MOUNT CARMEL MISSION
MATRIC. HR. SEC. SCHOOL
CARMEL NAGAR,
KALLAKURICHI.

CLASS : 10

Register Number

SECOND REVISION EXAMINATION, MARCH - 2023

Time Allowed : 3.00 Hours] **MATHEMATICS** [Max. Marks : 100

PART-A

Answer all the questions. $14 \times 1 = 14$

1. If there are 1024 relations from a set A {1,2,3,4,5} to a set B, then the number of elements in a B is
   a. 3 b. 2 c. 4 d. 8
2. If $g = \{(1,1),(2,3),(3,5),(4,7)\}$ is a function given by $g(x) = \alpha x + \beta$ then the values of α and β are
   a. -1,2 b. 2,-1 c. -1,-2 d. 1,2
3. The 20th term of the AP 3,8,13, ... is
   a. 95 b. 93 c. 98 d. 90
4. $(1^3 + 2^3 + 3^3 + \ldots\ldots + 15^3) - (1 + 2 + 3 + \ldots\ldots + 15)$
   a. 14400 b. 14200 c. 14280 d. 14520
5. The square root of $\frac{256x^6y^4z^{10}}{25x^6y^6z^6}$
   a. $\frac{16}{5}\left|\frac{x^2z^4}{y^2}\right|$ b. $16\left|\frac{y^2}{x^2z^4}\right|$ c. $\frac{16}{5}\left|\frac{y}{xz^2}\right|$ d. $\frac{16}{5}\left|\frac{xz^2}{y}\right|$
6. 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. $\begin{pmatrix} 2 & 1 \\ 2 & 2 \end{pmatrix}$
7. If in ΔABC $DE || BC$, AB=3.6 cm, AC = 2.4 cm and AD = 2.1 cm
   a. 1.4 cm b. 1.8 cm c. 1.2 cm d. 1.05 cm
8. The perimeters of two similar triangle ΔABC and ΔPQR are 36 cm and 24 cm respectively. If PQ=10 cm then the length of AB is
   a. $6\frac{2}{3}$cm b. $\frac{10\sqrt{6}}{3}$cm c. $66\frac{2}{3}$cm d. 15 cm
9. If A is a point on the y-axis whose ordinate is 8 and B is a point of the x-axis whose abscissa 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. When proving that a quadrilateral is a parallelogram by using slopes you must find
    a. the slopes of two sides b. the slopes of two pair of opposite sides
    c. the lengths of all sides d. both the lengths and slopes of two sides
11. $(1 + \tan\theta + \sec\theta)(1 + \cot\theta - \operatorname{cosec}\theta)$ is equal to
    a. 0 b. 1 c. 2 d. -1
12. The total surface are of a cylinder whose radius is 1/3 of its height is
    a. $\frac{9\pi h^2}{8}$sq.units b. $24\pi h^2$sq.units c. $\frac{8\pi h^2}{9}$sq.units d. $\frac{56\pi h^2}{9}$sq.units
13. For any set of numbers with n elements $(\sum x) - \bar{x} =$
    a. $n\bar{x}$ b. $(n-2)\bar{x}$ c. $(n-1)\bar{x}$ d. 0
14. If the standard deviation of x, y, z is p then the standard deviation of $3x + 5, 3y + 5, 3x + 5$ is
    a. $3p + 5$ b. $3p$ c. $p + 5$ d. $9p + 15$

PART-B

Answer any 10 questions. Question number 28 is compulsory. $10 \times 2 = 20$

15. If $X = \{-5,1,3,4\}$ and $Y = \{a,b,c\}$ then which of the following relations are functions from x to y. (i) $R_1 = \{(-5,a),(1,a),(3,b)\}$ (ii) $R_2 = \{(-5,b),(1,b),(3,a),(4,c)\}$
16. Find the value of k if $f(x) = 3x + 2, g(x) = 6x - k$ such that $f \circ g = g \circ f$
17. Prove that two consecutive positive integers or always co-primes.
18. If $3 + k, 18 - k, 5k + 1$ are in AP then find k.
19. Find the LCM of the polynomials $x^4 - 27a^3x, (x - 3a)^2$ whose GCD is $(x - 3a)$
20. If $A = \left\{\begin{matrix} \sqrt{7} & -3 \\ -\sqrt{5} & 2 \\ \sqrt{3} & -5 \end{matrix}\right\}$ then find the transpose of $-A$.
21. If radii of two concentric circles 4 cm and 5 cm, then find the length of the chord of one circle which is a tangent to the other circle.
22. The line through the points $(-2, a)$ and $(9,3)$ has slope $-\frac{1}{2}$. Find the value of a.
23. Prove that $1 + \frac{\cot^2\theta}{1+\operatorname{cosec}\theta} = \operatorname{cosec}\theta$
24. From the top of a rock $50\sqrt{3}$m high, the angle of depression of a car on the ground is observed to be 30°. Find the distance of the car from the rock.

