XI– MATHEMATICS TERM 1- Practice Paper 01

Answer key

SECTION: A

1. (a) 0
2. (b) $x \in (7, \infty)$
3. (d) cannot be evaluated
4. (a) 2^{15}
5. (c) {0, ±3, ±4, ±5}
6. (d) 40320
7. (a) −4
8. (c) 12
9. (b) $A \cap B = B$
10. (b) [-a, a]
11. (b) 0
12. (b) x = 4n, where n $\in N$
13. (d) 16
14. (a) 8.4
15. (a) −4
16. (b) 2
17. (a) 393216
18. (a) $-1760x^9 \times y^3$

19. (c) Assertion is true but reason is false

20. (a) both Assertion and reason are correct and reason is correct explanation for Assertion

SECTION: B

(VSA Questions of 2 marks each)

21. $f = \{(1,1)\}(0,-2),(3,0),(2,4)\}$

and $f(x) = ax + b$

then, $f(0) = -2$

$\Rightarrow -2 = a \times 0 + b$

$\Rightarrow -2 = b$

and $f(1) = 1$

$\Rightarrow 1 = a \times 1 + b$

$\Rightarrow 1 = a + b$

$\Rightarrow 1 = a - 2$

$\Rightarrow 3 = a$

22. Let, $22°30' = \frac{\theta}{2}$

$\therefore \theta = 45°$

$$\tan 22°30° = \tan\frac{\theta}{2} = \frac{\sin\frac{\theta}{2}}{\cos\frac{\theta}{2}}$$

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

$$\therefore = \frac{\sin 45°}{1+\cos 45°} = \frac{\frac{1}{\sqrt{2}}}{1+\frac{1}{\sqrt{2}}} = \frac{1}{\sqrt{2}+1}$$

$$= \frac{1\times(\sqrt{2}-1)}{(\sqrt{2}+1)(\sqrt{2}-1)} = \sqrt{2}-1$$

Hence, $\tan 22°30' = \sqrt{2} - 1$

OR

$\frac{-2}{9}$ radian $= \frac{-2}{9} \times \frac{180}{\pi}$

$= -\left(2 \times \frac{20}{\pi}\right)$

$= -\left(2 \times \frac{20 \times 7}{22}\right)$

$= -\left(\frac{20 \times 7}{11}\right)$

$= -\left(\frac{140}{11}\right) = -12.7272°$

23. $x + \frac{x}{2} + \frac{x}{3} < 11$

$\Rightarrow x\left(1 + \frac{1}{2} + \frac{1}{3}\right) < 11$

$\Rightarrow x\left(\frac{6 + 3 + 2}{6}\right) < 11$

$\Rightarrow \frac{11x}{6} < 11$

$\Rightarrow \frac{11x}{6 \times 11} < \frac{11}{11}$

$\Rightarrow \frac{x}{6} < 1$

$\Rightarrow x < 6$

Thus, all real numbers x, which are less than 6 m are the solutions of the given inequality.

Hence, the solution set of the given inequality is $(-\infty, 6)$.

24. R = {(2,5), (3,6), (5,8), (7,10)}

Domain = {2,3,5,7}

Range = {5,6,8,10}

25. $\lim_{x \to 0} \left(\frac{1 - cos4x}{x^2}\right)$

$\lim_{x \to 0} \left(\frac{2 \sin^2 2x}{x^2}\right)$

$\lim_{x\to 0}\left(\frac{8\sin^2 2x}{(2x)^2}\right)$

$8\lim_{x\to 0}\left(\frac{\sin 2x}{2x}\right)^2$

$8x\,1 = 8$

SECTION: C

(SA Questions of 3 marks each)

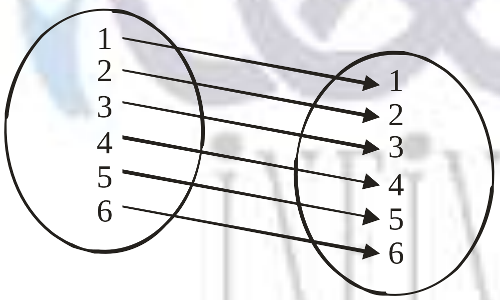
26. Given $A = \{1,2,3,4,5,6\}$ and

$R = \{(x, y): y = x - 1\}$

The given relation in roster form can be written as

$R = \{(2,1), (3,2), (4,3), (5,4), (6,5)\}$

The given relation can be represented with the following arrow diagram



So, domain of $R = \{1,2,3,4,5,6\}$, co-domain of

$R = \{0,1,2,3,4,5\}$ and range of $R = \{2,3,4,5,6\}$.

