Question Edited Successfully

BRINDHAVAN HIGHER SECONDARY SCHOOL, SUKKIRANPATTI

FINAL REVISION EXAMINATION 2023

10th Standard

Maths

Date : 29-Mar-23

Exam Time : 03:00:00 Hrs

Reg.No. : ☐☐☐☐☐☐

Total Marks : 100

PART-A

14 x 1 = 14

CHOOSE THE CORRECT ANSWER

1) The range of the relation R = {(x, x^2) |x is a prime number less than 13} is
(a) {2,3,5,7} (b) {2,3,5,7,11} (c) {4,9,25,49,121} (d) {1,4,9,25,49,121}

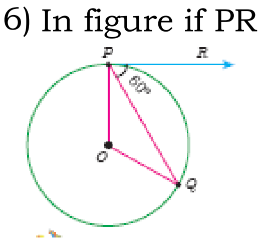
2) If g = {(1,1), (2,3), (3,5), (4,7)} is a function given by g(x) = αx + β then the values of α and β are
(a) (-1,2) (b) (2,-1) (c) (-1,-2) (d) (1,2)

3) The number of points of intersection of the quadratic polynomial $x^2 + 4x + 4$ with the X axis is
(a) 0 (b) 1 (c) 0 or 1 (d) 2

4) If A = 2^{65} and B = $2^{64} + 2^{63} + 2^{62} + ... + 2^0$ Which of the following is true?
(a) B is 2^{64} more than A (b) A and B are equal (c) B is larger than A by 1 (d) A is larger than B by 1

5) Find the matrix X if $2X + \begin{pmatrix} 1 & 3 \\ 5 & 7 \end{pmatrix} = \begin{pmatrix} 5 & 7 \\ 9 & 5 \end{pmatrix}$
(a) $\begin{pmatrix} -2 & -2 \\ 2 & -1 \end{pmatrix}$ (b) $\begin{pmatrix} 2 & 2 \\ 2 & -1 \end{pmatrix}$ (c) $\begin{pmatrix} 1 & 2 \\ 2 & 2 \end{pmatrix}$ (d) $\begin{pmatrix} 2 & 1 \\ 2 & 2 \end{pmatrix}$

6) In figure if PR is tangent to the circle at P and O is the centre of the circle, then $\angle PQR$ is



(a) 120° (b) 100° (c) 110° (d) 90°

7) The mean of 100 observations is 40 and their standard deviation is 3. The sum of squares of all observations is
(a) 40000 (b) 160900 (c) 160000 (d) 30000

8) tan θ cosec$^2\theta$ - tanθ is equal to
(a) secθ (b) $cot^2\theta$ (c) sinθ (d) $cot\theta$

9) If A is a point on the Y axis whose ordinate is 8 and B is a point on the X axis whose abscissae is 5 then the equation of the line AB is
(a) 8x + 5y = 40 (b) 8x - 5y = 40 (c) x = 8 (d) y = 5

10) The volume (in cm^3) of the greatest sphere that can be cut off from a cylindrical log of wood of base radius 1 cm and height 5 cm is
(a) $\frac{4}{3}\pi$ (b) $\frac{10}{3}\pi$ (c) 5π (d) $\frac{20}{3}\pi$

11) Axis of symmetry in the term of vertical line seperates parabola into ___________
(a) 3 equal halves (b) 5 equal halves (c) 2 equal halves (d) 4 equal halves

12) 44 ≡ 8 (mod12), 113 ≡ 5 (mod 12), thus 44 x 113 ≡______(mod 12):
(a) 4 (b) 3 (c) 2 (d) 1

13) In a competition containing two events A and B, the probability of winning the events A and B are $\frac{1}{3}$ and $\frac{1}{4}$ respectively and the probability if winning both events is ___________
(a) $\frac{1}{12}$ (b) $\frac{5}{12}$ (c) $\frac{1}{12}$ (d) $\frac{7}{12}$

14) Find the value of 'a' if the lines 7y = ax + 4 and 2y = 3 - x are parallel
(a) $\frac{7}{2}$ (b) $-\frac{2}{7}$ (c) $\frac{2}{7}$ (d) $-\frac{7}{2}$

PART-B

10 x 2 = 20

ANSWER THE ANY 10 QUESTIONS.QUESTION NO.28 IS COMPULSORY

15) Show that the function f: N ⟶ N defined by f(m) = $m^2 + m + 3$ is one-one function.

16) If f(x) = 2x - 1, g(x) = $\frac{x+1}{2}$, show that f o g = g o f = x.

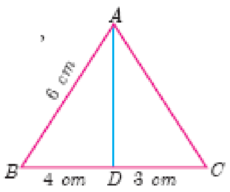
17) Today is Tuesday. My uncle will come after 45 days. In which day my uncle will be coming?

