 5, 7, 11, 13, 17, 19, 23, 29

   Required probability = $\frac{10}{30} = \frac{1}{3}$

7.

Std	Boys	Girls	Total
10A	30	20	50
10B	25	25	50

   a) Total pairs = 50 × 50 = 2500

b) $\frac{30\times25}{50\times50} = \frac{3}{10}$

c) $\frac{30\times25+20\times25}{50\times50} = \frac{750+500}{2500} = \frac{1250}{2500} = \frac{1}{2}$

d) At least one girls means both are not boys.

Number of pairs with atleast one girl = 2500 – 30× 25 = 1750

Probability = $\frac{1750}{2500} = \frac{7}{10}$

Unit 4

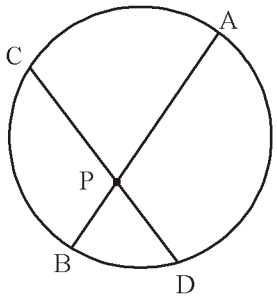
SECOND DEGREE EQUATIONS

Score : 30
Time : 1 hr

Questions 1 and 2 carries 3 score each. **(2 × 3 = 6)**

1. The product of two consecutive even natural numbers is 244.
   a) When the smaller number is taken as x then what is the large number.
   b) Write a second degree equation in x.
   c) Find the numbers

2. In the figure two chords AB and CD of a circle intersect at the point P. The length of PC is 2cm more than the length of PD. Also AB = 11cm and PB = 3cm



   a) If PD = x cm then PC = _____ cm
   b) PC × PD = _____
   c) What is the length of PC

Each questions from 3 to 8 carries 4 score. **(6 × 4 = 24)**

3. The length of a rectangle is 6cm more than its breadth. The area of the rectangle is 91 sq.cm.
   a) If the breadth is x, then length = _____
   b) Express area is terms of x.
   c) Form a second degree equation and find out the length and breadth of the rectangle.

4. p(x) = $x^2 + 4x$
   a) Find p (x) when $x = 2$
   b) Find p (1)
   c) For which positive number x, p(x) = 320

5. To find x from the equation $x^2 + 18x = 144$ some steps are given below. Fill up the blanks.

   $x^2 + 18x$ + _____ = 144 + _____

   $(x +$ _____ $)^2$ = _____

   $(x +$ _____ $)$ = _____

   x = _____ , _____

6. Consider the arithmetic sequence 3, 5, 7, ...
   a) What is its common difference?
   b) Find the sum of first 'n' terms of the sequence
   c) How many consecutive terms starting from the first are added to get 624?
7. The perimeter of a rectangle is 44cm and its area is 117 sq.cm
   a) Length + breadth = _____ cm
   b) If length is 11 + x. What is the breadth of the rectangle?
   c) Calculate the length and breadth of the rectangle.
8. Eight times a number added to the square of the number, we get 425.
   a) Form a second degree equation in x by taking the number as x.
   b) Find the number.

Unit 4

SECOND DEGREE EQUATIONS

ANSWER KEY

1. a) $x + 2$

   b) $x(x + 2) = 224$

   $x^2 + 2x - 224 = 0$

   c) $x^2 + 2x + 1^2 = 224 + 1^2$

   $(x+1)^2 = 225$

   $x + 1 = \sqrt{225} = 15$

   $x = 15 - 1 = 14$

   Even natural numbers are 14 and 16

2. a) $(x + 2)$

   b) PA × PB

   c) $x(x + 2) = 8 \times 3$

   $x^2 + 2x + 1^2 = 24 + 1^2$

   $x^2 + 2x + 1^2 = 24 + 1^2$

   $(x+1)^2 = 25$

   $x+1 = \pm 5$

   $x = 5 - 1 = 4$ (Since length can't be negative)

   PC = $x + 2 = 4 + 2 = 6$cm

3. a) $(x + 6)$

   b) Area = $x(x + 6)$

   c) $x(x + 6) = 91$

   $x^2 + 6x = 91$

   $x^2 + 6x + 3^2 = 91 + 3^2$

   $(x+3)^2 = 100$

   $x + 3 = \sqrt{100} = 10$

   $x = 10 - 3 = 7$

   Length = 7 + 6 = 13cm

   Breadth = 7cm

4. a) p(2) = 2^2 + 4 (2) = 4 + 8 = 12

   b) p (1) = 1^2 + 4(1) = 1 + 4 = 5

c) $x^2 + 4x = 320$

$x^2 + 4x + 2^2 = 320 + 2^2$

$(x+2)^2 = 324$

$x + 2 = \pm\sqrt{324} = \pm 18$

$x = 16, -20$ $\therefore$ Positive number, $x = 16$

5. $x^2 + 18x + \underline{9}^2 = 144 + \underline{9}^2$

$(x+\underline{9})^2 = 225$

$(x+\underline{9}) = \pm\sqrt{225} = \pm 15$

$x = \pm 15 - 9$

$x = 6, -24$

6. a) 2

b) $S_n = \frac{n}{2}(3 + 2n+1) = \frac{n}{2}(2n + 4) = n^2 + 2n$

c) $n^2 + 2n = 624$

$n^2 + 2n + 1^2 = 624 + 1^2$

$(n+1)^2 = 625$

n + 1 = 25

n = 24

7. a) 22

b) $11 - x$

c) Area = 117

$(11 + x)(11 - x) = 117$

$x^2 = 121 - 117 = 4$

$x = 2$

Length = $11 + x = 11 + 2 = 13$cm

Breadth = $11 - x = 11 - 2 = 9$cm

8. a) $x^2 + 8x = 425$

b) $x^2 + 8x + 4^2 = 425 + 4^2$

$(x+4)^2 = 441$

$x + 4 = \pm\sqrt{441} = \pm 21$

$x = \pm 21 - 4$

x = 17, –25

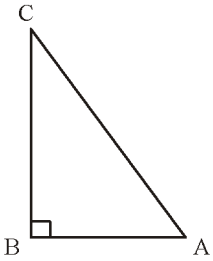
Number is 17 or –25

Unit 5

TRIGONOMETRY

Score : 30
Time : 1 hr

Questions 1 and 2 carries 2 score each. **(2 × 2 = 4)**

1. 

In triangle ABC $\angle B = 90°$, AC = 15cm and sin A = $\frac{4}{5}$

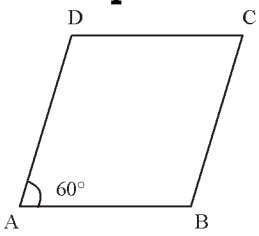
a) Find the length of BC.

b) Find cos A.

2. In triangle PQR, PQ = 8cm, $\angle R = 30°$

Find the circumradius of triangle PQR?

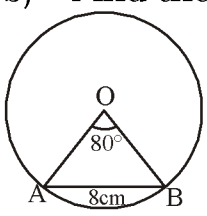
Each questions from 3 to 6 carries 3 score. **(4 × 3 = 12)**

3. 

In the figure, ABCD is a parallelogram AB = 10cm, BC = 8cm, $\angle A = 60°$

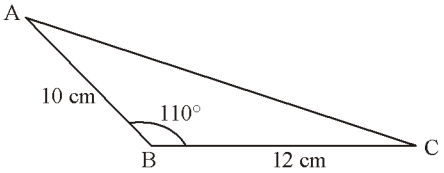
a) Calculate the perpendicular distance from D to AB?

b) Find the area of parallelogram ABCD?

4. 

