Common Instructions to Candidates:

1) This is a question cum answer paper booklet.
2) Space is provided to write answers below each question. Answer should be written within the space provided.
3) This question paper has 58 questions including the matching type question.
4) Candidate should not write the answer with pencil. Answer written with pencil will not be evaluated (Except graphs, diagrams & maps).
5) In case of multiple choice, fill in the blanks and matching questions, scratching, rewriting & marking is not allowed. Answers with such errors will not be evaluated.

I. Four alternatives are given to each of the following incomplete statements. Select the most appropriate one and write its serial letter and also the correct answer in the space provided. **[20 x 1 = 20]**

1. If $T_n = (-1)^n$, then the correct relation between the sum of terms is

a) $S_1 = S_2$ b) $S_2 = S_3$

c) $S_3 = S_4$ d) $S_2 = S_4$

Ans. d) $S_2 = S_4$ **1**

2. HCF of ab, bc and ac is

a) abc b) $a^2 b^2 c^2$

c) 1 d) $ab + bc + ac$.

Ans. c) 1 **1**

3. The corresponding sides of two similar triangles are in the ratio 4 : 9. The ratio between their areas is

a) 2 : 3 b) 16 : 81

c) 81 : 16 d) 14 : 19

Ans. b) 16 : 81 **1**

Space for Rough Work

4. If $9\sqrt{x} = \sqrt{12} + \sqrt{147}$, the value of x is

a) 12 b) 9

c) 3 d) $\sqrt{3}$

Ans. c) 3 **1**

5. The incorrect statement among the following is

a) ${}^{n}P_{n} = {}^{n}C_{n}$ b) ${}^{n}P_{1} = {}^{n}C_{1}$

c) ${}^{n}P_{0} = {}^{n}C_{0}$ d) ${}^{n}P_{n} = {}^{n}P_{n-1}$

Ans. a) ${}^{n}P_{n} = {}^{n}C_{n}$ **1**

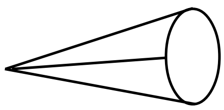
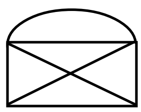
6. An example for HP among the following is

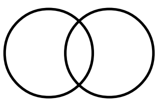
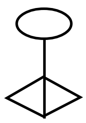
a) $1, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$ b) $1, \frac{1}{3}, \frac{1}{6}, \frac{1}{9}$

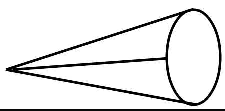
c) $1, \frac{2}{3}, \frac{1}{2}, \frac{2}{5}$ d) $1, \frac{1}{4}, \frac{1}{7}, \frac{1}{9}$

Ans. c) $1, \frac{2}{3}, \frac{1}{2}, \frac{2}{5}$ **1**

7. A non - traversable network among the following is

a)  b) 

c)  d) 

Ans. a)  **1**

Space for Rough Work

8. The fourth term of the sequence $\sqrt{3}$, 3, $3\sqrt{3}$ is

   a) 9 b) 21

   c) $27\sqrt{3}$ d) $9\sqrt{3}$

   Ans. a) 9 **1**

9. The LCM of $(x + y)^2$, $(x - y)^2$ and $(x^2 - y^2)$ is

   a) $(x^2 + y^2)^2$ b) $x^4 - y^4$

   c) $(x^2 - y^2)^2$ d) $(x + y)(x - y)^3$

   Ans. c) $(x^2 - y^2)^2$ **1**

10. The sum and the product of three numbers are 0 and 30 respectively. The sum of their cubes is

    a) 0 b) 90

    c) 160 d) 900

    Ans. b) 90 **1**

11. If $v^2 = u^2 + 2as$, then the value of 'u' is

    a) $v^2 - 2as$ b) $\pm\sqrt{v^2 + 2as}$

    c) $\pm\sqrt{v^2 - 2as}$ d) $2as - v^2$

    Ans. c) $\pm\sqrt{v^2 - 2as}$ **1**

12. The quadratic equation whose roots are 1 and –1 is

    a) $ax^2 - x - 1 = 0$ b) $ax^2 - 1 = 0$

    c) $x^2 = 1$ d) $x^2 + 1 = 0$

    Ans. c) $x^2 = 1$ **1**

Space for Rough Work

13. If $\sum_{abc} a = 0$, then $\sum_{abc} a^3$ is

a) 0 b) 1

c) $-3abc$ d) $3abc$

Ans. d) $3abc$ **1**

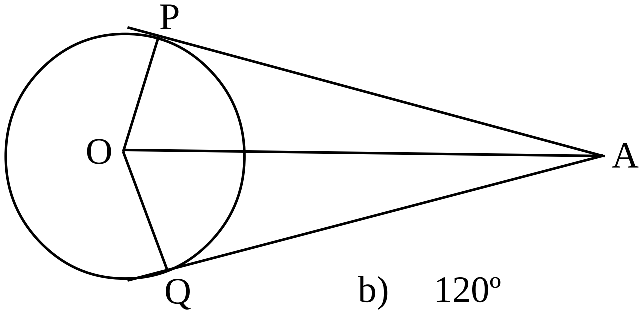
14. The value of $1! \times 3! \times 0!$ is