18) Find the sum of
$1^3 + 2^3 + 3^3 + .. + 16^3$

19) If the difference between the roots of the equation $x^2 - 13x + k = 0$ is 17. find k

20) Construct a 3 x 3 matrix whose elements are $a_{ij} = i^2j^2$

21) In the figure, AD is the bisector of ∠A. If BD = 4 cm, DC = 3 cm and AB = 6 cm, find AC.



22) Find the equation of a straight line which has Slope $\frac{-5}{4}$ passing through the point (–1, 2).

23) Find the area of the triangle formed by the points (1, –1), (–4, 6) and (–3, –5)

24) prove that $\sqrt{\frac{1+cos\theta}{1-cos\theta}}$ = cosec θ + cotθ

25) If the base area of a hemispherical solid is 1386 sq. metres, then find its total surface area?

26) The standard deviation and mean of a data are 6.5 and 12.5 respectively. Find the coefficient of variation.

27) If P(A) = $\frac{2}{3}$, P(B) = $\frac{2}{5}$, P(A U B) = $\frac{1}{3}$ then find P(A ∩ B).

28) The curved surface area of a right circular cylinder of height 14 cm is 88 cm^2. Find the diameter of the base of the cylinder

PART-C 10 x 5 = 50

ANSWER THE ANY 10 QUESTIONS.QUESTION NO.42 IS COMPULSORY

29) A function f: [-5,9] ⟶ R is defined as follows:

$$f(x) = \begin{cases} 6x+1 & \text{if } -5 \leq x < 2 \\ 5x^2-1 & \text{if } 2 \leq x < 6 \\ 3x-4 & \text{if } 6 \leq x \leq 9 \end{cases}$$

Find
i) f(-3) + f(2)
ii) f(7) - f(1)
iii) 2f(4) + f(8)
iv) $\frac{2f(-2)-f(6)}{f(4)+f(-2)}$

30) Find the greatest number consisting of 6 digits which is exactly divisible by 24,15,36?

31) Find the sum to n terms of the series 5 + 55 + 555 +...

32) If A = $\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ show that A^2 - 5A + $7I_2$ = 0

33) Find the square root of $64x^4 - 16x^3 + 17x^2 - 2x + 1$

34) Show that in a triangle, the medians are concurrent.

35) Find the area of the quadrilateral whose vertices are at (–9, –2), (–8, –4), (2, 2) and (1, –3)

36) A(-3, 0) B(10, - 2) and C(12, 3) are the vertices of ΔABC. Find the equation of the altitude through A and B.

37) The internal and external radii of a hollow hemispherical shell are 3 m and 5 m respectively. Find the T.S.A. and C.S.A. of the shell.

38) A wall clock strikes the bell once at 1 o' clock, 2 times at 2 o' clock, 3 times at 3 o' clock and so on. How many times will it strike in a particular day. Find the standard deviation of the number of strikes the bell make a day.

39) Two ships are sailing in the sea on either sides of a lighthouse as observed from the ships are 30° and 45° respectively. if the lighthouse is 200 m high,find the distance between the two ships. $(\sqrt{3} = 1.732)$

40) A vessel is in the form of a hemispherical bowl mounted by a hollow cylinder. The diameter is 14 cm and the height of the vessel is 13 cm. Find the capacity of the vessel.

41) Three fair coins are tossed together. Find the probability of getting
(i) all heads
(ii) atleast one tail
(iii) atmost one head
(iv) atmost two tails

42) A car left 30 minures later than the scheduled time. In order to reach its destination 150 km away in time, it has to increase its speed by 25 km/br from its usual speed. Find its usual speed

43) a) Draw a circle of diameter 6 cm from a point P, which is 8 cm away from its centre. Draw the two tangents PA and PB to the circle and measure their lengths.

(OR)

b) Construct a △PQR which the base PQ = 4.5 cm,∠R = 35°and the median RG from R to PG is 6 cm

44) a) Nishanth is the winner in a Marathon race of 12 km distance. He ran at the uniform speed of 12 km/hr and reached the destination in 1 hour. He was followed by Aradhana, Ponmozhi, Jeyanth, Sathya and Swetha with their respective speed of 6 km/hr, 4 km/hr, 3 km/hr and 2 km/hr. And, they covered the distance in 2 hrs, 3 hrs, 4 hrs and 6 hours respectively. Draw the speed-time graph and use it to find the time taken to Kaushik with his speed of 2.4 km/hr.

(OR)

b) Discuss the nature of solutions of the following quadratic equations.
$x^2 - 8x + 16 = 0$

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BRINDHAVAN HIGHER SECONDARY SCHOOL, SUKKIRANPATTI

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5) Find the matrix X if 2X + $\begin{pmatrix} 1 & 3 \\ 5 & 7 \end{pmatrix} = \begin{pmatrix} 5 & 7 \\ 9 & 5 \end{pmatrix}$
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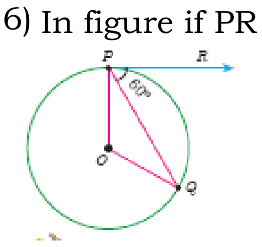

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PART-B

10 x 2 = 20

ANSWER THE ANY 10 QUESTIONS.QUESTION NO.28 IS COMPULSORY

15) Show that the function f: N ⟶ N defined by f(m) = $m^2 + m + 3$ is one-one function.
Answer : f(m) = $m^2 + m + 3$
when m = 1, f(1) = $1^2 + 1 + 3 = 5$
when m = 2 f(2) = $2^2 + 2 + 3 = 9$
when m = 3 f(3) = $3^2 + 3 + 3 = 15$ and so on.
Clearly, A function for which every element of the range of the function corresponds to exactly one element of the domain .