In the figure, AB is a chord of the circle with centre at 'O'. $\angle AOB = 80°$ AB= 8cm. Find the diameter of the circle?

(sin 80 = 0.98, cos 40 = 0.76, sin 40 = 0.64)

5. 

In triangle ABC AB = 10cm, BC = 12cm $\angle B = 110°$

a) Find the perpendicular distance from A to BC.

b) Find the area of triangle ABC (Sin 70 = 0.94, Cos 70 = 0.34)

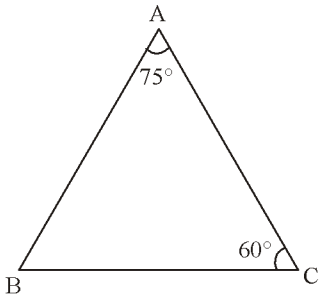
6. When the sun is at an elevation of 30°, length of the shadow of a tree is 72 m.

a) Draw a rough figure based on the given data.

b) Find the height of the tree?

Question 7 carries 4 score. **(1 × 4 = 4)**

7.



In triangle ABC $\angle A = 75°$, $\angle C = 60°$

a) Find $\angle B$.

b) If AB = $6\sqrt{2}$ cm , find the length of AC,

c) Find AB : BC : AC

Questions 8 and 9 carries 5 score each. **(2 × 5 = 10)**

8. Two persons are standing at opposite direction of a flag post of height 80 metre. They are at equal distance from the flag post. Both of them sees the tip of the flag post at an angle of elevation 45°.

a) Draw a rough figure based on the given data.

b) Find the distance between the two persons.

9. A boy sees the top of a building at an elevation of 60°. Stepping 40m back, he sees it at an elevation of 30°

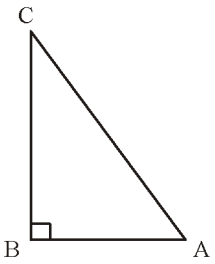
a) Draw a rough figure

b) Find the height of the building.

Unit 5

TRIGONOMETRY

ANSWER KEY

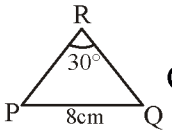
1. a) 

$\sin A = \frac{BC}{AC}\left(\frac{\text{Opposite side}}{\text{Hypotenuse}}\right)$

$BC = AC \times \sin A$ Given $\sin A = \frac{4}{5}$

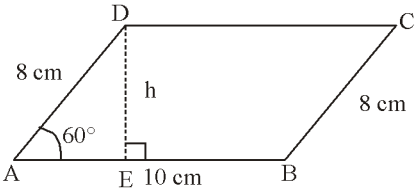
$= 15 \times \frac{4}{5} = 12\text{cm}$

b) $\cos A = \frac{\text{Adjacent side}}{\text{Hypotenuse}} = \frac{AB}{AC} = \frac{\sqrt{15^2 - 12^2}}{15} = \frac{9}{15} = \frac{3}{5}$

2. 

Circum diameter $= \frac{PQ}{\sin R}$

$2r = \frac{8}{\sin 30}, \quad r = \frac{4}{\left(\frac{1}{2}\right)} = 8$ cm

3. 

$DE \perp AB$

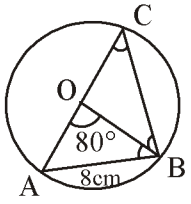
a) Consider $\triangle AED$. $\angle A = 60°$, $AD = 8$ cm

$\sin 60 = \frac{h}{8}$

$h = 8 \times \sin 60$

$= 8 \times \frac{\sqrt{3}}{2} = 4\sqrt{3}\,\text{cm}$

b) Area $= 10 \times 4\sqrt{3} = 40\sqrt{3}\,\text{cm}^2$

4. 

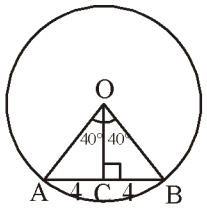
AC is the diameter .

$\angle AOB = 80° \therefore \angle C = \frac{80}{2} = 40°$

In triangle ABC, $\sin C = \frac{8}{AC}$

Diameter AC = $8/Sin40 = \frac{8}{0.64} = \frac{800}{64} = 12.5$ cm

OR

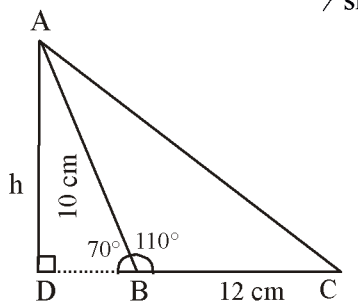


In triangle OCB $\angle COB = 40°$, $\angle OCB = 90°$

Sin 40 = $\frac{4}{r}$ $\therefore r = 4/\sin 40$

$2r = 8/\sin 40 = 8/0.64 = 12.5$cm

5. a)



Perpendicular from A to BC is AD.

Consider triangle ADB, $\angle D = 90°$, $\angle ABD = 70°$

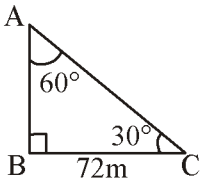
$\sin 70 = \frac{h}{10}$

h = 10 × Sin 70

= 10 × 0.94 = 9.4cm

b) Area of $\triangle$ ABC = $\frac{1}{2}$ BC × AD = $\frac{1}{2}$ × 12 × 9.4 = 56.4cm^2

6. a)



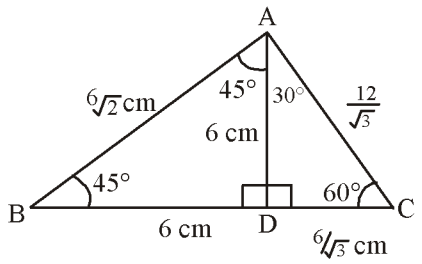
b) Triangle ABC

$\tan 30° = \frac{AB}{BC}$

AB = BC × tan 30

= 72 × $1/\sqrt{3} = \frac{72}{\sqrt{3}} = 24\sqrt{3}$ m

7. a)



$\angle B = 180 - (60 + 75) = 45°$

b) Given AB = $6\sqrt{2}$ cm. Angles in triangle ADB are 45°, 45°, 90°

$\therefore$ BD = DA = 6cm

In triangle ADC, Side 1 : $\sqrt{3}$: 2

AD = 6cm

$\therefore$ DC = $\frac{6}{\sqrt{3}}$ cm

AC = $2 \times \frac{6}{\sqrt{3}}$

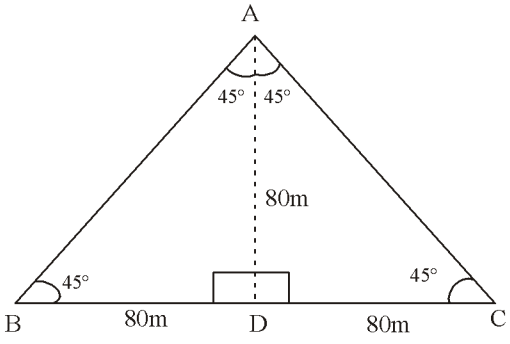
$= \frac{12}{\sqrt{3}}$ cm

c) AB : BC : AC = $6\sqrt{2} : \left(6 + \frac{6}{\sqrt{3}}\right) : \frac{12}{\sqrt{3}}$

$= \sqrt{2} : \left(1 + \frac{1}{\sqrt{3}}\right) : \frac{2}{\sqrt{3}}$

$= \sqrt{6} : \left(\sqrt{3} + 1\right) : 2$

8. a)



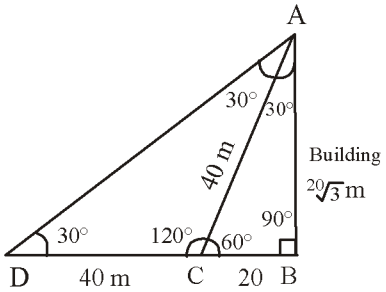
b) $\triangle$ADB, $\triangle$ADC are isosceles right angled triangle.