a) 6 b) 0

c) 3 d) 1

Ans. a) 6 **1**

15. In the given figure if $\angle PAO = 30^\circ$, the measure of $\angle POQ$ is



a) 60° b) 120°

c) 90° d) 30°

Ans. b) 120° **1**

16. The pure quadratic equation in the following is

a) $4x = \frac{81}{x}$ b) $x + \frac{1}{x} = 5$

c) $(x + 2)^2 = 3x$ d) $5 - x^2 = x$

Ans. a) $4x = \frac{81}{x}$ **1**

Space for Rough Work

17. The diagonal of a square is $10\sqrt{2}$ cm, then the length of its side is

a) 2 cm b) 10 cm

c) 8 cm d) 20 cm

Ans. b) 10 cm **1**

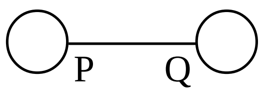
18. The Harmonic Mean between 1 and 2 is

a) $1\frac{1}{2}$ b) $1\frac{1}{4}$

c) $1\frac{1}{3}$ d) $1\frac{2}{3}$

Ans. c) $1\frac{1}{3}$ **1**

19. The matrix of the given network is



a) $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ b) $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$

c) $\begin{bmatrix} 2 & 1 \\ 2 & 1 \end{bmatrix}$ d) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$

Ans. b) $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$ **1**

20. The value of $\sum_{n=1}^{n} n + \sum_{n=1}^{n} (n-1)$ is

a) $n(n-1)$ b) $\frac{n^2}{2}$ c) $2n^2$ d) n^2

Ans. d) n^2 **1**

Space for Rough Work

II. Complete the following statements by filling the blanks. **[10 x 1 = 10]**

21. If the order of matrix A is $m \times n$ and the order of matrix B is $n \times p$, then the order of matrix AB is ________.

Ans. $m \times p$ **1**

22. A regular polyhedron enclosed by pentagonal faces is ____________.

Ans. Do decahedron **1**

23. If P and Q are non - empty sets and P – Q = P, then $P \cap Q$ is __________.

Ans. ϕ or Null set or { } **1**

24. The mathematician who proposed Basic Proportionality Theorem is _____________.

Ans. Thales **1**

25. The angle in a semi circle is ______________.

Ans. 90^o or Right angle **1**

Space for Rough Work

26. The formula used to find the coefficient of variation is ___________.

Ans. $\dfrac{\sigma}{\text{Mean}} \times 100$ or $\dfrac{\sigma}{\overline{x}} \times 100$ **1**

27. The conjugate of $a\sqrt{x} + b\sqrt{y}$ is ______________.

Ans. $a\sqrt{x} - b\sqrt{y}$ **1**

28. A solid described by the revolution of a semi circle about a fixed diameter is ______.

Ans. Sphere **1**

29. The formula used to find the curved surface area of a cylinder is __________.

Ans. $2\pi rh$ **1**

30. The reciprocals of the terms of an AP form _____________.

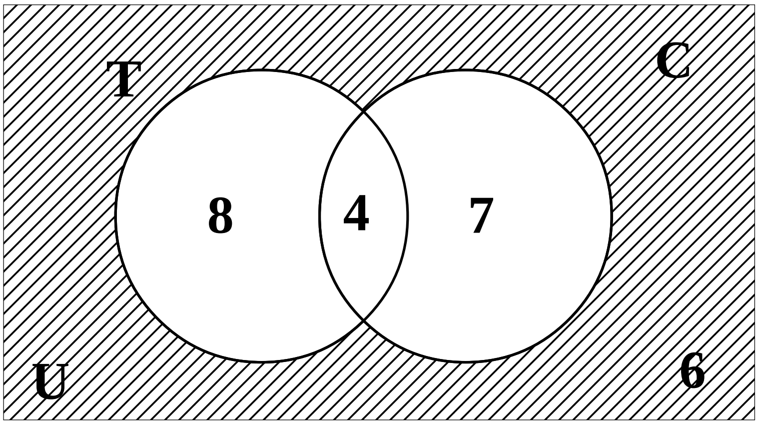
Ans. HP **1**

Space for Rough Work

III. Solve the following problems in the space provided.

31. In a group of 25 persons 8 drink tea only, 7 drink coffee only and 4 persons drink both tea and coffee. Draw a Venn diagram to show how many of them neither drink tea nor coffee. **[2]**

Ans.



32. If one root of the equation $px^2 + 3x + 2 = 0$ is reciprocal of the other, then find the value of p.

Ans.

$Px^2 + 3x + 2 = 0$ **2**

let m, n be the roots

$a = p$

$b = +3$

$c = 2$

$m + n = -b/a = -\frac{+3}{P} = \frac{-3}{P}$ **½**

$mn = c/a = 2/P$ **½**

$m = \frac{1}{n}$ (given)

$\therefore mn = \frac{1}{n} \times n = \frac{2}{P}$ **½**

$1 = \frac{2}{P}$; P = 2 **½**

Space for Rough Work

33. Solve the equation $x^2 + 1 = 8x$ using the formula. **[2]**

Ans. $x^2 - 8x + 1 = 0$

$a = 1$
$b = -8$
$c = 1$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ **½**

$$= \frac{-(-8) \pm \sqrt{(-8)^2 - 4 \times 1 \times 1}}{2 \times 1}$$ **½**

$$= \frac{8 \pm \sqrt{64 - 4}}{2}$$ **½**

$$= \frac{8 \pm \sqrt{60}}{2} = \frac{2\left(4 \pm \sqrt{15}\right)}{2} = 4 \pm \sqrt{15}$$ **½**

