

HALF YEARLY EXAMINATION - 2018

STD: X

MATHS ANSWER KEY

Section - I

1. B) $A \setminus B = A \cap B$
2. D) 1
3. B) $\frac{1}{3}$
4. A) Has infinitely many solutions
5. C) $-\frac{8}{5} < k < \frac{8}{5}$
6. D) not defined
7. B) (0,0)
8. C) $y = -7$
9. B) 4.5 cm
10. B) 16 cm
11. C) 1
12. C) $\sin^2 \theta + \cos^2 \theta$
13. B) $2\pi ab$
14. C) $(n-1)\bar{x}$
15. B) 0.16

Section - II

Two marks.

16. Cardinality of a finite set:

The number of elements in a set is called the cardinal number of the set.

It is denoted by $n(A)$.

Ex: $A = \{a, b, c\}$ then $n(A) = 3$

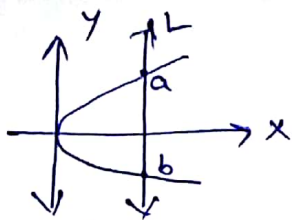
In general Two sets, A & B are finite.

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

Suppose $A \cap B = \phi$

$$n(A \cup B) = n(A) + n(B)$$

17.



The line L cut the curve at a and b two points.

∴ It is not a function.

18.

$n = 13$ odd number

$$b_n = n(n+2)$$

$$b_{13} = 13(13+2) = 13 \times 15 = 195$$

$n = 16$ even number

$$b_{16} = n^2 = (16)^2 = 256$$

19.

$$2x + 7y = -5 \rightarrow \textcircled{1}$$

$$-3x + 8y = -11 \rightarrow \textcircled{2}$$

$$\textcircled{1} \times 3 \Rightarrow 6x + 21y = -15$$

$$\textcircled{2} \times 2 \Rightarrow -6x + 16y = -22$$

$$\hline 37y = -37$$

$$y = -1$$

Put $y = -1$ in $\textcircled{1}$

$$\textcircled{1} \Rightarrow 2x + 7(-1) = -5$$

$$2x - 7 = -5$$

$$2x = -5 + 7$$

$$2x = 2$$

$$x = 1$$

Solution $\{1, -1\}$

24.

Interchanging the row and column of matrix A we get

$$A^T = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$$

$$A^T = \begin{bmatrix} a_{11} & a_{21} \\ a_{12} & a_{22} \end{bmatrix}$$

29.

$$AB = \begin{pmatrix} 3 & -2 \\ 5 & 1 \end{pmatrix} \begin{pmatrix} 4 & 1 \\ 2 & 7 \end{pmatrix}$$

$$= \begin{pmatrix} 12-4 & 3-14 \\ 20+2 & 5+7 \end{pmatrix}$$

$$= \begin{pmatrix} 8 & -11 \\ 22 & 12 \end{pmatrix}$$

23). Area of triangle

$$= \frac{1}{2} \begin{vmatrix} 0 & 3 & 0 & 0 \\ 0 & 0 & 2 & 0 \end{vmatrix}$$

$$= \frac{1}{2} (6) = 3 \text{ sq. u.}$$

20).

$$\alpha = 3 + \sqrt{7}$$

$$\beta = 3 - \sqrt{7}$$

$$\alpha + \beta = 3 + \sqrt{7} + 3 - \sqrt{7} = 6$$

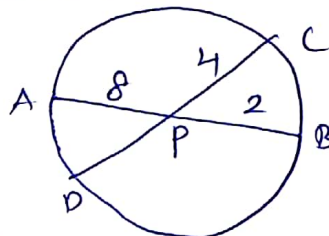
$$\alpha\beta = (3 + \sqrt{7})(3 - \sqrt{7}) = 3^2 - (\sqrt{7})^2$$

$$\alpha\beta = 9 - 7 = 2$$

$$x^2 - (\alpha + \beta)x + \alpha\beta = 0$$

$$x^2 - 6x + 2 = 0$$

24.