$\angle B = \angle DAB = 45°$, $\angle C = \angle CAD = 45°$

$\therefore$ BD = AD = CD =80m

$\therefore$ Distance between the two persons = 80 + 80 = 160m

9. a)



In triangle ACD $\angle ACD = 180 - 60 = 120$

$\angle CAD = 180 - (120 + 30) = 30°$

$\therefore$ DC = AC = 40m

In triangle ABC. Side opposite to 90° is 40m

Side opposite to 30° = BC = $\frac{40}{2}$ = 20m

Height of the building AB = Side opposite to 60°

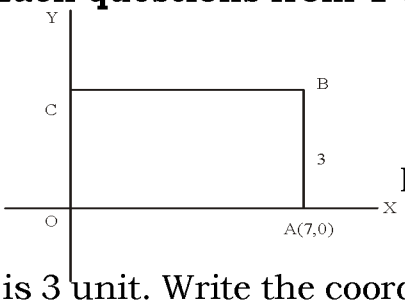
$= 20\sqrt{3}$ m

Unit 6

COORDINATES

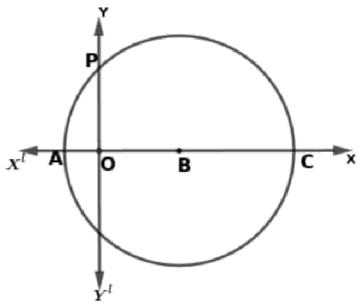
Score : 30
Time : 1 hr

Each questions from 1 to 3 carries 2 score. **(3 × 2 = 6)**

1. 

In the figure, the breadth of the rectangle OABC is 3 unit. Write the coordinates of the vertices B and C.

2. One pair of opposite vertices of the rectangle ABCD are A (2, 3) and C (8, 6). If the sides of this rectangle are parallel to the axes then find the coordinates of B and D.

3. 

In the figure 'B' is the centre of the circle with radius 4 unit. Also the coordinates of the point A are (–1, 0)

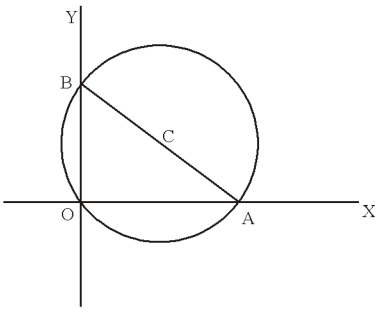
a) What is the length of OC ?

b) Find the coordinates of P.

Questions 4 and 5 carries 3 score each. **(2 × 3 = 6)**

4. a) Write the coordinates of the point on the *x*-axis at a distance 8 unit from the point (6, 8)

b) Find the coordinates of the points on the *x*-axis at a distance 10 unit from the point (6, 8)

5. 

In the figure, C is the centre of the circle and the origin is a point on the circle. OA = OB = 4 unit.

a) Write the coordinates of A and B

b) Find the coordinates of C.

Questions 6 and 7 carries 4 score each. **(2 × 4 = 8)**

6. The coordinates of the centre of a circle is (3, 2) and (6, 3) is a point on it.

   a) What is the radius of the circle?

   b) Check whether the points (0, 2), (3, 6) and (0, 3) are inside, outside or on this circle.

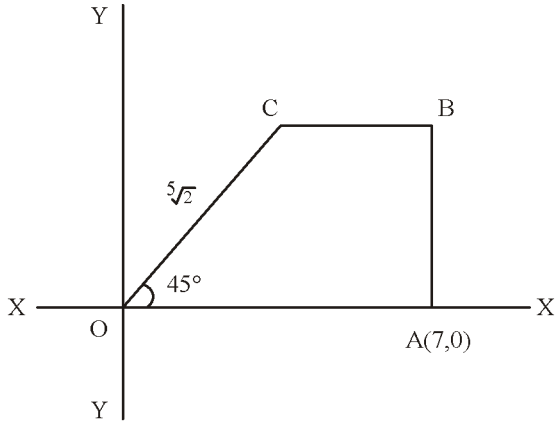
7. a) Draw the coordinate axes x and y and then mark the points A(1, 1) and B (7, 1)

   b) Draw isosceles right triangle with AB as hypotenuse.

   c) Write the coordinates of the third vertex.

Questions 8 and 9 carries 5 score each. **(2 × 5 = 10)**

8. Prove that by joining the point (2,1), (3, 4) and (–3, 6), we get a right triangle.

9. 

In the figure OABC is a trapezium. OC = $5\sqrt{2}$, $\angle$COA = 45°.

The coordinates of A are (7, 0)

a) What is the perpendicular distance from C to OA?

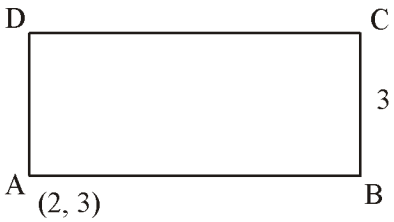
b) Write the coordinates of B and C.

Unit 6

COORDINATES

ANSWER KEY

1. B (7, 3), C (0, 3)

2. 

Coordinates of B are (8, 3)

Coordinates of D are (2, 6)

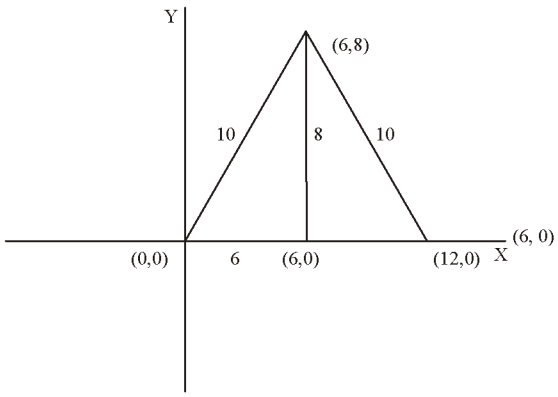
3. a) OC = 8 – 1 = 7 units

   b) OP^2 = OA × OC

   = 1 × 7

   ∴ OP = $\sqrt{7}$

   Coordinates of P are (0, $\sqrt{7}$)

4. a) 

   b) (0, 0) and (12, 0)

5. a) Coordinates of A are (4, 0)

   Coordinates of B are (0, 4)

   b) Coordinates of C are (2, 2)

6. a) Radius = $\sqrt{(6-3)^2 + (3-2)^2}$ = $\sqrt{10}$ unit

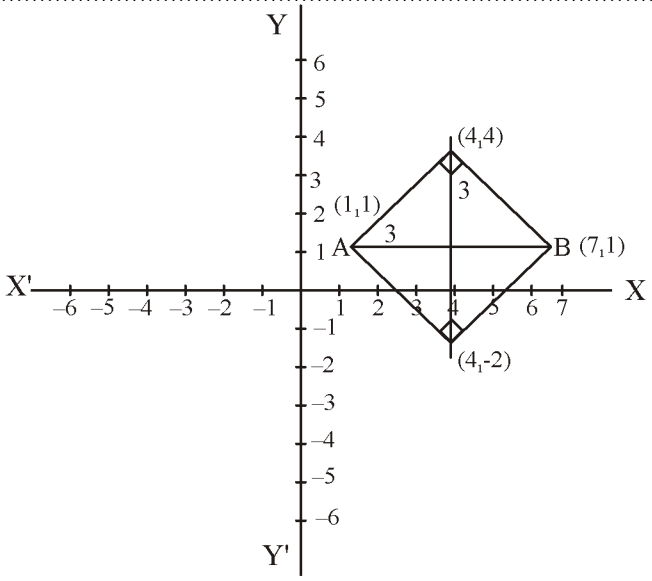
   b) Distance between (3, 2) and (0, 2) = 3 unit

   Distance between (3, 2) and (3, 6) = 4 unit

   Distance between (3, 2) and (0, 3) = $\sqrt{(3-0)^2 + (2-3)^2}$ = $\sqrt{10}$ unit

   The point (0, 2) is inside the circle, (3, 6) is outside and (0, 3) is on the circle.