34. Three numbers are in the ratio $\frac{1}{3} : \frac{1}{5} : \frac{1}{6}$. If the sum of their squares is 644, find the numbers. **[2]**

Ans. Given ratio of three numbers as $\frac{1}{3} : \frac{1}{5} : \frac{1}{6} = 10 : 6 : 5$

let the numbers be $10x$, $6x$, $5x$, **½**

According to problem

$(10x)^2 + (6x)^2 + (5x)^2 = 644$ **½**

$100x^2 + 36x^2 + 25x^2 = 644$

$161x^2 = 644$ **½**

Space for Rough Work

$$\left.\begin{aligned} x^2 &= \frac{644}{161} \\ x^2 &= 4 \\ x &= \pm 2 \end{aligned}\right\} \quad \text{(Neglect negative value)} \qquad \tfrac{1}{2}$$

the numbers are 20, 12, 10.

35. A = $\begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}$. Find the value of AA'. **[2]**

Ans.

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}; \quad A' = \begin{bmatrix} 1 & 3 \\ 2 & 0 \end{bmatrix} \qquad \tfrac{1}{2}$$

$$A \times A' = \begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix} \times \begin{bmatrix} 1 & 3 \\ 2 & 0 \end{bmatrix} \qquad \tfrac{1}{2}$$

$$= \begin{bmatrix} (1+4) & (3+0) \\ (3+0) & (9+0) \end{bmatrix} = \begin{bmatrix} 5 & 3 \\ 3 & 9 \end{bmatrix} \qquad \tfrac{1}{2} + \tfrac{1}{2}$$

Space for Rough Work

36. Two girls and four boys are made to sit in a line for a photograph. In how many different ways they can be seated so that the two girls are always together. **[2]**

Ans.

G_1	G_2	B_1	B_2	B_3	B_4

Taking two girls as one unit **½**

we can arrange all of them in ${}^5P_5$ ways. **½**

Girls may be inter changed in 2 ways.

$\therefore$ Total No. of ways $= {}^5P_5 \times 2$ **½**

$= 120 \times 2$

$= 240$ **½**

37. Rationalise the denominator and simplify

$$\frac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}-2\sqrt{3}}$$ **[2]**

Ans. RF of $3\sqrt{2}-2\sqrt{3}$ is $3\sqrt{2}+2\sqrt{3}$ **½**

$$\therefore \frac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}-2\sqrt{3}} \times \frac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}} = \frac{\left(3\sqrt{2}+2\sqrt{3}\right)^2}{\left(3\sqrt{2}\right)^2-\left(2\sqrt{3}\right)^2}$$

$$= \frac{\left(3\sqrt{2}\right)^2+\left(2\sqrt{3}\right)^2+2\left(3\sqrt{2}\right)2\sqrt{3}}{9\times 2-4\times 3}$$ **½**

Space for Rough Work

$$= \frac{18+12+12\sqrt{6}}{18-12} = \frac{30+12\sqrt{6}}{6}$$ **1/2**

$$= \frac{\cancel{6}\left(5+2\sqrt{6}\right)}{\cancel{6}}$$

$$= 5+2\sqrt{6}$$ **1/2**

38. Find the product of $\sqrt[4]{4}$ and $\sqrt[3]{3}$. **[2]**

Ans.

$$\sqrt[4]{4} \times \sqrt[3]{3}$$ **1**

$$\sqrt[4]{4} = 4^{1/4} = 4^{3/12} = \sqrt[12]{4^3} = \sqrt[12]{64}$$

$$\sqrt[3]{3} = 3^{1/3} = 3^{4/12} = \sqrt[12]{3^4} = \sqrt[12]{81}$$ **1/2**

$$\sqrt[4]{4} \times \sqrt[3]{3} = \sqrt[12]{64 \times 81} = \sqrt[12]{5184}$$ **1/2**

Space for Rough Work

39. Find the length and breadth of a rectangular plot whose area is 60 sq.m. and its perimeter is 32 m. **[2]**

Ans.

$\boxed{A = 60}$ $\qquad$ $\left.\begin{array}{l} l \times b = 60 \\ 2l + 2b = 32 \end{array}\right\}$ **½**

P = 32

$l + b = 16$

$l = 16 - b$

$\therefore l \times b = 60$

$(16 - b)\, b = 60$

$16b - b^2 = 60$

$b^2 - 16b + 60 = 0$

$(b - 10)\,(b - 6) = 0$ **1**

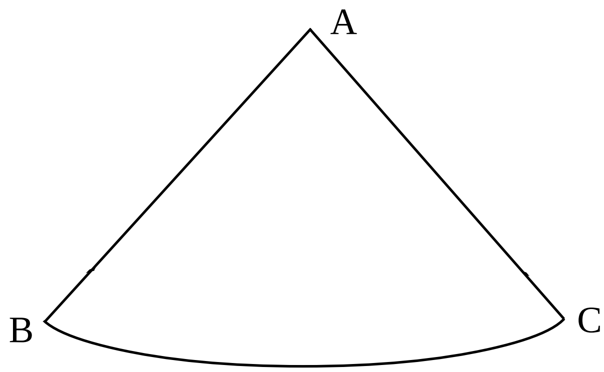
$(b = 10 \text{ or } 6)$

$\therefore$ If $l = 10m$ $b = 6m$

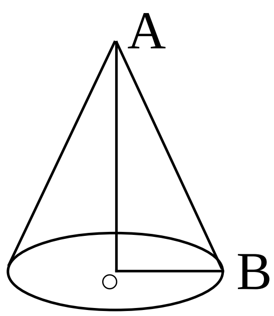
(or) If $l = 6m$ $b = 10m$ **½**

Space for Rough Work

40. A sheet of Aluminium foil having a shape as shown in the figure is rolled to make a cone. If AB = 25 cm and arc BC = 44 cm, find the volume of the obtained cone. **[2]**



Ans.