25. The volume of two cones of same base radius are 3600 cm^3 and 5040 cm^3. Find the ratio of heights.
26. The standard deviation and mean of a data are 6.5 and 12.5 respectively. Find the coefficient of variation.
27. The probability that a person will get an electrification contract is $\frac{3}{5}$ and the probability of getting plumping contract is $\frac{3}{8}$. The probability of getting at least one contract is $\frac{5}{7}$. What is the probability that he will get both?
28. Find the value of p if $4x^2 - (p-2)x + 1 = 0$ has real and equal roots.

PART-C

Answer any 10 questions. Question number 42 is compulsory. **$10 \times 5 = 50$**

29. Let $A = \{x \in W / x < 2\}; B = \{x \in N / 1 < x \leq 4\}$ and $C = \{3,5\}$ then verify that $A \times (B \cup C) = (A \times B) \cup (A \times C)$.
30. Let be a function defined by $f(x) = \frac{x}{2} - 1$, where $A = \{2,4,6,10,12\}, B = \{0,1,2,4,5,9\}$. Represent the function by (i) set of ordered pairs (ii) table (iii) an arrow diagram (iv) a graph.
31. Rekha has 15 square colourpapers of sizes 10cm,11cm,12cm,......,24cm How much area can be decorated with these colour papers?
32. The sum of thrice the first number, second number and twice the third number is 5. If thrice the second number is subtracted from the sum of first and thrice the third we get 2. If the third number is subtracted from the sum of twice the first, thrice the second we get 1. Find the numbers.
33. Find the value of m and n if following polynomial is a perfect square $x^4 - 8x + mx^2 + nx + 16$.
34. If $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ and $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ show that $A^2 - (a+d)A = (bc - ad)I_2$.
35. State and prove Angle Bisector Theorem.
36. Without using Pythagoras theorem, show that the points (1,-4), (2,-3) and (4,-7) from a right angled triangle.
37. A man is standing on a deck of a ship, which 40m above the sea level. He observes the angle of elevation of the top of a hill as 60^0 and angle of depression of the base of the hill as 30^0. Calculate the distance of the hill from the ship and height of the hill. $(\sqrt{3} = 1.732)$
38. If the radii of the circular ends of a frustum which is 45 cm high are 28 cm and 7 cm. Find the volume of frustum.
39. The ratio of the radii of two right circular cones of same height is 1:3. Find the ratio of their curved surface area when the height of each cone is 3 times the radius of smaller cone.
40. The following table gives the values of mean and variance of heights and weights of the 10th standard students of a school.
Which one is more varying than other?

	Height	Weight
Mean	155 cm	46.50 Kg
Variance	72.25 cm^2	28.09 Kg^2

41. A bag contains 6 green balls, some black and red balls. The number of black balls is twice as the number of red balls. The probability of getting a green ball is thrice as the probability of getting a red ball. Find (i) The number of black balls (ii) The total number of balls.
42. Find the area of the triangle formed by joining the mid points of a triangle whose vertices are (0,-1), (2,1) and (0,3).

PART-D

Answer the following. **$2 \times 8 = 16$**

43. A) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{7}{4}$ of the corresponding of the triangle PQR (Scale factor $\frac{7}{4} > 1$) (OR)
B) Draw a triangle ABC of base BC = 8cm, $\angle A = 60^0$ and the bisector of A meets BC at D such that BD=6cm.
44. A) A school announces that for a certain competitions, the cash price will be distributed for all the participants equally as shown below.

No. of Participants (x)	2	4	6	8	10
Amount for each participants (y)	180	90	60	45	36

(i) Find the constant of variation. (ii) Graph the above data and hence, find how much will each participants get if the number of participants are 12. (OR)
B) Discuss the nature of solutions of the quadratic equation $x^2 + x - 12 = 0$.