7.



c) Coordinates of third vertex are (4, 4) or (4 –2)

8. Let A (2, 1), B (3, 4) and C (–3, 6)

$AB = \sqrt{(2-3)^2 + (1-4)^2} = \sqrt{10}$

$AC = \sqrt{(2-(-3))^2 + (1-6)^2} = \sqrt{5^2+(-5)^2} = \sqrt{50}$

$BC = \sqrt{(3-(-3))^2 + (4-6)^2} = \sqrt{6^2+(-2)^2} = \sqrt{40}$

$AB^2 + BC^2 = \left(\sqrt{10}\right)^2 + \left(\sqrt{40}\right)^2$

$= 10 + 40$

$= 50$

$= AC^2$

$\therefore \Delta ABC$ is a right triangle.

9. a) Perpendicular distance from C to OA = 5 unit

b) Coordinates of B = (7, 5)

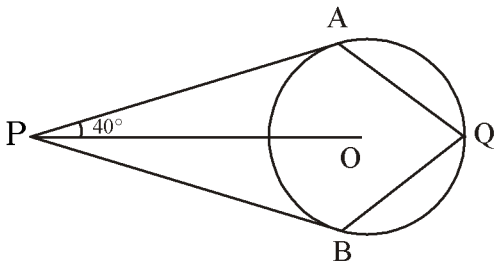
Coordinates of C = (5, 5)

Unit 7

TANGENTS

Score : 40
Time : 1½ hr

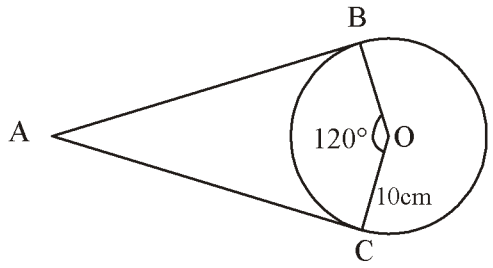
Each questions from 1 to 3 carries 2 score. **(3 × 2 = 6)**

1. 

In the picture, O is the centre of the circle. PA and PB are tangents to the circle. ∠APO = 40°

Find a) ∠APB

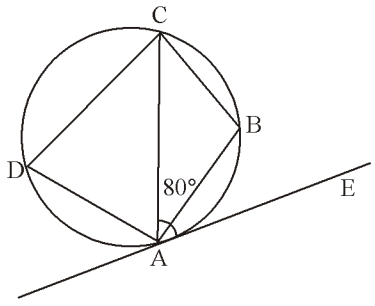
b) ∠AQB

2. 

In the picture O is the centre of the circle and radius is 10cm.

Find a) ∠BAC

b) Length of AB

3. 

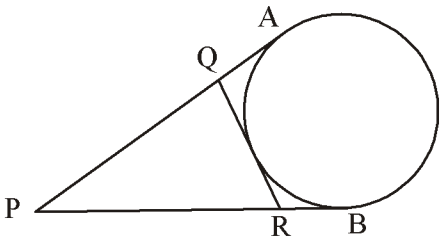
In the picture AE is the tangent to the circle ∠CAE = 80°

Find a) ∠ADC

b) ∠ABC

Each questions from 4 to 7 carries 3 score. **(4 × 3 = 12)**

4. Draw a circle of radius 3cm. Mark a point P at a distance 7cm away from the centre of the circle. Draw tangents from P to the circle.

5. 

In the picture PA, PB, QR are tangents to the circle. PA = 12cm.

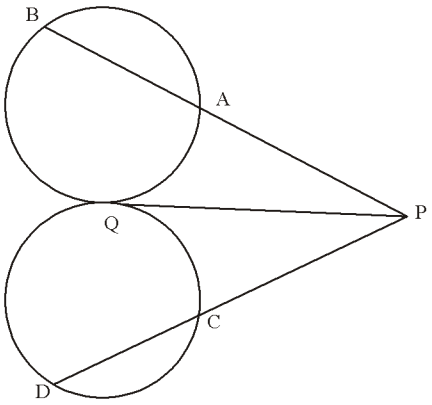
a) Find the length of PB.

b) Calculate the perimeter of triangle PQR.

6. The length of the sides of a triangle are 20cm, 21cm and 29cm.

a) Write the measure of the largest angle in this triangle.

b) Find the radius of in circle in this triangle?

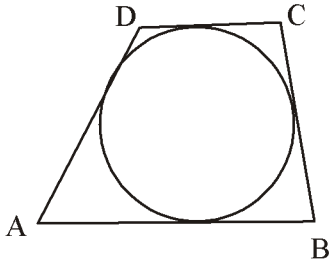
7. 

In this picture, PQ is the common tangent of two circles.

Prove that PA × PB = PC × PD

Each questions from 8 to 10 carries 4 score. **(3 × 4 = 12)**

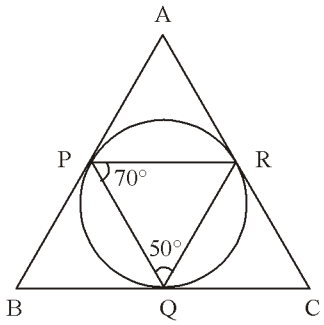
8. Draw a circle of radius 2.5cm. Draw a triangle of two angles 50° and 70° with all its sides touching this circle.

9. 

In the picture, all the sides of a quadrilateral ABCD touches the circle.

Prove that AB + CD = BC + AD

10.



In the picture, $\angle PQR = 50°$ $\angle QPR = 70°$

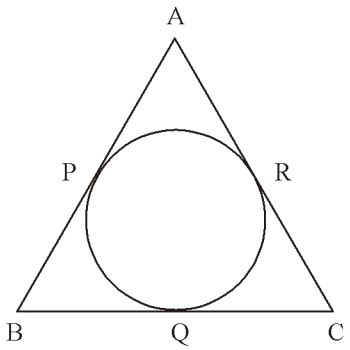
a) Find $\angle PRQ$?

b) Find all angles in triangle ABC?

Questions 11 and 12 carries 5 score each. **(2 × 5 = 10)**

11. In ΔABC, AB = 6cm, BC = 5cm, $\angle B = 70°$construct ΔABC and draw a circle touching the three sides of the triangle. Also write the measure of radius in this in circle.

12.