So, it is one-to-one function.

16) Today is Tuesday. My uncle will come after 45 days. In which day my uncle will be coming?

Answer : Starting from Tuesday we have to calculate the day after 45 days
The number for Tuesday is 2.
2 + 45 (mod 7) ≡ 47 (mod 7)
≡ 5 (mod 7)
Number 5 stands for Friday.
Uncle will be coming on Friday.

17) Find the sum of
$1^3 + 2^3 + 3^3 + .. + 16^3$

Answer : $1^3 + 2^3 + 3^3 + ... + 16^3 = \left[\frac{16\times(16+1)}{2}\right]^2 = (136)^2 = 18496$

18) If f(x) = 2x - 1, $g(x) = \frac{x+1}{2}$, show that f o g = g o f = x.

Answer : f(x) = 2x - 1, $g(x) = \frac{x+1}{2}$

$f \circ g(x) = f(g(x)) = f\left(\frac{x+1}{2}\right) = 2\left(\frac{x+1}{2}\right) - 1 = x + 1 - 1 = x$

$gof(x) = g(f(x)) = g(2x - 1) = \frac{2x-1+1}{2}$

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

f o g = g o f = x
Hence proved.

19) If the difference between the roots of the equation $x^2 - 13x + k = 0$ is 17. find k

Answer : $x^2 - 13x + k = 0$ here, a = 1, b = -13, c = k
Let α, β be the roots of the equation. Then
$\alpha + \beta = \frac{-b}{a} = \frac{-(-13)}{1} = 13$ ...... (1) also α - β = 17 ......(2)
(1) + (2) we get, 2α = 30 gives α = 15
Therefore, 15 + β = 13 (from (1)) gives β = -2
But, $\alpha\beta = \frac{c}{a} = \frac{k}{1}$ gives 15 x (-2) = k we get, k = -30

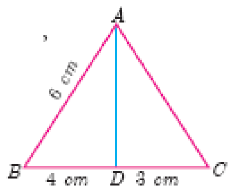
20) Construct a 3 x 3 matrix whose elements are $a_{ij} = i^2j^2$

Answer : The general 3 x 3 matrix is given by $A = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}$ $a_{ij} = i^2j^2$

$a_{11} = 1^2 \times 1^2 = 1 \times 1 = 1$; $a_{12} = 1^2 \times 2^2 = 1 \times 4 = 4$; $a_{13} = 1^2 \times 3^2 = 1 \times 9 = 9$
$a_{21} = 2^2 \times 1^2 = 2 \times 1 = 2$; $a_{22} = 2^2 \times 2^2 = 4 \times 4 = 16$; $a_{23} = 2^2 \times 3^2 = 4 \times 9 = 36$
$a_{31} = 3^2 \times 1^2 = 3 \times 1 = 3$; $a_{32} = 3^2 \times 2^2 = 9 \times 4 = 36$; $a_{33} = 3^2 \times 3^2 = 9 \times 9 = 81$

Hence the required matrix is $A = \begin{pmatrix} 1 & 4 & 9 \\ 4 & 16 & 36 \\ 9 & 36 & 81 \end{pmatrix}$

21) In the figure, AD is the bisector of ∠A. If BD = 4 cm, DC = 3 cm and AB = 6 cm, find AC.



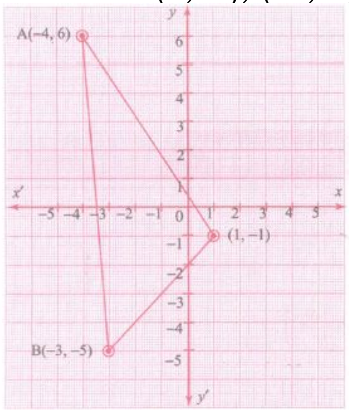
Answer : In △ABC, AD is the bisector of ∠A
Therefore by Angle Bisector of ∠A
$\frac{AB}{AC} = \frac{BD}{DC}$
$\frac{4}{3} = \frac{6}{AC}$ gives 4AC = 18. Hence, $AC = \frac{9}{2} = 4.5$ cm

22) Find the equation of a straight line which has Slope $\frac{-5}{4}$ passing through the point (–1, 2).