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MATHEMATICS

KALLAKURICHI DISTRICT ANSWER'S KEY

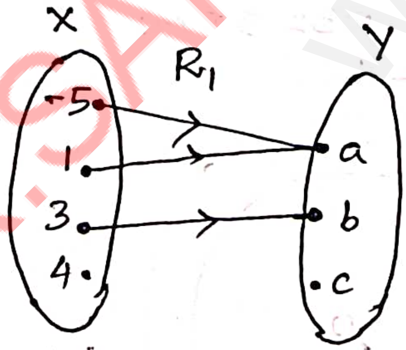
PART - A

1. (b) 2
2. (b) 2, −1
3. (c) 98
4. (c) 14280
5. (d) $\frac{16}{5}\left|\frac{xz^2}{y}\right|$
6. (b) $\begin{pmatrix} 2 & 2 \\ 2 & -1 \end{pmatrix}$
7. (a) 1.4 cm
8. (d) 15 cm
9. (a) $8x+5y=40$
10. (b) The slopes of two pair of opposite sides
11. (c) 2
12. (c) $\frac{8\pi h^2}{9}$ sq. units
13. (c) $(n-1)\bar{x}$
14. (b) 3P

PART - B

15. (i) $R_1 = \{(-5, a), (1, a), (3, b)\}$

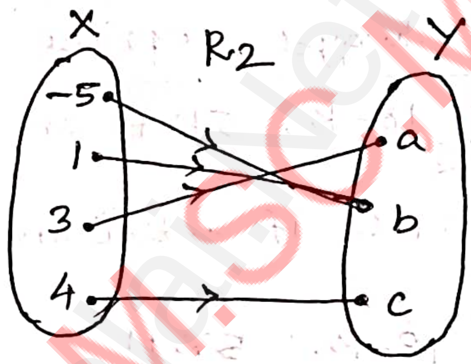
We may represent the relation R_1 in an arrow diagram



R_1 is not a function as $4 \in X$ does not have an image in Y.

(ii) $R_2 = \{(-5, b), (1, b), (3, a), (4, c)\}$

We may represent the relation R_2 in an arrow diagram



R_2 is a function as each element of X has an unique image in Y.

16. $f(x) = 3x+2,\ g(x) = 6x-k$

$f\circ g(x) = f(g(x)) = f(6x-k)$

$= 3(6x-k)+2$

$f\circ g(x) = 18x-3k+2 \quad \ldots\ldots (1)$

$g\circ f(x) = g(f(x)) = g(3x+2)$

$= 6(3x+2)-k$

$g\circ f(x) = 18x+12-k \quad \ldots\ldots (2)$

$(1) = (2)$

$18x-3k+2 = 18x+12-k$

$2k = -10$

$\boxed{k = -5}$

17. Let n, (n+1) be the consecutive terms.

Using Euclid division lemma

$a = bq + r, \quad 0 \le r < b$

$n+1 > n$, then

$(n+1) = n(1) + 1$

$n = (1)(n) + 0$

1
n | n+1
  | n
1 | n
  | n
  | 0

Remainder $= 0$,

divisor $= 1$

$HCF = 1$.

$\therefore$ It is always coprime.

(18) $3+k, \ 18-k, \ 5k+1$ are in A.P.

$\Rightarrow 2b = a + c$ if a, b, c are in A.P.

$\underbrace{3+k}_{a}, \ \underbrace{18-k}_{b}, \ \underbrace{5k+1}_{c}$

$2b = a + c$

$2(18-k) = (3+k) + (5k+1)$

$36 - 2k = 3 + k + 5k + 1$

$36 - 4 = 8k$

$32 = 8k$

$k = \frac{32}{8}$

$\boxed{k = 4}$

Another Method

$t_2 - t_1 = t_3 - t_2$

Here $t_1 = 3+k$, $t_2 = 18-k$, $t_3 = 5k+1$.

$\therefore t_2 - t_1 = t_3 - t_2$

$(18-k) - (3+k) = (5k+1) - (18-k)$

$18 - k - 3 - k = 5k + 1 - 18 + k$

$\Rightarrow 8k = 15 + 17 \Rightarrow 8k = 32$

$k = 32/8 \Rightarrow \boxed{k = 4}$

(19) $f(x) = x^4 - 27a^3x$

$\therefore f(x) = x(x^3 - (3a)^3)$

$g(x) = (x-3a)^2$; G.C.D $= (x-3a)$

L.C.M $\times$ G.C.D $= f(x) \times g(x)$

$$L.C.M = \frac{x(x^3 - (3a)^3) \times (x-3a)^2}{x - 3a}$$

$L.C.M = x(x^3 - (3a)^3).(x-3a)$

$= x(x-3a)\,[x^3 - (3a)^3]$

$= x(x-3a)\left[(x-3a)\ x^2 + 3ax + 9a^2\right]$

$\because a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

(20) If $A = \begin{bmatrix} \sqrt{7} & -3 \\ -\sqrt{5} & 2 \\ \sqrt{3} & -5 \end{bmatrix}$

$-A = \begin{bmatrix} -\sqrt{7} & 3 \\ \sqrt{5} & -2 \\ -\sqrt{3} & 5 \end{bmatrix}$