In the picture AB = 8cm, BC = 10 cm, AC = 6 cm

Find a) Length of AP

b) Length of CR

c) Length of BQ

Unit 7

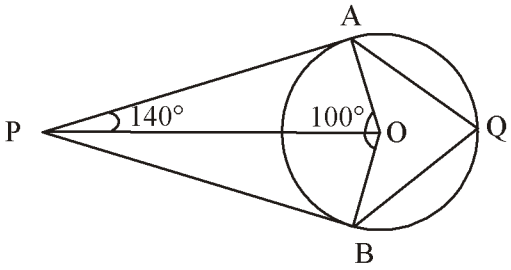
TANGENTS

ANSWER KEY

1. a) $\angle BPO = 40°$

$\angle APB = 40° + 40° = 80°$

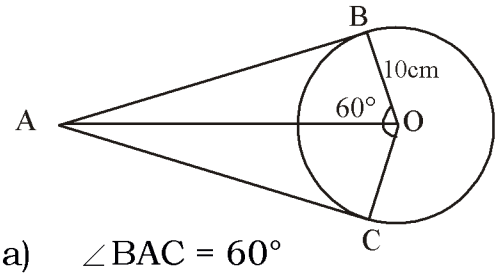
b)



$\angle AOB = 180° - 80° = 100°$

$\therefore \angle AQB = \frac{100^0}{2} = 50°$

2.



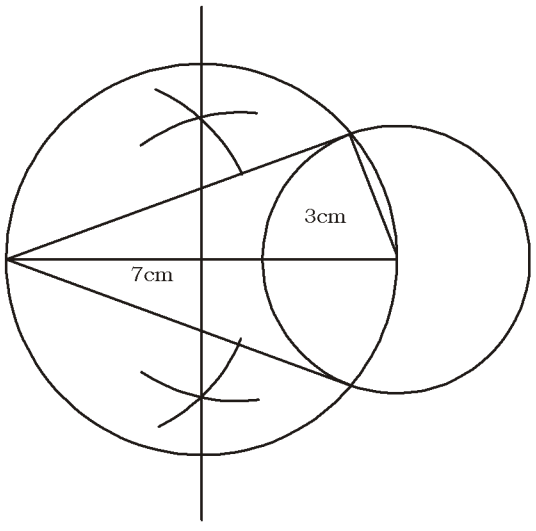
a) $\angle BAC = 60°$

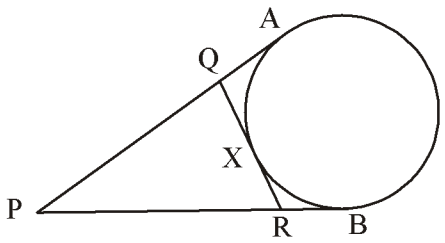
b) $AB = 10\sqrt{3}$ cm

3. a) $\angle ADC = 80°$

b) $\angle ABC = 180° - 80° = 100°$

4.



5. a) 

PB = 12cm

b) QX = QA (Tangent line)

RX = RB (Tangent line)

Perimeter of Δ PQR = PQ + QR + PR

= PQ + QX + RX + PR

= PQ + QA + RB + PR

= PA + PB

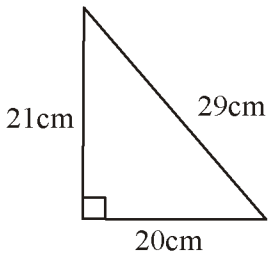
= 12 + 12

= 24cm

6. a) 90°

b) Area = $\frac{1}{2} \times 20 \times 21$

= 210cm^2



S = $\frac{20+21+29}{2}$

= $\frac{70}{2}$

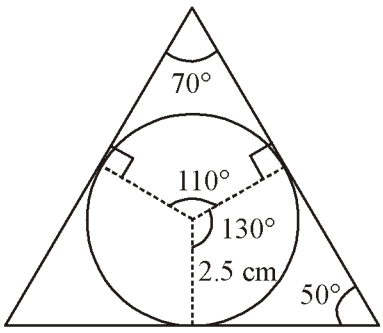
= 35

r = $\frac{A}{S} = \frac{210}{35}$ = 6cm

7. PA × PB = PQ^2

PC × PD = PQ^2

$\therefore$ PA × PB = PC × PD

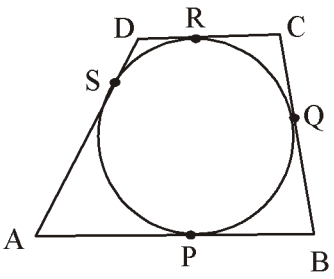
8. 

180° – 50° = 130°

180° – 70° = 110°

9. In the picture

AP = AS (Tangent line)



PB = BQ

CQ = CR

DR = DS

AB + CD = AP + PB + CR + DR

= AS + BQ + CQ + DS

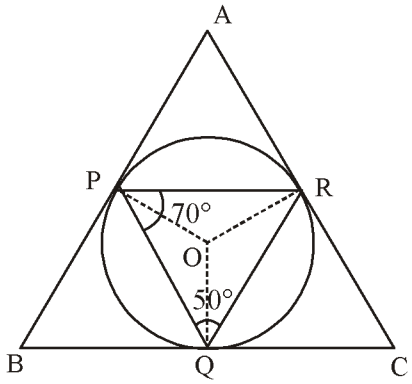
= BQ + CQ + AS + DS

= BC + AD

10. a) $\angle PRQ = 180° - (70° + 50°)$

$= 180° - 120°$

$= 60°$



b) $\angle POR = 2 \times 50° = 100°$

$\angle A = 180° - 100° = 80°$

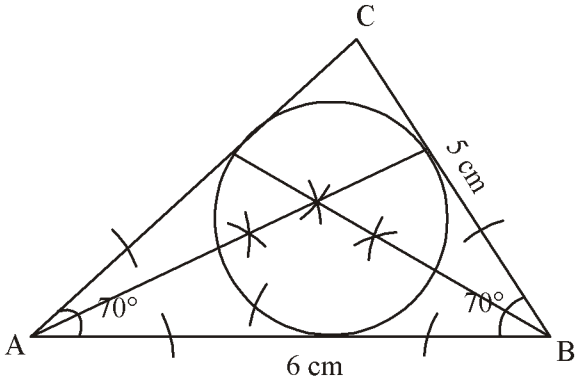
$\angle POQ = 2 \times 60° = 120°$

$\therefore \angle B = 180° - 120° = 60°$

$\angle QOR = 2 \times 70 = 140°$

$\therefore \angle C = 180° - 140° = 40°$

11.



In radius = 1.6cm

12. In the picture,

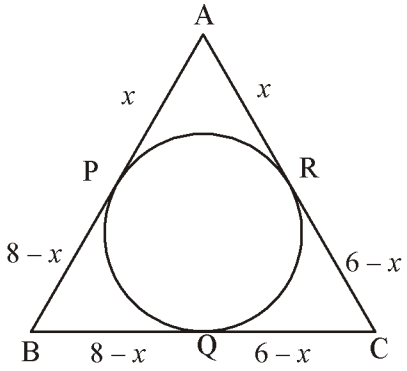
$8 - x + 6 - x = 10$

$14 - 2x = 10$

$-2x = 10 - 14$

$-2x = -4$

$= 2$



a) AP = 2cm

b) CR = 6 – 2 = 4cm

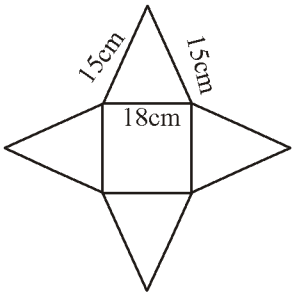
c) BQ = 8 – 2 = 6cm

Unit 8

SOLIDS

Score : 40
Time : 1½ hr

Each question from 1 to 3 carries 2 score. **(3 × 2 = 6)**

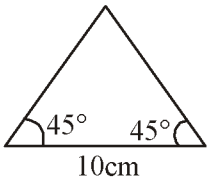
1. 