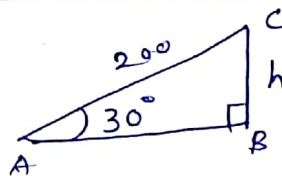
$$PA \times PB = PC \times PD$$

$$8 \times 2 = 4 \times PD$$

$$\frac{16}{4} = PD$$

$$PD = 4 \text{ cm.}$$

25.



$$\sin 30^\circ = \frac{BC}{AC}$$

$$\frac{1}{2} = \frac{h}{200}$$

$$h = 100 \text{ m.}$$

26. $\sec^2 \theta + \csc^2 \theta$

$$= \frac{1}{\cos^2 \theta} + \frac{1}{\sin^2 \theta}$$

$$= \frac{\sin^2 \theta + \cos^2 \theta}{\cos^2 \theta \cdot \sin^2 \theta}$$

$$= \frac{1}{\cos^2 \theta \cdot \sin^2 \theta}$$

$$= \sec^2 \theta \cdot \csc^2 \theta.$$

27.

$$\begin{aligned}
 \text{Vol} &= \frac{4}{3}\pi(R^3 - r^3) \\
 &= \frac{4}{3} \times \frac{22}{7} \times [12^3 - 10^3] \\
 &= \frac{4}{3} \times \frac{22}{7} \times [1728 - 1000] \\
 &= \frac{4}{3} \times \frac{22}{7} \times 728 \\
 V &= 3050 \frac{2}{3} \text{ cm}^3
 \end{aligned}$$

28.

$$\sigma = \sqrt{\frac{n^2 - 1}{12}}$$

$$\sigma = \sqrt{\frac{13^2 - 1}{12}}$$

$$\sigma = \sqrt{\frac{169 - 1}{12}}$$

$$\sigma = \sqrt{\frac{168}{12}}$$

$$\sigma = \sqrt{14}$$

$$\boxed{\sigma \approx 3.74}$$

29.

$$n(S) = 100$$

$$A = \{10, 20, 30, \dots, 100\}$$

$$n(A) = 10$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A) = \frac{10}{100}$$

$$\boxed{P(A) = \frac{1}{10}}$$

30.

(a)

$$\theta = 45^\circ, \quad c = \frac{2}{5}$$

$$m = \tan 45^\circ = 1$$

$$y = mx + c$$

$$y = 1x + \frac{2}{5}$$

$$y = x + \frac{2}{5}$$

$$5y = 5x + 2$$

$$\Rightarrow \boxed{5x - 5y + 2 = 0}$$

30.

b)

$$r = 7 \text{ cm}, \quad h = 20 \text{ cm}$$

$$\begin{aligned}
 \text{CSA} &= 2\pi r h = 2 \times \frac{22}{7} \times 7 \times 20 \\
 &= 44 \times 20 \\
 &= 880 \text{ cm}^2
 \end{aligned}$$

Section - III

5-marks.

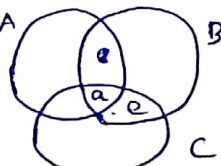
$$31.) \quad f(3) = 3(3) - 2 = 9 - 2 = 7$$

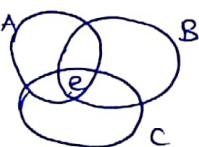
$$f(-1) = 4(-1)^2 - 1 = 4 - 1 = 3$$

$$f(6) = 2(6) - 3 = 12 - 3 = 9$$

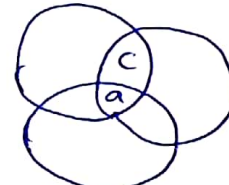
$$f(1) = 4(1)^2 - 1 = 4 - 1 = 3$$


$$\frac{f(3) + f(-1)}{2f(6) - f(1)} = \frac{7 + 3}{2(9) - 3} = \frac{10}{18 - 3} = \frac{10}{15} = \frac{2}{3}$$

$$32.) \quad B \cap C = A$$


$$A \cap (B \cap C) = A$$


$$A \cap B =$$



$$(A \cap B) \cap C =$$


33.

$$16^2 + 17^2 + \dots + 25^2$$

$$= (1^2 + 2^2 + \dots + 25^2) - (1^2 + 2^2 + \dots + 15^2)$$

$$= \frac{25}{1} n^2 - \frac{15}{1} n^2$$

$$= \frac{n(n+1)(2n+1)}{6} - \frac{n(n+1)(2n+1)}{6}$$

$$= \left[\frac{25(25+1)(2 \times 25+1)}{6} \right] - \left[\frac{15(15+1)(2 \times 15+1)}{6} \right]$$

$$= \left[\frac{25 \times 26 \times 51}{6} \right] - \left[\frac{15 \times 16 \times 31}{6} \right]$$