Answer : Given point (- 1,2), Slope $m = -\frac{5}{4}$
Equation of the line passing through (x_1, y_1) and having slope 'm' is
$y - y_1 = m(x - x_1)$
$y - 2 = -\frac{5}{4}(x + 1)$
4y - 8 = -5x - 5
5x + 4y - 3 = 0

23) Find the area of the triangle formed by the points (1, –1), (–4, 6) and (–3, –5)

Answer : (1,–1), (–4, 6) and (–3, –5)



A(-4, 6), B(-3, -5), C(1, -1)

Area of triangle ABC $= \frac{1}{2}[(x_1y_2 + x_2y_3 + x_3y_1) - (x_2y_1 + x_3y_2 + x_1y_3)]$

$= \frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$ sq. units

$= \frac{1}{2}[-4(-5+1) - 3(-1-6) + 1(6+5)]$

$= \frac{1}{2}[-4 \times (-4) - 3 \times (-7) + 1 \times (11)]$

$= \frac{1}{2}[16 + 21 + 11]$

$= \frac{1}{2}(48) = 24$ sq. units.

24) prove that $\sqrt{\frac{1+cos\theta}{1-cos\theta}}$ = cosec θ + cotθ

Answer : $\sqrt{\frac{1+cos\theta}{1-cos\theta}} = \sqrt{\frac{1+cos\theta}{1-cos\theta} \times \frac{1+cos\theta}{1+cos\theta}}$ [multiply numerator and denominator by the conjugate of 1 - cosθ]

$= \sqrt{\frac{(1+cos\theta)^2}{(1-cos\theta)^2}} = \frac{1+cos\theta}{\sqrt{sin^2\theta}}$ [since $\sin^2\theta + \cos^2\theta = 1$]

$= \frac{1+cos\theta}{sin\theta} = cosec\theta + cot\theta$

25) The curved surface area of a right circular cylinder of height 14 cm is 88 cm^2. Find the diameter of the base of the cylinder

Answer : Radius of the cylinder = r cm

Height 'h' = 14 cm

C.S.A $= 2\pi rh$ sq. units

$\therefore 2\pi rh = 88$

$2 \times \frac{22}{7} \times r \times 14 = 88$

r = cm

Diameterof the base = 2 x 1 = 2cm

26) The standard deviation and mean of a data are 6.5 and 12.5 respectively. Find the coefficient of variation.

Answer : Standard deviation $\sigma = 6.5$

Mean $\bar{x} = 12.5$

Coefficient of variation C.V $= \frac{\sigma}{x} \times 100\%$

$= \frac{6.5}{12.5} \times 100\%$

$= \frac{65}{125} \times 100\%$

$= \frac{13}{25} \times 100\%$

= 52 %

Co-efficient of variation is 52%

27) If P(A) = $\frac{2}{3}$, P(B) = $\frac{2}{5}$, P(A U B) = $\frac{1}{3}$ then find P(A ∩ B).

Answer : $\text{P}(A \cup B) = \text{P(A)} + \text{P(B)} - \text{P}(A \cap B)$

$\frac{1}{3} = \frac{2}{3} + \frac{2}{5} - \text{P}(A \cap B)$

$\text{P}(A \cap B) = \frac{2}{3} + \frac{2}{5} - \frac{1}{3}$

$\text{P}(A \cap B) = \frac{10+6-5}{15} = \frac{16-5}{15} = \frac{11}{15}$

28) If the base area of a hemispherical solid is 1386 sq. metres, then find its total surface area?

Answer : Let r be the radius of the hemisphere.

Given that, base area = πr^2 = 1386 sq. m

T.S.A. = 3 πr^2 sq.m

= 3 x 1386 = 4158

Therefore, T.S.A. of the hemispherical solid is 4158 m^2.

PART-C 10 x 5 = 50

ANSWER THE ANY 10 QUESTIONS.QUESTION NO.42 IS COMPULSORY

29) A function f: [-5,9] ⟶ R is defined as follows:

$$f(x) = \begin{cases} 6x+1 & \text{if } -5 \le x < 2 \\ 5x^2 - 1 & \text{if } 2 \le x < 6 \\ 3x - 4 & \text{if } 6 \le x \le 9 \end{cases}$$

Find

i) f(-3) + f(2)

ii) f(7) - f(1)

iii) 2f(4) + f(8)

iv) $\frac{2f(-2)-f(6)}{f(4)+f(-2)}$

Answer : f: [-5,9] ⟶ R

(i) f(-3) + f(2)
= [6(-3) + 1] + [5(2)^2 - 1]
= (-18 + 1) + (20 - 1)
= -17 + 19 = 2.