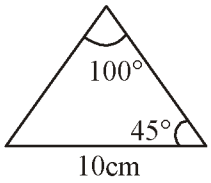
The given figure is folded to make a square pyramid.

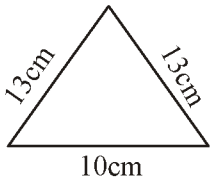
   a) Base edge of the square pyramid is ?

   b) Find the slant height of the pyramid.

2. Which of the following can be a lateral face of a square pyramid? Given reason.

   a) 

   b) 

   c) 

3. A square pyramid has base perimeter 40cm and its volume is one litre. Find the height of the pyramid?

Each question from 4 to 7 carries 3 score. **(4 × 3 = 12)**

4. A cone of maximum size is made with a semicircle of radius 10cm.

   a) Find the slant height of the cone

   b) What is the base radius of the cone?

   c) Find the height of the cone.

5. A square pyramid of maximum size is carved out from a solid cube of side 20cm.

   a) What is the length of its base edge?

   b) Find its slant height.

   c) Calculate the total surface area of the square pyramid.

6. Ratio of radius and slant height of a cone is 2:3.

   a) How much part of the slant height is its base radius?

   b) Find the central angle of the sector, that used to make the cone.

7. Two cones have the same volume and the base radii are in the ratio 2:3

   a) If h_1, h_2 are the heights of the cones, write down an equation based on the given data.

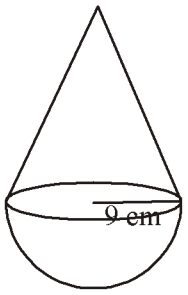
b) What is the ratio of heights of the cone?

Each question from 8 to 10 carries 4 score. **(3 × 4 = 12)**

8. From a circular aluminium sheet of radius 20cm, a sector of central angle 216° is cut off. A cone of maximum size is made with that sector.
   a) What is the slant height of the cone?
   b) Find the base radius of the cone.
   c) Find the height of the cone.
   d) Calculate volume of the cone.
9. In a square pyramid, the length of eight edges are equal in length. If the length of one edge is 10 cm.
   a) Find the total length of all its edges.
   b) Calculate the slant height of the pyramid.
   c) Find the total surface area of the pyramid.
10. Base radius of a conical vessel is 12cm. Angle formed by its slant height and base radius is 60°.
   a) Find the height of the vessel.
   b) What is its slant height?
   c) How many litres of water can contain in the vessel?

Questions 11 and 12 carries 5 score each. **(2 × 5 = 10)**

11. A solid is formed by joining a hemisphere and a cone of same radius, as shown in the figure. Radius of the hemisphere is 9cm. Total height of the solid is 24cm.

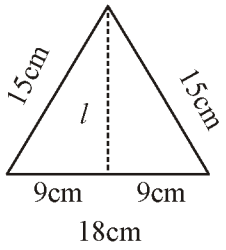


   a) What is the height of the cone?
   b) Find the volume of the cone.
   c) Find the volume of the hemisphere.
   d) What is the total volume of the solid?
12. Radii of two spheres are in the ratio 3:4
   a) What is the ratio of the surface areas?
   b) If the surface area of the first sphere is 450π cm^2. What is the surface area of the second sphere?
   c) How many small spheres of radius 1cm can be made by melting and recasting a solid hemisphere of total surface area 300π cm^2?

Unit 8

SOLIDS

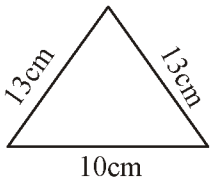
ANSWER KEY

1. 

a) Base edge = 18cm

b) Slant height = $\sqrt{15^2 - 9^2}$

$= \sqrt{144} = 12\text{cm}$

2. 

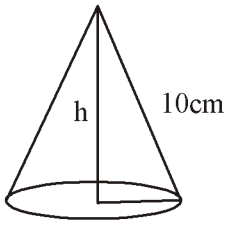
Reason: One angle in the other two triangles is ≥ 90. Answer (c)

3. Base perimeter 4b = 40cm

$b = \frac{40}{4} = 10\text{cm}$ 1 ltr = 1000 cm^3

Volume = $\frac{1}{3} b^2 h = 1000$

$h = \frac{1000 \times 3}{10^2} = 30\text{cm}$

4. 

a) Slant height of the cone = Radius of the sector = 10 cm

b) Base perimeter = Arc length

$2\pi r = \pi \ell$

$r = \ell/2 = 10/2 = 5\text{cm}$

c) Height, $h = \sqrt{\ell^2 - r^2} = \sqrt{10^2 - 5^2}$

$= 5\sqrt{3}$ cm

5. a) Base edge = 20cm

b) Slant height $\ell = \sqrt{h^2 + (b/2)^2}$ h = 20cm

$= \sqrt{20^2 + 10^2}$

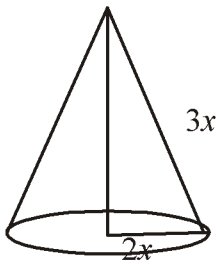
$= 10\sqrt{5}$ cm

c) Total surface Area = $b^2 + 2b\ell$

$= 20^2 + \left(2 \times 20 \times 10\sqrt{5}\right)$

$= 400\left(1 + \sqrt{5}\right)$ cm^2

6.



a) Base radius = $\frac{2}{3}$ × slant height

Ans : $\frac{2}{3}$

b) If the central angle is y, then $\frac{y}{360}\ 2\pi \times 3x = 2\pi \times 2x$

$y = \frac{360 \times 2}{3} = 240$

OR

Central angle = $360 \times \frac{2}{3} = 240$

7. $V_1 = V_2$

$r_1 : r_2 = 2 : 3 = 2k : 3k$

a) $\frac{1}{3}\pi r_1^2 h_1 = \frac{1}{3}\pi r_2^2 h_2$

b) $r_1^2 h_1 = r_2^2 h_2$

$(2k)^2 h_1 = (3k)^2 h_2$

$4h_1 = 9h_2$

$\frac{h_1}{h_2} = \frac{9}{4}$ $h_1 : h_2 = 9 : 4$

8. a) Slant height = Radius of the sector = 20cm

b) $\frac{216}{360} \times 2\pi \times 20 = 2\pi r$

$r = \frac{216 \times 20}{360} = 12\text{cm}$

c) Height, h = $\sqrt{l^2 - r^2}$

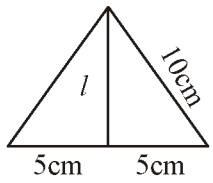
$= \sqrt{20^2 - 12^2} = 16\text{cm}$

d) Volume $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi \times 12^2 \times 16$

$= 768\ \pi cm^3$

9.



a) Total length = 8 × 10 = 80cm

b) Slant height, $\ell = \sqrt{10^2 - 5^2}$

$= \sqrt{75} = 5\sqrt{3}$ cm

c) Total surface area = $b^2 + 2b\ell$

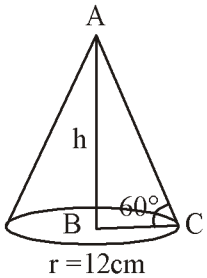
$= 10^2 + 2 \times 10 \times 5\sqrt{3}$

$= 100 + 100\sqrt{3}$

$= 100 + (100 \times 1.73)$

$= 273\text{cm}^2$

10.