$$= 5525 - 1240$$

$$= 4285$$

34. $P = 500$
 $R = 10\%$
 $n = 10$

$$A = P \left(1 + \frac{r}{100}\right)^n$$

$$A = 500 \left(1 + \frac{10}{100}\right)^{10}$$

$$A = 500 \left(\frac{11}{10}\right)^{10}$$

35. $3P^2x^2 - 2PQ + Q^2 = 0$

$$A = 3P^2$$

$$B = -2PQ$$

$$C = Q^2$$

$$\Delta = B^2 - 4AC$$

$$= (-2PQ)^2 - 4(3P^2)Q^2$$

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

$$= -8P^2Q^2$$

$$\Delta < 0$$

roots are not real.

36.

$$\begin{array}{r} x^2 - 2x + 3 \\ \hline x^4 - 4x^3 + 10x^2 - 12x + 9 \\ \underline{2x^4 - 4x^3} \\ 6x^2 - 12x + 9 \\ \underline{6x^2 - 12x + 9} \\ 0 \end{array}$$

$$\sqrt{x^4 - 4x^3 + 10x^2 - 12x + 9} = (x^2 - 2x + 3)$$

37.

$$\begin{array}{r} x^3 + 2x^2 - 4x - 8 \\ \hline 2x^3 + 7x^2 + 4x - 4 \\ \underline{2x^3 + 4x^2 - 8x + 16} \\ 3x^2 + 12x + 12 \\ \underline{3x^2 + 12x + 12} \\ 0 \end{array}$$

$$3 \div x^2 + 4x + 4$$

38). $2x + 3y = \begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix} \rightarrow \textcircled{1}$

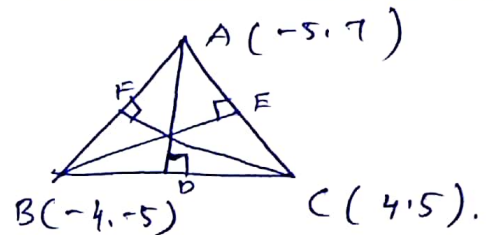
$$3x + 2y = \begin{bmatrix} 2 & -2 \\ -1 & 5 \end{bmatrix} \rightarrow \textcircled{2}$$

solving eqn ① & ② we get

$$x = \begin{bmatrix} 2/5 & -12/5 \\ -1/5 & 3 \end{bmatrix}$$

$$y = \begin{bmatrix} 2/5 & 13/5 \\ 14/5 & -2 \end{bmatrix}$$

39).



$$\text{slope } m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\text{slope of } BC = 5/4 \quad (m_1 \times m_2 = -1)$$

$$\text{slope of } AD = -4/5$$

$$\text{slope of } AC = \frac{5-7}{4+5} = -2/9$$

$$\text{slope of } BE = 9/2$$

$$\text{slope of } AB = \frac{7+5}{-5+4} = -12$$

$$\text{slope of } CF = 1/12$$

$$\begin{array}{r} x^2 + 4x + 4 \\ \hline x^3 + 2x^2 - 4x - 8 \\ \underline{x^3 + 4x^2 + 4x} \\ -2x^2 - 8x - 8 \\ \underline{-2x^2 - 8x - 8} \\ 0 \end{array}$$

$$\text{GCD} = x(x^2 + 4x + 4)$$

40. $a+b=5$
 $b=5-a$
 $\frac{x}{a} + \frac{y}{5} = 1$
 $\frac{x}{a} + \frac{y}{5-a} = 1$

$(5-a)x + ay = a(5-a) \rightarrow \textcircled{1}$
 passes through $(6, -2)$
 $(5-a)6 + (-2)a = a(5-a)$
 $30 - 6a - 2a = 5a - a^2$
 $a^2 - 8a + 30 = 0$
 $(a-3)(a-10) = 0$
 $a=3, a=10.$

put $a=3$ in $\rightarrow \textcircled{1}$

$2x + 3y = 6$

$2x - 3y - 6 = 0$

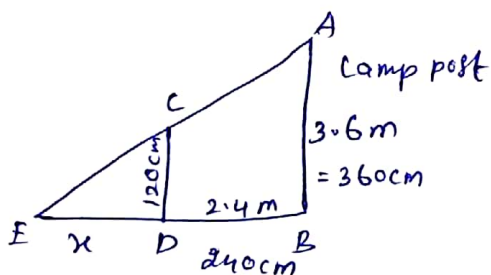
put $a=10$ in equ $\textcircled{1}$

$-5x + 10y = -50$

$x - 2y = 10$

$x - 2y - 10 = 0$

41.