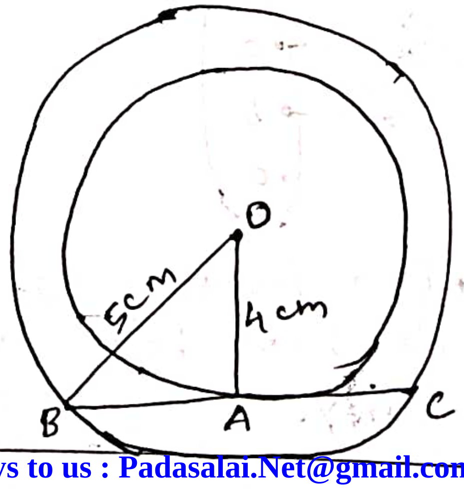
Transpose of $-A$ is $(-A)^T$

$(-A)^T = \begin{bmatrix} -\sqrt{7} & \sqrt{5} & -\sqrt{3} \\ 3 & -2 & 5 \end{bmatrix}$

(21)

$OA = 4$ cm, $OB = 5$ cm;

Also $OA \perp BC$.



$OB^2 = OA^2 + AB^2$

$5^2 = 4^2 + AB^2$ gives $AB^2 = 9$

$\therefore AB = 3$ cm

$BC = 2AB$ hence $BC = 2 \times 3$

$\therefore BC = 6$ cm.

(22) A line joining the points $(-2, a)$ and $(9, 3)$ has slope $m = -\frac{1}{2}$.

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3-a}{9-(-2)} = \frac{3-a}{9+2}$

$m = \frac{3-a}{11} = -\frac{1}{2}$

$\frac{3-a}{11} = -\frac{1}{2}$

$2(3-a) = -11$

$6 - 2a = -11$

$-2a = -11 - 6$

$\cancel{-}2a = \cancel{-}17$

$\boxed{a = \frac{17}{2}}$

(23) LHS $= \frac{1+\cot^2\theta}{1+\operatorname{cosec}\theta} = 1 + \frac{\operatorname{cosec}^2\theta - 1}{\operatorname{cosec}\theta + 1}$

$(\because \operatorname{cosec}^2\theta - 1 = \cot^2\theta)$

$\Rightarrow 1 + \frac{(\operatorname{cosec}\theta + 1)(\operatorname{cosec}\theta - 1)}{\operatorname{cosec}\theta + 1}$

$(\because a^2 - b^2 = (a+b)(a-b))$

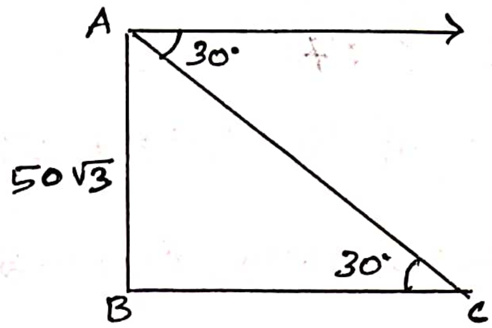
$= 1 + (\operatorname{cosec}\theta - 1)$

$= \operatorname{cosec}\theta$

LHS = RHS.

Hence proved.

(24)



AB = Height of the rock

$\therefore AB = 50\sqrt{3}$

Angle of depression $= 30°$

In right angle ΔABC

$\tan 30° = \frac{AB}{BC} = \frac{1}{\sqrt{3}}$

$\frac{50\sqrt{3}}{BC} = \frac{1}{\sqrt{3}}$

$50\sqrt{3} \times \sqrt{3} = BC$

$50 \times 3 = BC$

$\therefore BC = 150$ m.

$(\because \sqrt{3}\sqrt{3} = 3)$

(25) Volume of the cone is $\frac{1}{3}\pi r^2 h$

Volume of cone 1 : Volume of cone 2 = 3600 : 5040

$\frac{1}{3}\pi r^2 h_1 : \frac{1}{3}\pi r^2 h_2$

$= 3600 : 5040.$

$\frac{\frac{1}{3}\pi r^2 h_1}{\frac{1}{3}\pi r^2 h_2} = \frac{3600}{5040}$

$\frac{h_1}{h_2} = \frac{180}{252}$

$h_1 : h_2 = 45 : 63$

$h_1 : h_2 = 5 : 7$

$\therefore$ Ratio of the height 5:7.

(26)

$S.D = \sigma = 6.5$, Mean $\bar{x} = 12.5$.

$C.V = ?$

Coefficient of variation

$= \frac{\sigma}{\bar{x}} \times 100\ \%$

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

$= 0.52 \times 100\%$

$\therefore C.V = 52\%$

(27) The probability of get an electrification contract is $\frac{3}{5}$.