a) In 30°, 60°, 90° triangle, side opposite to 30° = 12cm. (Radius)

Height h = Side opposite to 60°

$= 12\sqrt{3}$ cm

b) Slant height ℓ , 2 × 12 = 24 cm

c) Volume of the vessel = $\frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times 12^2 \times 12\sqrt{3}$

$= 576\sqrt{3}\ \pi\text{cm}^3$

$= 3128\ cm^2$

$= 3.128$ litre

11. a) Height of the cone = 24 – 9 = 15cm

b) Volume of the cone = $\frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times 9^2 \times 15 = 405\pi cm^3$

c) Volume of the hemisphere $= \frac{2}{3}\pi r^3 = \frac{2}{3}\pi \times 9^3 = 486\pi cm^3$

d) Total volume = $405\pi cm^3 + 486\pi cm^3$

$= 891\pi cm^3$

12. $r_1 : r_2 = 3:4$ = 3r : 4r

a) $4\pi r_1^2 : 4\pi r_2^2 = r_1^2 : r_2^2 = (3r)^2 : (4r)^2$

= 9 : 16

b) $9 : 16 = 450\pi : A$

$A = \frac{16 \times 450\pi}{9} = 800\pi cm^2$

c) Total surface area of the hemisphere, $3\pi r^2 = 300\pi$

$r = \sqrt{\frac{300}{3}} = 10$ cm

Radius of small sphere = 1cm

$\therefore$ Number of spheres = $\frac{\text{Volume of Hemisphere}}{\text{Volume of a small sphere}}$

$= \frac{\frac{2}{3}\pi \times 10^3}{\frac{4}{3}\pi \times 1} = \frac{2}{3}\pi \times 1000 \times \frac{3}{4\pi} = 500$

Unit 9

GEOMETRY AND ALGEBRA

Score : 30
Time : 1 hr

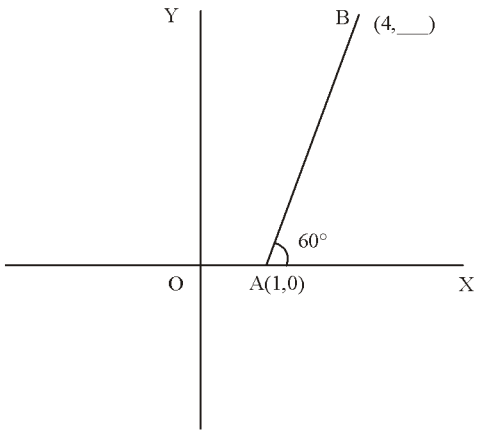
Each question from 1 to 3 carries 2 score. **(3 × 2 = 6)**

1. The coordinates of the end points of the diameter of a circle are (1, 2) and (9, 6).
   a) Write the coordinates of its centre.
   b) What is the radius of this circle?
2. a) Write the equation of the circle with centre as the origin and radius 5 unit.
   b) Write the coordinates of any one point on this circle.
3. The slope of the line joining the point A (2, 5) and B (4, k) is $\frac{3}{2}$
   a) What number is k?
   b) Write the coordinates of the midpoint of the line AB.

Questions 4 and 5 carries 3 score each. **(2 × 3 = 6)**

4. The coordinates of the points A and B are (3, 2) and (8, 7) respectively.
   a) Write the coordinates of any other point on this line AB.
   b) P is a point on this line AB such that AP : PB = 2 : 3. Find the coordinates of P.

5.



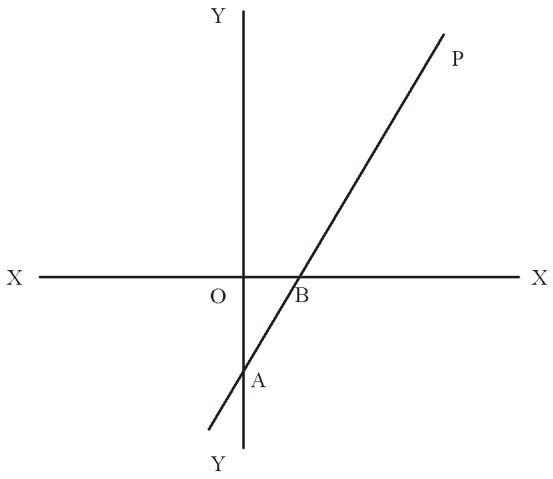
In the figure, the x-coordinate of B is 4.
   a) What is the y-coordinate of B
   b) Find the slope of AB
   c) Write the equation of AB

Questions 6 and 7 carries 4 score each. **(2 × 4 = 8)**

6. a) C (1, k) is a point on the line through the points A (3, 5) and B (5, 9). What number is k?

   b) What is the relation between x-coordinate and y-coordinate of any point on this line?

7.



In the figure, the equation of the line AB is $3x-2y-6 = 0$. This line cut the y-axis at A and x-axis at B. Also P is a point on this line.

a) What is the x-coordinate of A?

b) Write the length of OA.

c) What is the length of OB?

d) The x-coordinate and the y-coordinate of the point P are equal. Find the coordinates of P.

Questions 8 and 9 carries 5 score each. **(2 × 5 = 10)**

8. a) What is the slope of the line joining the points (2,5) and (3, 8)

   b) Write the equation of this line.

   c) If (x, y) is a point on this line, then prove that $(x + 1, y + 3)$ is again a point on the same line.

9. A circle with centre (3, 4) passes through the origin.

   a) What is the radius of this circle?

   b) If (x, y) is a point on this circle, then write the relation between x and y.

   c) Check whether the point (2, 3) is on this circle.

Unit 9

GEOMETRY AND ALGEBRA

ANSWER KEY

1. a) Centre is (5, 4)

   b) Radius = $\sqrt{(5-1)^2+(4-2)^2} = \sqrt{20} = 2\sqrt{5}$ unit

2. a) Equation of the circle is $x^2+y^2=25$

   b) (5, 0)

3. a) $\frac{k-5}{4-2} = \frac{3}{2}$

   $\therefore$ k – 5 = 3

   $\therefore$ k = 8

   b) A (2, 5), B (4, 8)

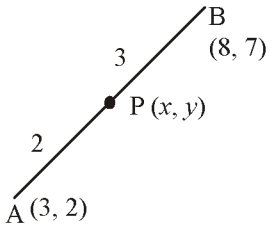
   Midpoint of AB = $\left(3, \frac{13}{2}\right)$

4. a) $\left(\frac{11}{2}, \frac{9}{2}\right)$ is another point on this line.

   b) Coordinates of P

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

   = (5, 4)



5. a) y coordinates of B = $3\sqrt{3}$

   b) Slope of AB = $\frac{3\sqrt{3}-0}{4-1} = \sqrt{3}$

   c) Equation of AB is

   $$\frac{y-0}{x-1} = \sqrt{3}$$

   $y = \sqrt{3}\ (x-1)$

   $\sqrt{3}\ x - y\ -\sqrt{3} = 0$

6. a) Slope of the line AB = $\frac{9-5}{5-3} = \frac{4}{2} = 2$

   $\therefore$ Slope of the line joining (1, k) and (3, 5) is also 2.

   $\frac{5-k}{3-1} = 2$

   5 – k = 4

   $\therefore$ k = 1

b) The relation between x-coordinate and y-coordinate of any point on the line is the equation of that line.