BC = Perimeter of cone = 44 cm

$2\pi r = 44$

$r = \frac{\cancel{44}}{\cancel{2}\times\cancel{22}}\times 7 = 7\text{cm}$ **½**

AB = slant ht of cone = 25 cm

$AO^2 = AB^2 - BO^2$ (In Δ AOB)

$= 25^2 - 7^2$

$= 625 - 49 = 576$

$AO = h = \sqrt{576} = 24$ (h) **½**

Vol of Cone $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{\cancel{3}}\times\frac{22}{\cancel{7}}\times\cancel{7}\times 7\times\overset{8}{\cancel{24}}$ **½**

$= 1232$CC **½**

Space for Rough Work

41. Draw a plan for the recordings from the surveyor's field book given below. (scale 20 m = 1cm). **[2]**

	Metres	
	To D	
	140	
	120	60 to C
to E 80	100	
	50	40 to B
	From A	

Ans.

20m = 1cm

140m = 7cm

100m = 5cm

120m = 6cm

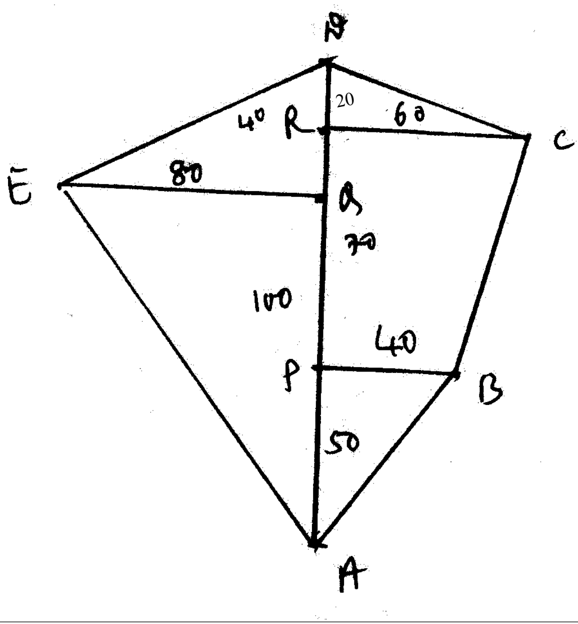
60m = 3cm

40m = 2cm

80m = 4cm

50m = 2.5cm

$\frac{1}{2}$



$1\frac{1}{2}$

Space for Rough Work

42. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$

$A = \{x : x$ is a perfect square less than $10\}$

$B = \{x : x$ is an even natural number less than $10\}$

Verify $(A \cup B)' = A' \cap B'$ **[2]**

Ans.

$A = \{1, 4, 9\}$; $A' = \{2, 3, 5, 6, 7, 8\}$;

$B = \{2, 4, 6, 8\}$; $B' = \{1, 3, 5, 7, 9\}$; **½**

$A \cup B = \{1, 2, 4, 6, 8, 9\}$ **½**

$A' \cap B' = \{3, 5, 7\}$ — 2 **½**

$(A \cup B)' = \{3, 5, 7\}$ — 1 **½**

$\therefore (A \cup B)' = A' \cap B'$

43. In a HP $T_7 = \frac{1}{20}$ and $T_{13} = \frac{1}{38}$. Find the first term of H.P. **[2]**

Ans.

$$T_7 = \frac{1}{20} \quad ; \quad T_{13} = \frac{1}{38}$$

$$\frac{1}{a+6d} = \frac{1}{20} \quad ; \quad \frac{1}{a+12d} = \frac{1}{38}$$ **½**

$$a + 6d = 20 \quad ; \quad a + 12d = 38$$ **½**

Space for Rough Work

Solve for a ; $a + 12d = 38 \times 1$

$a + \quad 6d = 20 \quad \times 2$

$$\left.\begin{array}{r} a + 12\cancel{d} = 38 \\ \underset{(-)}{2a} + \underset{(-)}{12d} = \underset{(-)}{40} \end{array}\right\}$$ **½**

(or) Any other alternate method

Sub $-a \quad = -2$

$a \ = 2$

a = The first term of HP = 2 **½**

44. Construct Cayley's table under multiplication modulo 10 on S = {2, 4, 6, 8}. **[2]**

Ans.

$\otimes_{10}$	2	4	6	8
2	4	8	2	6
4	8	6	4	2
6	2	4	6	8
8	6	2	8	4

½ mark for each correct row / column **½ ½ ½ ½**

Space for Rough Work

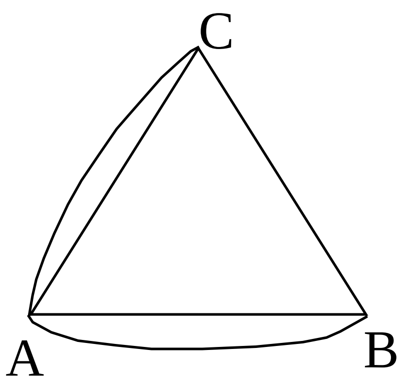
45. Draw the graph for the following matrix **[2]**

$$\begin{bmatrix} 0 & 2 & 2 \\ 2 & 0 & 1 \\ 2 & 1 & 0 \end{bmatrix}$$

Ans.