$P(A) = \frac{3}{5}$.

The probability of will not getting plumbing contract is $\frac{5}{8}$

$P(\bar{B}) = \frac{5}{8}$

The probability of getting atleast one contract is $\frac{5}{7}$

$P(A \cup B) = \frac{5}{7}$; $P(A \cap B) = ?$

$P(\bar{B}) = 1 - P(B)$

$P(B) = 1 - P(\bar{B})$

$= 1 - \frac{5}{8} \Rightarrow \frac{8-5}{8}$

$P(B) = \frac{3}{8}$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$

$= \frac{3}{5} + \frac{3}{8} - \frac{5}{7}$

$= \frac{24+15}{40} - \frac{5}{7}$

$= \frac{39}{40} - \frac{5}{7}$

$= \frac{39 \times 7 - 40 \times 5}{40 \times 7}$

$= \frac{273 - 200}{280}$

$P(A \cap B) = \frac{73}{280}$

(28) Compulsory sum

$4x^2 - (P-2)x + 1 = 0$

Here,

$a = 4,\ b = -(P-2),\ c = 1$

Given that,

Real and equal roots

$\Delta = 0$.

$\Rightarrow b^2 - 4ac = 0$

$[-(P-2)]^2 - 4(4)(1) = 0$

$(P-2)^2 - 16 = 0$

$P^2 + 4 - 4P - 16 = 0$

$P^2 - 4P - 12 = 0$

$(P-6)(P+2) = 0$ -12; -6, 2; -4

$P-6=0$; $P+2=0$

$P=6$; $P=-2$.

PART – C

(29) $A \times (B \cup C) = (A \times B) \cup (A \times C)$

$A = \{x \in W / x < 2\}$

$\therefore A = \{0, 1\}$

$B = \{x \in N / 1 < x \leq 4\}$

$\therefore B = \{2, 3, 4\}$

$C = \{3, 5\}$

LHS $= A \times (B \cup C)$

$B \cup C = \{2, 3, 4\} \cup \{3, 5\}$

$B \cup C = \{2, 3, 4, 5\}$

$A \times (B \cup C) = \{(0,2)\ (0,3)\ (0,4)\ (0,5)$
$(1,2)\ (1,3)\ (1,4)\ (1,5)\}$ ⟶ (1)

RHS $= (A \times B) \cup (A \times C)$

$A \times B = \{(0,2), (0,3), (0,4), (1,2), (1,3),$
$(1,4)\}$

$A \times C = \{(0,3)\ (0,5)\ (1,3)\ (1,5)\}$

$(A \times B) \cup (A \times C) = \{(0,2), (0,3), (0,4),$
$(1,2)\ (1,3)\ (1,4)\ (0,5),$
$(1,5)\}$ ⟶ (2)

$(1) = (2)$,

LHS = RHS.

Hence proved.