$\therefore$ Required relation is

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

$$y - 5 = 2x - 6$$

$$2x - y - 1 = 0$$

7. a) x coordinate of A = 0

b) OA = 3 unit

c) OB = 2 unit

d) Let the point P be (k, k) then $3k - 2k - 6 = 0$

$\therefore$ $k = 6$

8. a) Slope = $\frac{8-5}{3-2} = 3$

b) Equation of the line is

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

$$3(x-2) = y - 5$$

$$3x - y - 1 = 0$$

c) Slope of the line = $3 = {}^{3}\!/_{1}$

Hence we have, when the x-coordinate is increased by 1 and the y-coordinate is increased by 3, then the resulting point is again a point on the same line.

$\therefore$ If (x, y) is a point on this line, then $(x + 1, y+3)$ is again a point on the same line.

9. a) Radius = $\sqrt{3^2 + 4^2}$ = 5 unit

b) $(x-3)^2 + (y-4)^2 = 25$

c) Distance between (2, 3) and (3, 4)

$$= \sqrt{(3-2)^2 + (4-3)^2}$$

$$= \sqrt{2}$$

Since $\sqrt{2} < 5$, the point (2, 3) is not on the circle.

Unit 10

POLYNOMIALS

Score : 20
Time : 1hr

Questions 1 and 2 carries 2 score each. **(2 × 2 = 4)**

1. In the polynomial $x^2+kx+12$. What number must be taken as k to get a polynomial for which $(x-1)$ is a factor.
2. Prove that the polynomial x^2+x+1 cannot be factored as a product of first degree polynomials.

Each questions from 3 to 6 carries 3 score. **(4 × 3 = 12)**

3. x is a natural number.
   a) Which number added to x^2+10x to make it as a perfect square.
   b) For what number m, the polynomial $x^2+mx+64$ is a perfect square.
4. If $(x+1)$ is a factor of the second degree polynomial ax^2+bx+c, then prove that b = a + c
5. p(x) is a polynomial in x
   a) Which are the first degree factors of p(x) if p(1) = 0, p(–2) = 0 and p(2) = 0
   b) Write p(x) as a third degree polynomial.
6. p(x) = x^2-4x+2
   a) What number is p(5)
   b) Write p(x) – p(5) as the product of two first degree polynomials.

Question 7 carry 4 score. **(1 × 4 = 4)**

7. p (x) = $x^2+7x+12$
   a) Write p(x) as the product of two first degree polynomials.
   b) What are the solutions of the equation p(x) = 0?

Unit 10

POLYNOMIALS

ANSWER KEY

1. k = –13

2. $x^2+x+1 = (x-a)(x-b) = x^2-(a+b)x+ab$

   a+ b = –1, ab = 1

   $(a-b)^2 = (a+b)^2 - 4ab = (-1)^2-4\times1 = 1-4 = -3$

   We Cannot get (a – b) as a real number

   $\therefore$ x^2+x+1 cannot be factored as a product of first degree polynomials.

3. a) 25

   b) m = 16 or –16

4. Since $(x+1)$ is a factor of ax^2+bx+c

   $a(-1)^2+b(-1)+c=0$

   a – b + c = 0

   $\therefore$ b = a+c

5. a) $(x-1)$, $(x+2)$ and $(x-2)$ are first degree factors of $p(x)$

   b) $p(x) = (x-1)(x+2)(x-2)$

   $= x^2-x^2-4x+4$

6. a) $p(5) = 5^2-4\times5+2 = 7$

   b) $p(x) - p(5) = x^2-4x+2 = -7$

   $= x^2-4x-5 = (x-5)(x+1)$

7. a) $p(x) = x^2+7x+12 = (x+3)(x+4)$

   b) $p(x) = 0$

   $(x+3)(x+4) = 0$

   $x = -3, \quad x = -4$

Unit 11

STATISTICS

Score : 20
Time : 1 hr

Question 1 carry 2 score. **(1 × 2 = 2)**

1. Calculate median of the following measures

   24, 33, 16, 28, 12, 14

Questions 2 and 3 carries 4 score each. **(2 × 4 = 8)**

2. In a class, the scores of 7 students in an examination are given below.

   15, 10, 25, 16, 12, 9, 11

   a) Calculate mean of the scores?

   b) What is the median?

3. The monthly income of 35 families in a place are given in the following table.

Monthly Income (Rs.)	Number of families
5000	3
6000	7
7000	10
8000	5
9000	6
10000	4

If the families are arranged according to their monthly income

a) Which family got the median monthly income?

b) Calculate the median monthly income?

Questions 4 and 5 carries 5 score each. **(2 × 5 = 10)**

4. The following table shows the students in a class sorted according to their heights.

Heights (cm)	Number of students
145 – 150	6
150 – 155	12
155 – 160	2
160 – 165	5
165 – 170	11
170 – 175	9

If the students are arranged according to their heights.

a) Which student have the median height?

b) What is the assumed height of the 21st student?

c) Calculate the median height of the students.

5. The table below shows the children in a class sorted according to their marks in Mathematics examination.

Marks	Number of children
0 – 10	3
10 – 20	6
20 – 30	9
30 – 40	4
40 – 50	5
50 – 60	8
60 – 70	9
70 – 80	6

If the children are arranged according to their marks.

a) What is the assumed mark of the 23rd child?

b) Calculate the median mark of the class?

Unit 11

STATISTICS

ANSWER KEY

1. Ascending order of measures

12, 14, 16, 24, 28 33

$\text{Median} = \frac{16+24}{2}$

$= \frac{40}{2}$

$= 20$

2. a) $\text{Mean} = \frac{15+10+25+16+12+9+11}{7}$

$= \frac{98}{7}$

$= 14$

b) Ascending order of scores.

9, 10, 11, 12, 15, 16, 25

Median = 12

3.

Monthly Income (Rs.)	Number of families
Up to 5000	3
Up to 6000	10
Up to 7000	20
Up to 8000	25
Up to 9000	31
Up to 10000	35

a) 18^{th} family got the median monthly income

b) Median monthly income = Rs. 7000

4.

Height (cm)	Number of students
Below 150	6
Below 155	18
Below 160	20
Below 165	25
Below 170	36
Below 175	45

a) 23^{rd} student have the median height.

b) If dividing 160 – 165 into 5 equal sub classes then the size of each subdivision, $d = \frac{5}{5} = 1$

Assumed height of 21st student = $160 + \frac{d}{2}$

$= 160 + \frac{1}{2}$

$= 160\frac{1}{2}$

c) Median height = height of 23rd student

$= 160\frac{1}{2} + 2d$

$= 160\frac{1}{2} + 2 \times 1$

$= 160\frac{1}{2} + 2$

$= 162\frac{1}{2}$

5.

Marks	Number of children
Below 10	3
Below 20	9
Below 30	18
Below 40	22
Below 50	27
Below 60	35
Below 70	44
Below 80	50

a) If dividing 40 – 50 into 5 equal sub classes then the size of each subdivision $d = \frac{10}{5} = 2$

$\therefore$ Assumed mark of 23rd child = $40 + \frac{d}{2}$

$= 40 + \frac{2}{2}$

$= 40 + 1$

$= 41$

b) Mark of 25th child = $41 + 2d$

$= 41 + 2 \times 2$

$= 45$

Mark of 26th child = $45 + 2$

$= 47$

Median mark $= \frac{\text{Mark of } 25^{th} \text{ child} + \text{mark of } 26^{th} \text{ child}}{2}$

$= \frac{45+47}{2}$

$= \frac{92}{2} = 46$