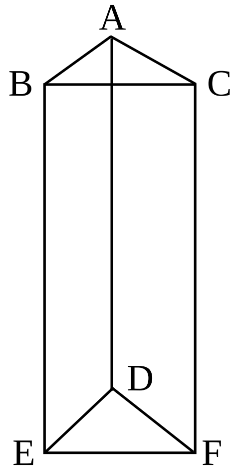
	A	B	C
A	0	2	2
B	2	0	1
C	2	1	0

2

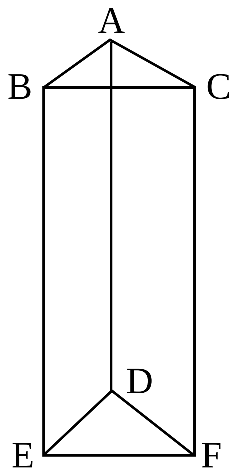


Space for Rough Work

46. Verify Euler's formula for the solid given below. **[2]**



Ans.



$V = 6$ $\frac{1}{2}$

$F = 5$ $\frac{1}{2}$

$E = 9$ $\frac{1}{2}$

Euler's formula

$V + F = E + 2$

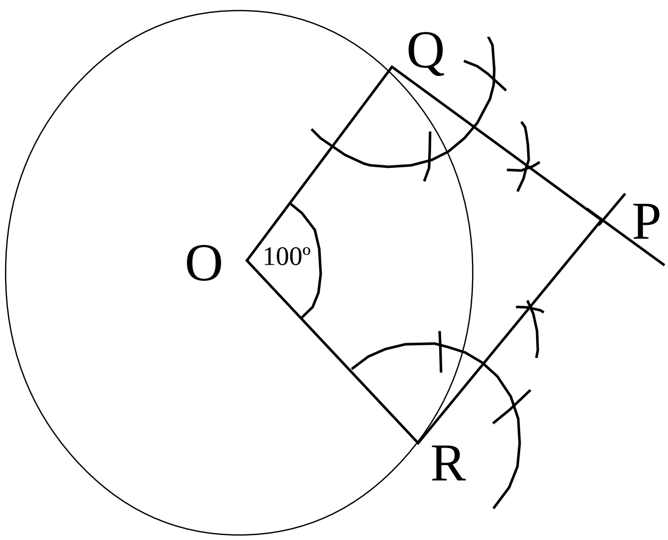
$6 + 5 = 9 + 2$ $\frac{1}{2}$

$11 = 11$

Space for Rough Work

47. In a circle of radius 4cm, draw two radii such that the angle between them is 100°. Draw two tangents at the ends of the radii. **[2]**

Ans.



4 cm circle **$\frac{1}{2}$**

Radii **$\frac{1}{2}$**

dev
PQ **$\frac{1}{2}$**
PR **$\frac{1}{2}$**

48. The first term of a GP is 64 and the common ratio is 'r'. If the average of the first and the fourth term is 140, find the value of 'r'. **[2]**

Ans. $64, 64r, 64r^2, 64r^3 \ldots\ldots\ldots$ GP. **$\frac{1}{2}$**

$$\frac{64+64r^3}{2}=140$$

$64 + 64r^3 = 280$ (or) Any other alternate method **$\frac{1}{2}$**

$64r^3 = 280 - 64 = 216$

$$r^3 = \frac{216}{64} = \frac{27}{8} = \left(\frac{3}{2}\right)^3$$ **$\frac{1}{2}$**

$$r = \frac{3}{2} = 1\tfrac{1}{2}$$ **$\frac{1}{2}$**

Space for Rough Work

IV. 49. If $a + b + c = 2s$, then show that **[3]**

$$\frac{a^2 + b^2 - c^2 + 2ab}{a^2 - b^2 - c^2 + 2bc} = \frac{s}{(s-b)}.$$

Ans.

Nu $\rightarrow a^2 + b^2 + 2ab - c^2$ | $a + b + c = 2s$

$= (a + b)^2 - c^2$ | $a + b = 2s - c$ **½**

$= (a + b + c)(a + b - c)$

$= 2s(2s - 2c)$

$= 4s(s - c)$ —— 1

½

De $\rightarrow a^2 - (b^2 + c^2 - 2bc)$

$a^2 - (b - c)^2$ **½**

$(a + b - c)(a - b + c)^2$ | $a + b = 2s - c$

$(2s - 2c)(2s - 2b)$ | $a + c = 2s - b$

$4(s - b)(s - c)$ —— 2 1

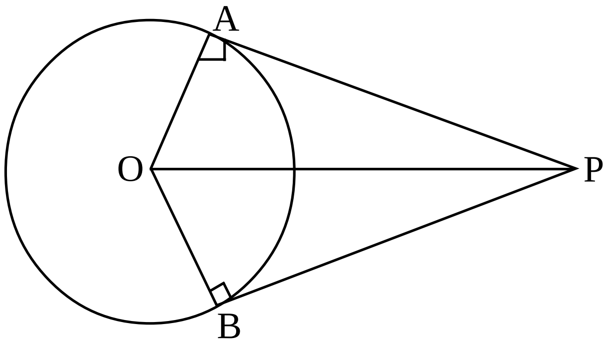
Divide 1 by 2

$$\frac{4s(s-c)}{4(s-b)(s-c)} = \frac{s}{s-b}$$ proved **½**

Space for Rough Work

50. Prove that the tangents drawn to a circle from an external point are equal. **[3]**

Ans.