(ii) f(7) - f(1)
= [3(7) - 4] - [6(1) + 1]
= (21 - 4) - (6 + 1)
=17 - 7 = 10

(iii) 2 f(4) + f(8)
= 2 [5(4)^2 - 1] + [3(8) - 4]
= 2[80 - 1] + [24 - 4]
= 158 + 20 = 178

(iv) $\frac{2f(-2)-f(6)}{f(4)+f(-2)}$

f(-2) = 6x + 1 = 6(-2) + 1 = -11
f(6) = 3x - 4 = 3(6) - 4 = 14
f(4) = 5x^2 - 1 = 5(4^2) - 1 = 79
f(-2) = 6x + 1 = 6(-2) + 1 =-11

$\frac{2f(-2)-f(6)}{f(4)+f(-2)} = \frac{2(-11)-14}{79+(-11)} = \frac{-22-14}{68}$

= $\frac{-36}{68} = \frac{-9}{17}$

30) Find the greatest number consisting of 6 digits which is exactly divisible by 24,15,36?

Answer :

3	24, 15, 36
2	8, 5, 12
2	4, 5, 6
	2, 5, 3

L.C.M.= 3 x 2 x 2 x 5 x 3 = 360
Greatest number of 6 digit is 999999
L.C.M. of 24,15 and 36 = 360

```
          2777
    360 | 999999
          720
          2799
          2520
           2799
           2520
            2799
            2520
             279
```

On dividing 999999 by 360 remainder obtained is 279.
Greatest number of 6 digit, divisible by 24,15 and 36 = 999999 - 279 = 999720
Hence the required number is = 999720

31) If A = $\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ show that A^2 - 5A + 7I$_2$ = 0

Answer : $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$

A^2 = A.A

$= \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$

$= \begin{bmatrix} 9-1 & 3+2 \\ -3-2 & -1+4 \end{bmatrix} = \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix}$

$5A = 5\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} 15 & 5 \\ -5 & 10 \end{bmatrix}$

$7I_2 = 7\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$

$\therefore A^2 - 5A + 7I_2 = \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix} - \begin{bmatrix} 15 & 5 \\ -5 & 10 \end{bmatrix} + \begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$

$= \begin{bmatrix} 8-15+7 & 5-5+0 \\ -5+5+0 & 3-10+7 \end{bmatrix}$

$= \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} = 0$

Hence Proved.

32) Find the sum to n terms of the series 5 + 55 + 555 +...

Answer : The series is neither Arithmetic nor Geometric series. So it can be split into two series and then find the sum.

5 + 55 + 555 + ... + n terms = 5 [1 + 11 + 111 + ...n terms]

= $\frac{5}{9}$ [9 + 99 + 999 +...+ n terms]

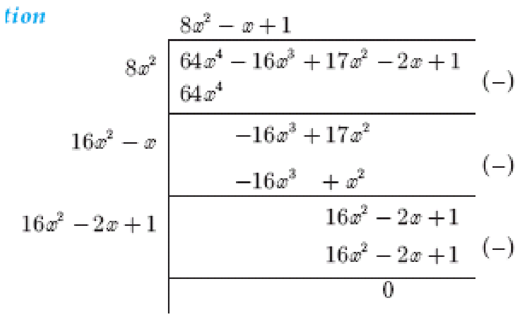
= $\frac{5}{9}$[(10 - 1) + (100 - 1) + (1000 - 1) +...+ n terms]

= $\frac{5}{9}$[10 + 100 + 1000 +...+ n terms)-n]

= $\frac{5}{9}\left[\frac{10(10^n-1)}{(10-1)} - n\right] = \frac{50(10^n-1)}{81} = \frac{5n}{9}$

33) Find the square root of $64x^4 - 16x^3 + 17x^2 - 2x + 1$

Answer :



Therefore, $\sqrt{64x^2 - 16x^3 + 17x^2 - 2x + 1}$ = $|8x^2 - x + 1|$

34) Show that in a triangle, the medians are concurrent.

Answer : Medians are line segments joining each vertex to the midpoint of the corresponding opposite sides.

Thus medians are the cevians where D, E, F are midpoints of BC, CA and AB respectively

Since D is a midpoint of BC, BD = DC so $\frac{BD}{DC} = 1$ ..(1)

Since, E is a midpoint of CA, CE = EA so $\frac{CE}{EA} = 1$ ..(2)

Since, F is a midpoint of AB, AF FB so $\frac{AF}{FB} = 1$ ...(3)

Thus, multiplying (1), (2) and (3) we get,

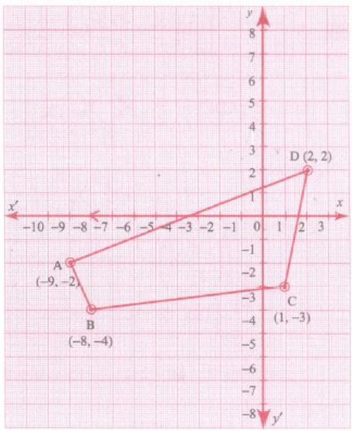
$\frac{BD}{DC} \times \frac{CE}{EA} \times \frac{AF}{FB} = 1 \times 1 \times 1 = 1$

And so, Ceva's theorem is satisfied.

Hence the Medians are concurrent.