(30) $f : A \to B$

$A = \{2, 4, 6, 10, 12\}$, $B = \{0, 1, 2, 4, 5, 9\}$

$f(x) = \frac{x}{2} - 1$, $f(2) = \frac{2}{2} - 1 = 0$

$f(4) = \frac{4}{2} - 1 \Rightarrow f(4) = 1$

$f(6) = \frac{6}{2} - 1 \Rightarrow f(6) = 2$

$f(10) = \frac{10}{2} - 1 \Rightarrow f(10) = 4$

$f(12) = \frac{12}{2} - 1 \Rightarrow f(12) = 5$

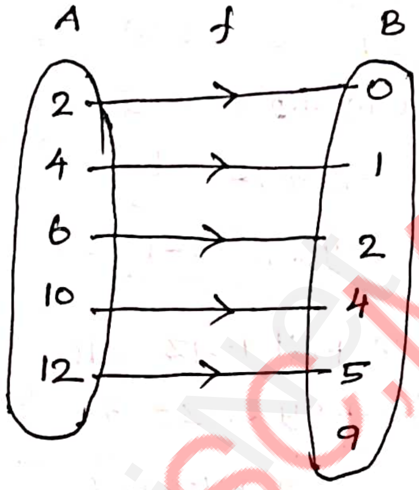
(i) Set of ordered pairs

$\Rightarrow \{(2,0), (4,1), (6,2), (10,4), (12,5)\}$

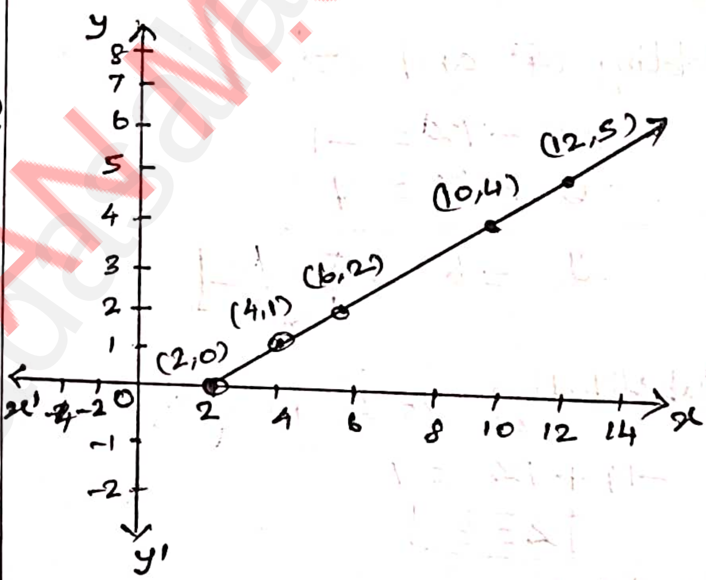
(ii) A table

x	2	4	6	10	12
$f(x)$	0	1	2	4	5

(iii) an arrow diagram



(iv) a graph



(31) $10^2 + 11^2 + 12^2 + \cdots + 24^2$

$= (1^2 + 2^2 + \cdots + 24^2) - (1^2 + 2^2 + \cdots + 9^2)$

$= \left(\frac{n(n+1)(2n+1)}{6}\right)_{n=24} - \left(\frac{n(n+1)(2n+1)}{6}\right)_{n=9}$

$= \frac{\overset{4}{\cancel{24}} \times 25 \times 49}{\cancel{6}} - \frac{\overset{3}{\cancel{9}} \times \overset{5}{\cancel{10}} \times 19}{\underset{\cancel{3}}{\cancel{6}}}$

$= 4900 - 285$

$= 4615$

$\therefore$ Rekha has $4615\ cm^2$ colour papers. She can decorate $4615\ cm^2$ area with these colour papers.

(32) Let the Three numbers be x, y, z

From the given data we get the following equations,

$3x+y+2z=5 \longrightarrow (1)$

$x+3z-3y=2 \longrightarrow (2)$

$2x+3y-z=1 \longrightarrow (3)$

$(1)\times 1 \Rightarrow 3x+y+2z=5$

$(2)\times 3 \Rightarrow 3x-9y+9z=6$ (−)

$10y-7z=-1 \longrightarrow (4)$

$(1)\times 2 \Rightarrow 6x+2y+4z=10$

$(3)\times 3 \Rightarrow 6x+9y-3z=3$ (−)

$-7y+7z=7 \longrightarrow (5)$

Adding (4) and (5),

$10y-7z=-1$

$-7y+7z=7$

$3y=6 \Rightarrow \boxed{y=2}$

Substituting $y=2$ in (5),

$-14+7z=7$

$\boxed{z=3}$

Substituting $y=2$ and $z=3$ in (1)

$3x+2+6=5$ we get $x=-1$

$\therefore x=-1, y=2, z=3.$

(33) $x^4-8x^3+mx^2+nx+16$

	1 −4				
1	1	−8	+m	+n	+16
	1				
	(−)				
2−4		−8	+m		
		−8	+16		
		(+)	(−)		
2−8+4			m−16	+n	+16
			8	−32	+16
			(−)	(+)	(−)
				0	

The given polynomial is perfect square

$m-16-8=0 \Rightarrow m-24=0 \Rightarrow m=24$

$n+32=0 \Rightarrow n=-32$

(34) Given that, $A=\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ and $I=\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

$LHS = A^2-(a+d)A$

$A^2=\begin{pmatrix} a & b \\ c & d \end{pmatrix}\begin{pmatrix} a & b \\ c & d \end{pmatrix}$

$A^2=\begin{pmatrix} a^2+bc & ab+bd \\ ac+cd & bc+d^2 \end{pmatrix}$

$(a+d)A=(a+d)\begin{pmatrix} a & b \\ c & d \end{pmatrix}$

$=\begin{pmatrix} a^2+ad & ab+bd \\ ac+cd & ad+d^2 \end{pmatrix}$

$A^2-(a+d)A=\begin{bmatrix} a^2+bc & ab+bd \\ ac+cd & bc+d^2 \end{bmatrix}-\begin{bmatrix} a^2+ad & ab+bd \\ ac+cd & ad+d^2 \end{bmatrix}$

$=\begin{bmatrix} bc-ad & 0 \\ 0 & bc-ad \end{bmatrix}$

$=(bc-ad)\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$=(bc-ad)\, I_2$

LHS = RHS

Hence proved.