½

Data : O is the centre of the circle.

PA & PB are tangents from Ext. point P.

AO & BO joined **½**

<u>To prove</u> : PA = PB **½**

<u>Proof</u> : compare Δ^{les} PAO and PBO

AO = BO	(radii of same circle)
OP = OP	(common)
$P\hat{A}O = P\hat{B}O$	(Radius and tangent at a common point) **1½**

$\therefore \Delta PAO \cong \Delta PBO$ (RHS)

$\therefore$ PA = PB

Space for Rough Work

51. Calculate the standard deviation for the following frequency distribution. **[3]**

C.I	f
20 – 24	2
25 – 29	3
30 – 34	5
35 – 39	3
40 – 44	2

Ans.

C.I.	f	x	fx	d	d^2	fd^2
20-24	2	22	44	–10	100	200
25-29	3	27	81	–5	25	75
30-34	5	32	160	0	0	0
35-39	3	37	111	5	25	75
40-44	2	42	84	10	100	200
	15		480			550

$fx = \mathbf{1/2}$

$M = \mathbf{1/2}$

$d^2 = \mathbf{1/2}$

$fd^2 = \mathbf{1/2}$

$$\text{Arith. Mean} = \frac{480}{15} = 32 \qquad \left(M = \frac{\sum fx}{N}\right)$$

$$\text{Std. Deviation : } \sigma = \sqrt{\frac{\sum fd^2}{N}} = \sqrt{\frac{550}{15}} = \sqrt{36.6} = 6.05$$ **1**

$$\sigma = 6.05$$

Space for Rough Work

52. There are 16 cricket players in a club, of whom 5 are batsmen, 4 are bowlers and the rest are allrounders. In how many ways a team of 11 be selected so as to contain 3 batsmen, 2 bowlers and the remaining allrounders. **[3]**

Ans. 3 batsmen are selected out of 5 in ${}^{5}C_{3}$ ways **$\frac{1}{2}$**

2 bowlers are selected out of 4 in ${}^{4}C_{2}$ ways **$\frac{1}{2}$**

6 allrounders are selected out of 7 in ${}^{7}C_{6}$ ways **$\frac{1}{2}$**

Total no. of ways $= {}^{5}C_{3} \times {}^{4}C_{2} \times {}^{7}C_{6}$. **1**

$= 10 \times 6 \times 7 = 420$ Teams **$\frac{1}{2}$**

53. Find the L.C.M. of :

$(x^3 - 9x^2 + 26x - 24)$ and $(x^3 - 6x^2 + 11x - 6)$. **[3]**

Ans.

x	$x^3 - 9x^2 + 26x - 24$	$x^3 - 6x^2 + 11x - 6$	1
	$x^3 - 5x^2 + 6x$	$x^3 - 9x^2 + 26x - 24$	
	(+) (–)	(+) (–) (+)	
-4	$-4x^2 + 20x - 24$	$3x^2 - 15x + 18$	
	$-4x^2 + 20x - 24$	$\div 3$	**2**
	0	$x^2 - 5x + 6$	

$$
\begin{array}{r|l}
x^2 - 5x + 6) & x^3 - 9x^2 + 26x - 24 \;(x - 4 \\
 & x^3 - 5x^2 + 6x \\
\hline
 & -4x^2 + 20x - 24 \\
 & -4x^2 + 20x - 24 \\
\hline
 & 0
\end{array}
$$

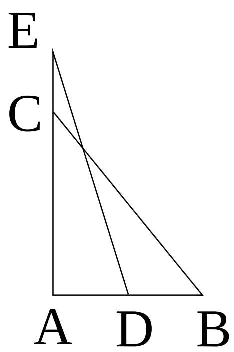
LCM $= (x - 4)\,(x^3 - 6x^2 + 11x - 6)$ **1**

Space for Rough Work

(or) $(x - 1)\,(x^3 - 9x^2 + 26x - 24)$

54. A ladder of length 2.6m is leaned against a wall. When it is at a distance of 2.4 m from the foot of the wall, the top of the ladder touches the bottom edge of the window in the wall. If the foot of the ladder is moved 1.4m towards the wall it touches the top edge of the window. Find the height of the window. **[3]**

Ans.



In Δ ABC

$$AC^2 = BC^2 - AB^2$$
$$= (2.6)^2 - (2.4)^2$$
$$= 6.76 - 5.76$$
$$= 1$$
$$AC = 1cm$$ **1**

In ΔADE AD = 2.4 – 1.4 = 1 cm **½**

$$\left.\begin{aligned} AE^2 &= DE^2 - AD^2 \\ &= (2.6)^2 - 1^2 \\ &= 6.76 - 1 \\ &= 5.76 \\ AE &= 2.4 \end{aligned}\right\}$$ **1**

Hight of window
EC = 2.4 – 1 = 1.4 **½**

Space for Rough Work

V. 55. If 7 times the 7th term of an A.P. is equal to 11 times the 11th term, prove that 18th term is equal zero. **[4]**

Ans.