35) Find the area of the quadrilateral whose vertices are at (–9, –2), (–8, –4), (2, 2) and (1, –3)

Answer :



Given vertices are A (–9, –2), B(–8, –4), C(1, –3) and D(2, 2)

Area of the Quadrilateral ABCD

$= \frac{1}{2}[(x_1y_2 + x_2y_3 + x_3y_4 + x_4y_1) - (x_2y_1 + x_3y_2 + x_4y_3 + x_1y_4)]\ sq.units$

= $\frac{1}{2}$ [(- 9) (- 4) + (- 8) (-3) + (1) (2) + (2) (- 2)] - [(- 8) (- 2) + (1) (- 4) + (2) (-3) + (- 9) (2)]

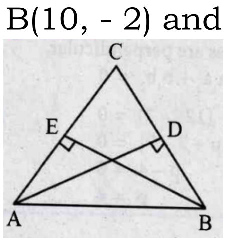
= $\frac{1}{2}$ [(36 + 24 + 2 - 4)- (16 - 4 - 6 - 18)]

= $\frac{1}{2}$ [58 - (-12)] = $\frac{1}{2}$ [70] = 35 sq. units

Area of quadrilateral = 35 sq. units.

36) A(-3, 0) B(10, - 2) and C(12, 3) are the vertices of ΔABC. Find the equation of the altitude through A and B.

Answer :



Given vertices are A(- 3, 0), B(10, - 2) and, C(12, 3).

Slope of BC = $\frac{y_1-y_2}{x_1-x_2} = \frac{-2-3}{10-12} = \frac{-5}{-2} = \frac{5}{2}$

Altitude AD is perpendicular to BC and passing through A(- 3, 0)

Slope of AD = $-\frac{2}{5}$

Equation of AD $y - y_1 = m(x - x_1)$

$y - 0 = -\frac{2}{5}(x + 3)$

5y = -2x - 6

2x + 5y + 6 = 0

Slope of AC $= \frac{y_1-y_2}{x_1-x_2} = \frac{0-3}{-3-12} = \frac{-3}{-15} = \frac{1}{5}$

Altitude BE is perpendicular to AC and passing through B(10, - 2). Slope of BE = 5

Equation of BE $y - y_1 = m(x - x_1)$

y + 2 = - 5(x - 10)

y + 2 = -5x + 50

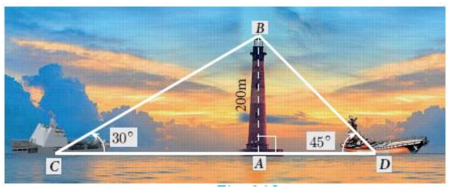
5x + y - 48 = 0

37) The internal and external radii of a hollow hemispherical shell are 3 m and 5 m respectively. Find the T.S.A. and C.S.A. of the shell.

Answer : Let the internal and external radii of the hemispherical shell be r and R respectively.
Given that, R = 5 m, r = 3 m
C.S.A. of the shell = $2\pi(R^2 + r^2)$ sq. units
$= 2 \times \frac{22}{7} \times (25 + 9) = 213.71$
T.S.A. of the shell = $\pi(3R^2 + r^2)$ sq. units
$= \frac{22}{7}(75 + 9) = 264$
Therefore, C.S.A. = 213.71 m^2 and T.S.A. = 264 m^2.

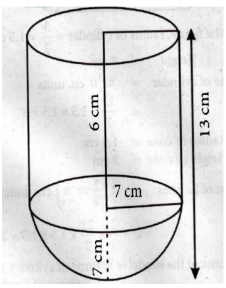
38) A wall clock strikes the bell once at 1 o' clock, 2 times at 2 o' clock, 3 times at 3 o' clock and so on. How many times will it strike in a particular day. Find the standard deviation of the number of strikes the bell make a day.
Answer : Clock strikes once at 1, twice at 2, thrice at 3 and so on.
But it only strikes 12 times at most and then it repeats. So, Number of times clock strikes = 2(1 + 2 + 3 + 4 + 5 + 6 +7 + 8 + 9 + 10 + 11 + 12)
= 78 x 2 = 156 times.
In a particular day the clock strikes 156 times.
Also standard deviation for first n natural numbers is $\sqrt{\frac{n^2-1}{12}}$
Standard deviation of the number of strikes
$= 2\sqrt{\frac{n^2-1}{12}}$
$= 2\sqrt{\frac{12^2-1}{12}} = 2\sqrt{\frac{144-1}{12}}$
$= 2\sqrt{\frac{143}{12}} = 2\sqrt{11.92}$
= 2 x 3.45 = 6.9
Standard deviation of the number of strikes the bell make a day = 6.9

39) Two ships are sailing in the sea on either sides of a lighthouse as observed from the ships are 30° and 45° respectively. if the lighthouse is 200 m high,find the distance between the two ships. $(\sqrt{3} = 1.732)$

Answer : 