(35) ANGLE BISECTOR THEOREM

Statement:

The internal bisector of an angle of a triangle divides the opposite side internally in the ratio of

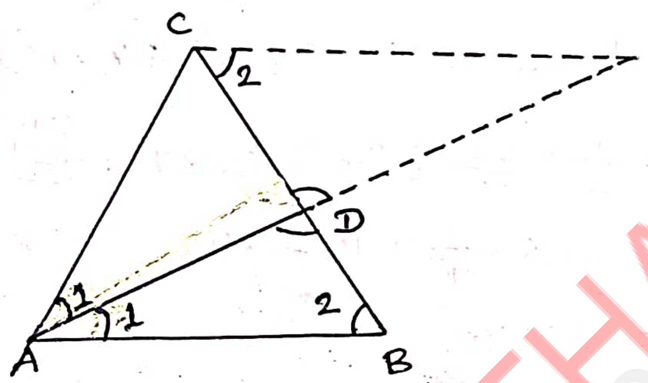
The corresponding sides containing the angle.

Proof:

Given : In ΔABC, AD is the internal bisector

To prove: $\frac{AB}{AC} = \frac{BD}{CD}$

construction: Draw a line Through C parallel to AB. Extend AD to meet line through C at E.



(36) Let the given points be A(1, −4), B(2, −3), and C(4, −7)

The Slope of $AB = \frac{y_2-y_1}{x_2-x_1} = \frac{-3+4}{2-1}$

$AB = \frac{1}{1} = 1.$

∵ The slope of $BC = \frac{-7+3}{4-2} = \frac{-4}{2}$

The slope of BC = −2

The slope of $AC = \frac{-7+4}{4-1}$

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

∴ The slope of AC = −1

slope of AB × slope of AC

$= (1)(-1) = -1$

AB is perpendicular to AC.

$\angle A = 90°$

Therefore, ΔABC is a right angled triangle.

NO	Statement	Reason
1.	$\angle AEC = \angle BAE = \angle 1$	Two parallel lines cut by a transversal make alternate angles equal.
2.	ΔACE is isosceles AC = CE ......(1)	In ΔACE, $\angle CAE = \angle CEA$
3.	$\Delta ABD \sim \Delta ECD$ $\frac{AB}{CE} = \frac{BD}{CD}$	By AA similarity
4.	$\frac{AB}{AC} = \frac{BD}{CD}$	From (1) AC = CE Hence proved

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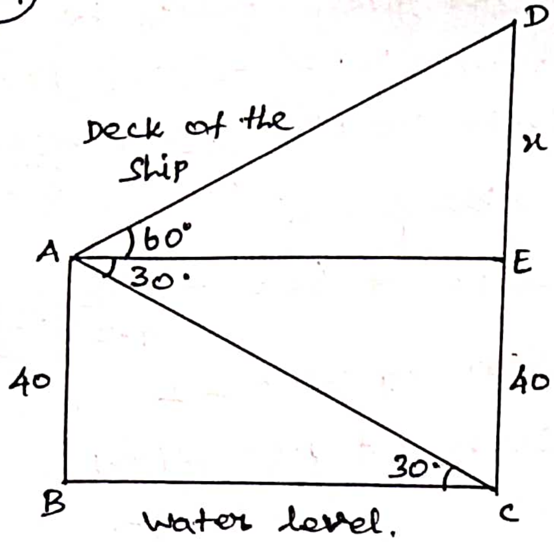
(37)



A → Deck of the Ship

BC → water level.

AB → 40m , ED = x, BC = y

CD = $x + 40$

= Height of the hill

In right angle Δ AED

$\theta = 60°$

$\tan 60° = \frac{DE}{AE} = \frac{x}{y} = \sqrt{3}$

$x = y\sqrt{3}$ ——— (1)

In right angle Δ ABC

$\theta = 30°$

$\tan 30° = \frac{AB}{BC} = \frac{1}{\sqrt{3}}$

$\frac{40}{y} = \frac{1}{\sqrt{3}}$

$y = 40\sqrt{3}$ ——— (2)

Substitute (2) in (1) we get

$x = y\sqrt{3}$

$x = 40\sqrt{3} \times \sqrt{3} = 40 \times 3 = 120$

$\therefore x = 120m$

∴ Height of the hill $= x + 40$

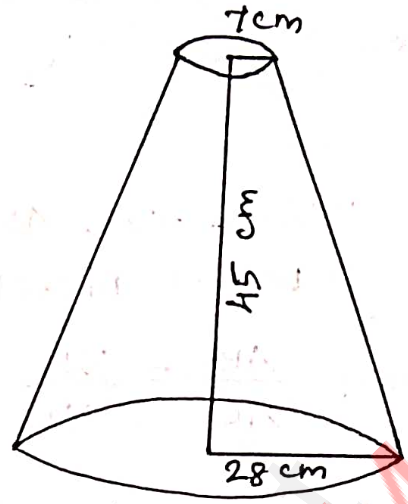
$\Rightarrow x + 40$

$= 120 + 40$

$h = 160m$

Distance of the hill from the Ship. $y = 40\sqrt{3} = 40 \times 1.732 = 69.28m$

(38)



Let h, r and R be the height, top and bottom radii of the frustum.