$T_n = a + (n - 1)\ d$

$T_7 = a + 6d$ ——————— $\frac{1}{2}$

$T_{11} = a + 10d$ ——————— $\frac{1}{2}$

${}^{7}T_7 = {}^{11}\ T_{11}$

$7[a + 6d] = 11\ [a + 10d]$

$7a + 42d = 11a + 110d$ ——————— $\frac{1}{2}$

$7a - 11a = 110d - 42d$

$-4a = 68d$

$a = \dfrac{68d}{-4}$

$\boxed{a = -17d}$ ——————— **1**

$T_{18} = a + 17d$ ——————— $\frac{1}{2}$

$T_{18} = -17d + 17d$ ——————— $\frac{1}{2}$

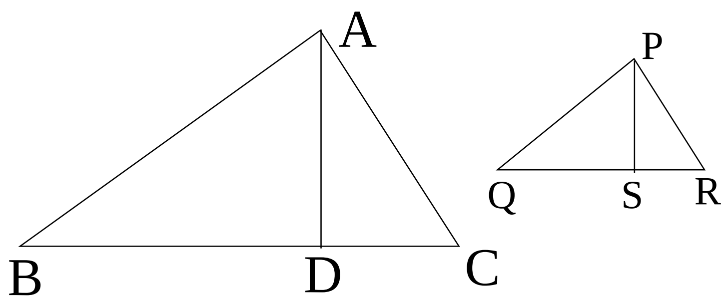
$\boxed{T_{18} = 0}$ ——————— $\frac{1}{2}$ **4**

(or)
Any other alternate method

Space for Rough Work

56. Prove that the areas of similar triangles are proportional to the squares of the corresponding sides. **[4]**

Ans.



½

Data : $\Delta ABC \parallel\!| \Delta PQR$

To prove : $\dfrac{Area\, of\, \Delta\, ABC}{Area\, of\, \Delta\, PQR} = \dfrac{BC^2}{QR^2}$ **½**

Construction : Draw AD ⊥ BC and PS ⊥ QR.

Proof: - $\dfrac{Area\, of\, \Delta\, ABC}{Area\, of\, \Delta\, PQR} = \dfrac{\frac{1}{2} \times BC \times AD}{\frac{1}{2} \times QR \times PS}$ **½**

$$= \frac{BC}{QR} \times \frac{AD}{PS} \text{ ——— } (1)$$ **½**

Compare Δ^{les} ABD and PQS.

$A\hat{B}D = P\hat{Q}S$ (given)

$A\hat{D}B = P\hat{S}Q$ (by construction)

$B\hat{A}D = Q\hat{P}S$ (remaining angles) **1**

$\therefore \Delta ABD ||| \Delta PQS$ (Δ^{les} are equiangular)

$\therefore \frac{AB}{PQ} = \frac{AD}{PS}$ —— 2 (corresponding sides)

But $\frac{AB}{PQ} = \frac{BC}{QR}$ – 3 (given)

From 2 & 3 $\frac{AD}{PS} = \frac{BC}{QR}$ —4 **½**

From 1 & 4 we get

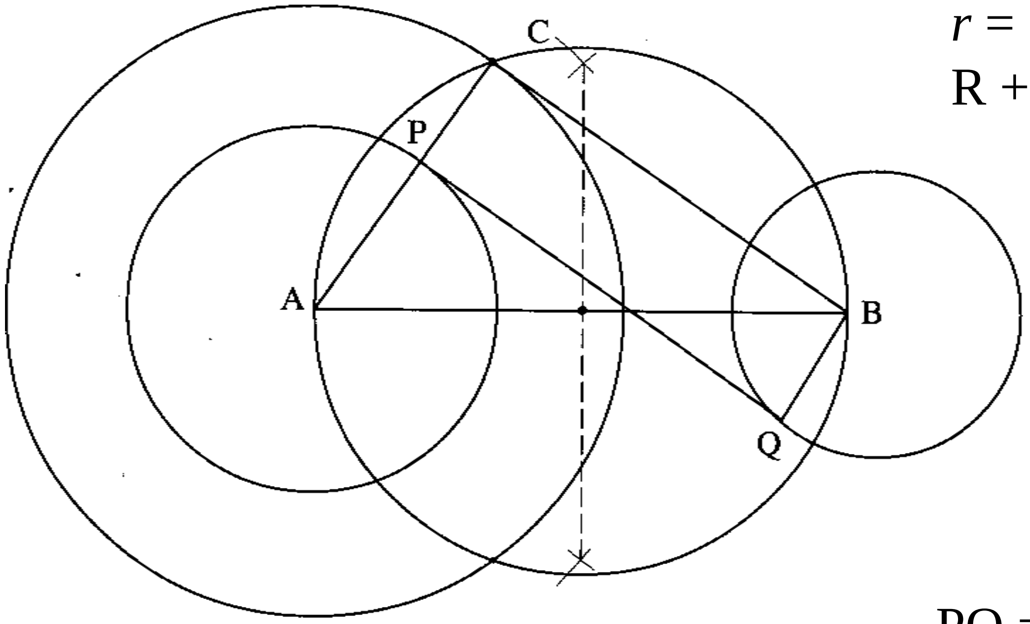
$$\frac{Area\, of\, \Delta\, ABC}{Area\, of\, \Delta PQR} = \frac{BC}{QR} \times \frac{BC}{QR} = \frac{BC^2}{QR^2}$$ **½**

Space for Rough Work

57. Construct a transverse common tangent to two circles of radii 3 cm and 2 cm, with their centres 9 cm apart. Measure the length of the tangent and verify. **[4]**

Ans.

d = 9 cm
R = 3 cm
r = 2 cm
R + r = 5cm



T.C.T.
PQ = 7.5 cm.