Let AB the lighthouse. Let C and D be the positions of the two ships. ×
Then, AB = 200m.
$\angle ACB = 30^\circ, \angle ADB = 45^\circ$
In right triangles BAC, tan30°= $\frac{AB}{Ac}$
$\frac{1}{\sqrt{3}} = \frac{200}{AC}$ *gives* $AC = 200\sqrt{3}$ ...(1)
In the right triangle BAD,tan45°= $\frac{AB}{AD}$
$1 = \frac{200}{AD}$ gives AD = 200 ...(2)
Now, CD = AC + AD = $200\sqrt{3} + 200$ [by(1) and (2)]
CD = $200(\sqrt{3} + 1)$ = 200 x 2.732 = 546.4
Distance between two ships is 546.4m

40) A vessel is in the form of a hemispherical bowl mounted by a hollow cylinder. The diameter is 14 cm and the height of the vessel is 13 cm. Find the capacity of the vessel.

Answer : 

Diameter of the bowl = 14 cm
Radius r = 7 cm
Volume of hemisphere $= \frac{2}{3}\pi r^3$ cu. units
$= \frac{2}{3} \times \frac{22}{7} \times 7 \times 7 \times 7$
$= \frac{2156}{3} = 1718.67\ \text{cm}^3$
Radius of cylinder 'r' = 7 cm
Height 'h' = 6 cm
Volume of cylinder $= \pi r^2 h$ cu. units
$= \frac{22}{7} \times 7 \times 7 \times 6$
= 924 cm^3
capacity of the vessel = Volume of hemisphere + Volume of cylinder
= 718.67 + 924
= 1642.67 cm^3

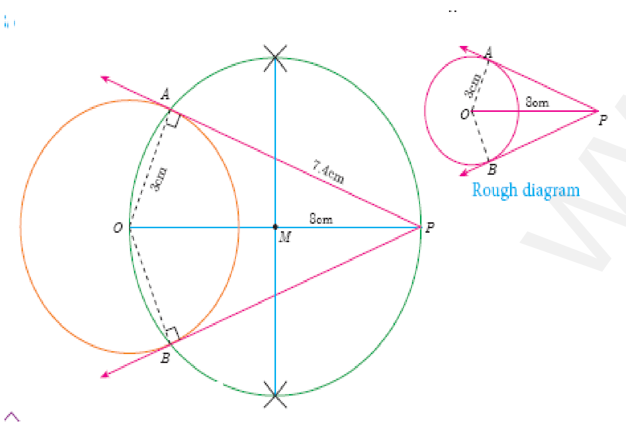
41) Three fair coins are tossed together. Find the probability of getting
(i) all heads
(ii) atleast one tail

(iii) atmost one head
(iv) atmost two tails
Answer : When three fair coins are tossed together, the sample space
S = {(HHH), (THH), (HTH),(HHT), (TTH), (THT), (HTT), (TTT)}
N(s) = 8
(i) Let A be the event of getting all heads
A = {HHH}
n(A) = 1
$P(A) = \frac{n(A)}{n(S)} = \frac{1}{8}$
(ii) Let B be the event of getting atleast one tail
B = {HHT, HTH, HTT, THH, THT, TTH, TTT}
n(B) = 7
$\text{P(B)} = \frac{n(B)}{n(S)} = \frac{7}{8}$
(iii) Let C be the event of getting atmost one head
C = {HTT, THT, TTH, TTT}
n(C) = 4
$\text{P(C)} = \frac{n(C)}{n(S)} = \frac{4}{8} = \frac{1}{2}$
(iv) Let D be the event of getting atmost two tails
P = {HHH, HHT, HTH, HTT, THH, THT, TTH}
n(D) = 7
$\text{P(D)} = \frac{n(D)}{n(S)} = \frac{7}{8}$

42) A car left 30 minures later than the scheduled time. In order to reach its destination 150 km away in time, it has to increase its speed by 25 km/br from its usual speed. Find its usual speed
Answer : Usual speed = x km/hr
After increasing speed = x + 25 km/hr
Distance = 150 km
$\text{Time} = \frac{\text{Distance}}{\text{speed}}$
$\frac{150}{x} - \frac{150}{x+25} = \frac{1}{2}hr \left[\because 30 \text{ min} = \frac{1}{2}hr\right]$
$150x + \frac{150 \times 25}{x(x+25)} - 150x = \frac{1}{2}$
$150 \times 25 \times 2 = x(x+25)$
$7500 = x^2 + 25x$
$x^2 + 25x - 750 = 0$
$(x-75)(x+100) = 0$
$x = 75 \text{ (or) } x = -100$
x is +ve
x = 75km/hr
speed = 75 km/hr

43) a) Draw a circle of diameter 6 cm from a point P, which is 8 cm away from its centre. Draw the two tangents PA and PB to the circle and measure their lengths.