Given that,

$h = 45$ cm, $R = 28$cm, $r = 7$cm

volume $= \frac{1}{3}\pi[R^2 + Rr + r^2]h$ cu. units

$= \frac{1}{3} \times \frac{22}{7}[28^2 + (28\times 7) + 7^2] \times 45$

$= \frac{1}{3} \times \frac{22}{7} \times 1029 \times 45$

$= 48510.$

Therefore, volume of the frustum is 48510 cm^3.

(39) Smaller cone: | Large cone

Smaller cone:

$r_1 \to r$

$h_1 \to 3r$

$l_1 = \sqrt{(3r)^2 + r^2}$

$= \sqrt{10r^2}$

$l_1 = r\sqrt{10}$

Large cone

$r_2 = 3r$

$h_2 = 3r$

$l_2 = \sqrt{(3r)^2 + (3r)^2}$

$= \sqrt{18r^2}$

$= \sqrt{9 \times 2(r)^2}$

$l_2 = 3r\sqrt{2}$

CSA of small cone : CSA of a large cone

$\cancel{\pi} r_1 l_1 : \cancel{\pi} r_2 l_2$

$r \times r\sqrt{10} : 3r \times 3r\sqrt{2}$

$\cancel{r^2}\sqrt{5}\sqrt{2} : 9\cancel{r^2}\sqrt{2} \Rightarrow \sqrt{5}\sqrt{2} = 9\sqrt{2}$

$\sqrt{5} : 9$

Ratio of the CSA is $\sqrt{5} : 9$

(40) For comparing two data, first we have to find their coefficient of variations

Mean $\bar{x}_1 = 155$ cm, variance, $\sigma_1^2 = 72.25\ cm^2$

Therefore standard deviation $\sigma_1 = 8.5$

coefficient of variation

$$C.V_1 = \frac{\sigma_1}{\bar{x}_1} \times 100\%$$

$$C.V_1 = \frac{8.5}{155} \times 100\%$$

$= 5.48\%$ (for heights)

Mean $\bar{x}_2 = 46.50$ kg,

Variance $\sigma_2^2 = 28.09\ kg^2$

Standard deviation $\sigma_2 = 5.3$ kg

coefficient of variation

$$C.V_2 = \frac{\sigma_2}{\bar{x}_2} \times 100\%$$

$$C.V_2 = \frac{5.3}{46.50} \times 100\%$$

$= 11.40\%$ (for weights)

$C.V_1 = 5.48\%$ and $C.V_2 = 11.40\%$

Height is more constant.

(41) Number of green balls is $n(G) = 6$.

Let number of red balls is $n(R) = x$

Therefore, number of black balls is $n(B) = 2x$

Total number of balls

$n(S) = 6 + x + 2x$
$= 6 + 3x$

It is given that,

$P(G) = 3 \times P(R)$

$$\frac{6}{6+3x} = 3 \times \frac{x}{6+3x}$$

$3x = 6 \Rightarrow x = 2$.

(i) Number of black balls $= 2 \times 2 = 4$.

(ii) Total Number of balls $= 6 + (3 \times 2)$
$= 6 + 6$
$= 12$.

(42) <u>compulsory sum</u>

Let (x_1, y_1) (x_2, y_2) and (x_3, y_3) be the Midpoint of Δ ABC.

$x_1 = \frac{0+2}{2} = 1$; $y_1 = \frac{-1+1}{2} = 0$

$x_2 = \frac{2+0}{2} = 1$; $y_2 = \frac{1+3}{2} = 2$

$x_3 = \frac{0+0}{2} = 0$; $y_3 = \frac{3-1}{2} = 1$

Midpoints are, $(1,0)$ $(1,2)$ $(0,1)$

Area of the triangle joining the Midpoints.

$$= \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$

$$= \frac{1}{2}\begin{vmatrix} 1 & 0 & 1 \\ 1 & 2 & 1 \\ 0 & 1 & 1 \end{vmatrix}$$

$= \frac{1}{2}[1(2-1) - 0 + 1(1-0)]$

$= \frac{1}{2}[1 - 0 + 1] = \frac{2}{2} = 1$

$\therefore$ Area of Δ ABC is 1 sq. units.