Verification

$$t = \sqrt{d^2 - (R+r)^2}$$
$$= \sqrt{9^2 - 5^2}$$
$$= \sqrt{81 - 25}$$
$$= \sqrt{56}$$
$$= 7.49$$

PQ = 7.5 cm.

4 circles -	**2**
PQ tangent	**1**
Correct Measure	**½**
Verification	**½**

Space for Rough Work

58. Draw the graphs of $y = x^2$ and $y = 6 - x$ and hence solve the equation $x^2 + x - 6 = 0$. **[4]**

Ans.

$y = x^2$

x	0	1	–1	2	–2	3	–3
y	0	1	1	4	4	9	9

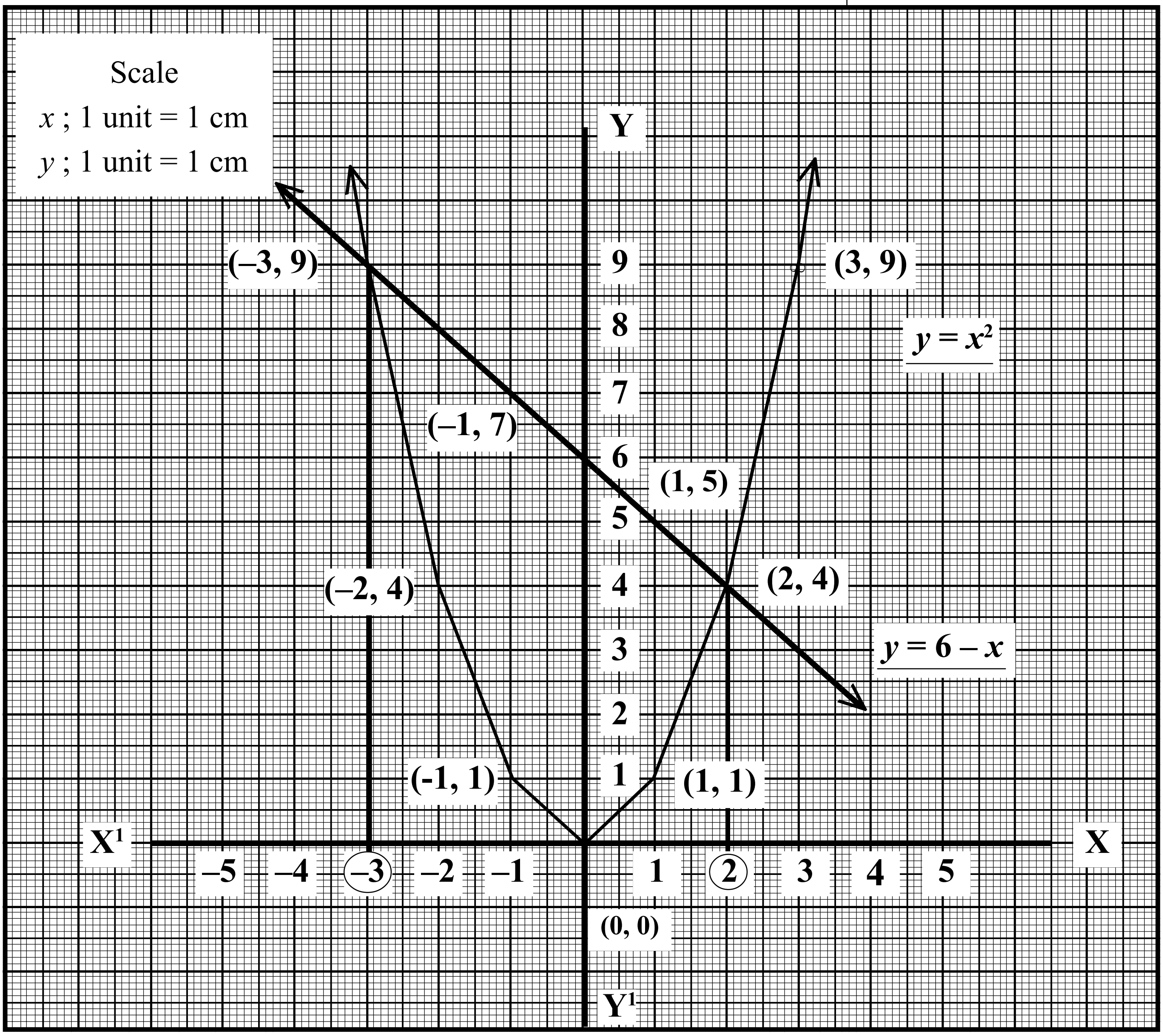
—— **(1)**

$y = 6 - x$

x	1	–1	2	–2	–3	3
y	5	7	4	8	9	3

—— **(1)**

1



Ans : $x = 2$ or -3 **(1)**

Space for Rough Work