Answer : Given, diameter (d) = 6 cm, we find radius $(r) = \frac{6}{2} = 3cm$

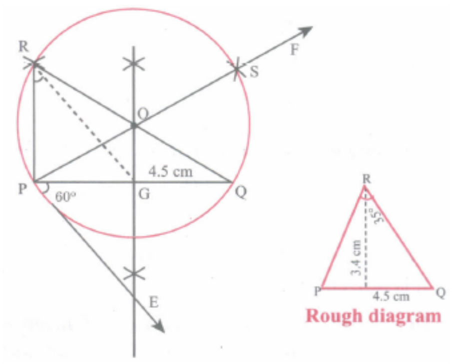


Construction
Step 1: With centre at O, draw a circle of radius 3 cm.
Step 2: Draw a line OP of length 8 cm.
Step 3: Draw a perpendicular bisector of OP, which cuts OP at M.
Step 4: With M as centre and MO as radius, draw a circle which cuts previous circle at A and B.
Step5: Join AP and BP. AP and BP are the required tangents. Thus length of the tangents are PA = PB = 7.4 cm.
Verification : In the right angle triangle OAP,$PA^2 = OP^2 - OA^2$ = 64 -9 = 55
$PA = \sqrt{55} =$7.4 cm (approximately) .

(OR)

b) Construct a △PQR which the base PQ = 4.5 cm,∠R = $35^o$and the median RG from R to PG is 6 cm

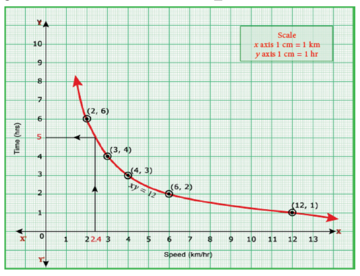
Answer :



Construction:
Step (1) Draw a line segment PQ = 4.5 cm
Step (2) At P, draw PE such that $\angle QPE = 35^0$
Step (3) At P, draw PF such that $\angle EPF = 90^0$
Step (4) Draw $\perp$ bisector to PQ which intersects PF at O.
Step (5) With O centre OP as raidus draw a circle.
Step (6) From G, marked arcs of radius 6 cm on the circle marked them as R and S.
Step (7) foined PR and RQ. Then $\triangle$PQR is the required triangle
Step (8) $\triangle$PQS is the required triangle

44) a) Nishanth is the winner in a Marathon race of 12 km distance. He ran at the uniform speed of 12 km/hr and reached the destination in 1 hour. He was followed by Aradhana, Ponmozhi, Jeyanth, Sathya and Swetha with their respective speed of 6 km/hr, 4 km/hr, 3 km/hr and 2 km/hr. And, they covered the distance in 2 hrs, 3 hrs, 4 hrs and 6 hours respectively. Draw the speed-time graph and use it to find the time taken to Kaushik with his speed of 2.4 km/hr.

Answer :



Let us form the table with the given details.

Speed x(**km/hr**)	12	6	4	3	2
Time y (hours)	1	2	3	4	6

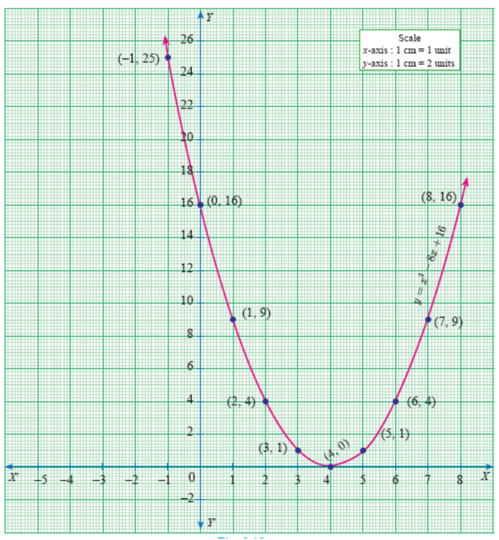
From the table, we observe that as x decreases, y increases. Hence, the type is inverse variation.
Let $y = \frac{k}{x}$
⇒ xy = k, k > 0 is called the constant of variation.
From the table k = 12 x 1 = 6 x 2 = ...
= 2 x 6 = 12
Therefore, xy = 12.
Plot the points (12,1), (6,2), (4,3), (3,4), (2,6) and join these points by a smooth curve (Rectangular Hyperbola).
From the graph, we observe that Kaushik takes 5 hrs with a speed of 2.4 km/hr.

(OR)

b) Discuss the nature of solutions of the following quadratic equations.
$x^2 - 8x + 16 = 0$
Answer : $x^2 - 8x + 16 = 0$
Step 1 Prepare the table of values for the equation $y = x^2 - 8x + 16$

x	-1	0	1	2	3	4	5	6	7	8
y	25	16	9	4	1	0	1	4	9	16

Step 2: Plot the points for the above ordered pairs (x, y) on the graph using suitable scale.



Step 3: Draw the parabola and mark the coordinates of the parabola which intersect with the X axis.
Step 4: The roots of the equation are the x coordinates of the intersecting points of the parabola with the X axis (4,0) which is 4.
Since there is only one point of intersection with X axis, the quadratic equation $x^2 - 8x + 16 = 0$ has real and equal roots.