$\triangle ABE \sim \triangle CDE$

$\frac{AB}{CD} = \frac{BE}{DE}$

$\frac{360}{120} = \frac{x+240}{x}$

$3x = x + 240$

$2x = 240$

$x = 120$

$x = \frac{120}{100}$

$x = 1.2 \text{ m}$

The length of the tree shadow after 4 sec = 1.2 m.

42.)

Vol. of melted = Vol. of recast

$\frac{4}{3} \pi (2^3 + 12^3 + r_3^3) = \frac{4}{3} \pi (18)^3$

$8 + 1728 + r_3^3 = 18 \times 18 \times 18$

$1736 + r_3^3 = 5832$

$r_3^3 = 4096$

$r_3^3 = 4^3 \times 4^3$

$r_3^3 = 16^3$

$r_3 = 16 \text{ cm}$



43.)

Hollow cylinder.

$CSA = 2\pi h(R+r)$

$= 2 \times \frac{22}{7} \times 14 (12+18)$

$= 2 \times 22 \times 2 (30)$

$= 88 \times 30$

$= 2640 \text{ cm}^2$

$TSA = 2\pi (R+r)(R-r+h)$

$= 2 \times \frac{22}{7} \times (12+18)(18-12+14)$

$= \frac{77}{7} \times 30 \times 20$

$= \frac{44 \times 600}{7}$

$= \frac{26400}{7} \text{ cm}^2$

$TSA = 3771 \frac{3}{7} \text{ cm}^2$

44.)

$n = 30$

$\bar{x} = 18$

$\sigma = 3$

$\bar{x} = \frac{\sum x}{n} = 18$

$\frac{\sum x}{30} = 18$

$\sum x = 18 \times 30$

$\sum x = 540$

$$\sigma^2 = \frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2$$

$$(3)^2 = \frac{\sum x^2}{30} - (18)^2$$

$$9^2 = \frac{\sum x^2}{30} - 324$$

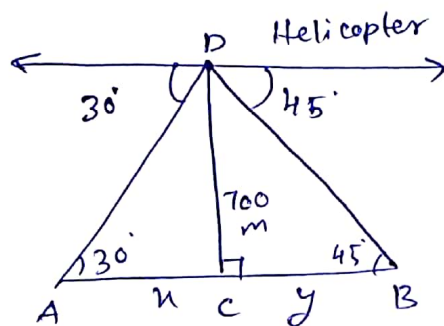
$$270 = \sum x^2 - 324 \times 30$$

$$270 = \sum x^2 - 9720$$

$$\sum x^2 = 270 + 9720$$

$$\sum x^2 = 9990.$$

45
(a)



AB is the width of the river = $x + y$

In rt $\triangle ACD$

$$\tan 30^\circ = \frac{700}{x}$$

$$\frac{1}{\sqrt{3}} = \frac{700}{x}$$

$$\Rightarrow x = 700\sqrt{3} \text{ m}$$

In rt $\triangle BCD$

$$\tan 45^\circ = \frac{700}{y}$$

$$1 = \frac{700}{y}$$

$$y = 700$$

$$\therefore AB = x + y$$

$$= 700\sqrt{3} + 700$$

$$= 700 \cdot (\sqrt{3} + 1)$$

$$= 700 (1.732 + 1)$$

$$= 700 \times 2.732$$

$$\text{The width of the river.} = 1912.40 \text{ m}$$

45).
(b).

$$P(A) = 0.25$$

$$P(B) = 0.35$$

$$P(A \cap B) = 0.15$$

(i) P[it will get at least one of two awards]

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

$$= 0.25 + 0.35 - 0.15$$

$$P(A \cup B) = 0.45$$

(ii) P[It will get only one of the awards]

P(only A only B)

$$= P(A \cap \bar{B}) + P(\bar{A} \cap B)$$

$$= [P(A) - P(A \cap B)] + [P(B) - P(A \cap B)]$$

$$= (0.25 - 0.15) + (0.35 - 0.15)$$

$$= 0.10 + 0.20$$

$$= 0.30$$

$$= 0.3.$$

Thank you.

M. Murugan, M.Sc. B.Ed.

Phone No. 8883932320.