27. LHS: $\frac{\tan A+\tan B}{\tan A-\tan B}$

$= \frac{\frac{\sin A}{\cos A}+\frac{\sin B}{\cos B}}{\frac{\sin A}{\cos A}-\frac{\sin B}{\cos B}}$

$= \frac{\frac{\sin A\cos B+\cos A\sin B}{\cos A\cos B}}{\frac{\sin A\cos B-\cos A\sin B}{\cos A\cos B}}$

$= \frac{\sin A\cos B+\cos A\sin B}{\cos A\cos B-\cos A\sin B}$

$= \frac{\sin(A+B)}{\sin(A-B)}$

$\therefore \frac{\tan A+\tan B}{\tan A-\tan B} = \frac{\sin(A+B)}{\sin(A-B)}$

28. $a + ib = \frac{c+i}{c-i}$

$\Rightarrow \; a + ib = \frac{(c+i)(c+i)}{(c-i)(c+i)}$

$\Rightarrow \; a + ib = \frac{(c+i)^2}{c^2-i^2}$

$\Rightarrow \; a + ib = \frac{c^2+2ic+i^2}{c^2+1}$

$\Rightarrow \; a + ib = \frac{c^2-1}{c^2+1} + i \cdot \frac{2c}{c^2+1}$

$\Rightarrow \; a = \frac{c^2-1}{c^2+1}$ and $b = \frac{2c}{c^2+1}$

$\Rightarrow \; a^2 + b^2 = \left(\frac{c^2-1}{c^2+1}\right)^2 + \frac{4c^2}{(c^2+1)^2}$

$= \frac{c^4+1-2c^2+4c^2}{(c^2+1)^2}$

$\Rightarrow a^2 + b^2 = \frac{c^4+2c^2+1}{(c^2+1)^2}$

$\Rightarrow a^2 + b^2 = \frac{(c^2+1)^2}{c^2+1)^2} \Rightarrow a^2 + b^2 = 1$

$\Rightarrow \; \frac{b}{1} = \frac{\frac{2c}{c^2+1}}{\frac{c^2-1}{c^2+1}}$

$\Rightarrow \; \frac{c^2}{c^2-1}$

29. k=4

30. $n(A - B) = 14 + x$

$n(B - A) = 3x$

$n(A \cap B) = x$

We know that:

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

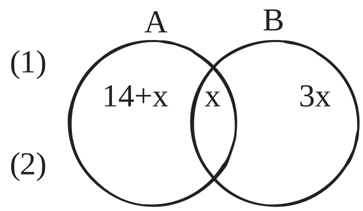
$\Rightarrow n(A) = 14 + x + x = 14 + 2x$

we know that:

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

$\Rightarrow n(A) = 14 + x + x = 14 + 2x$

Similarly,



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

$\Rightarrow n(B) = 3x + x = 4x$

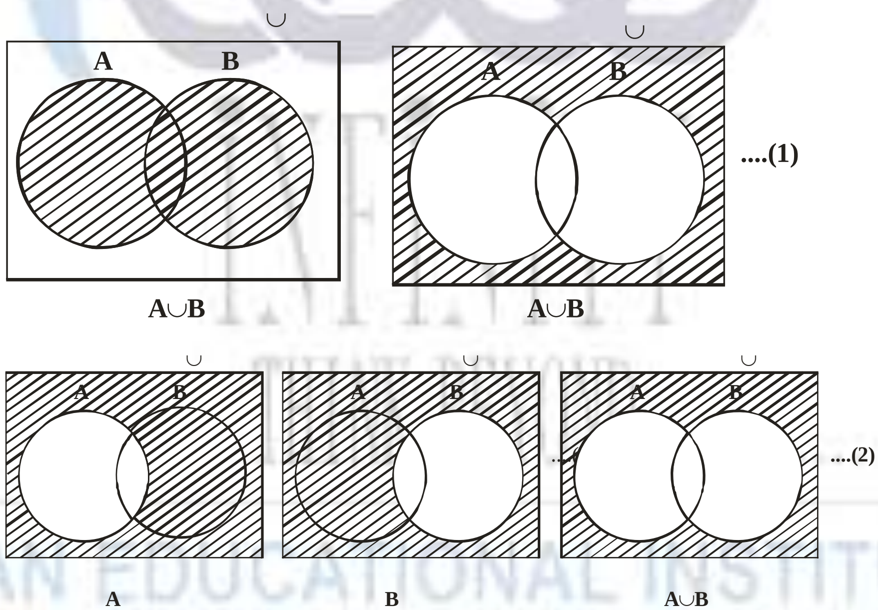
It is given that,

$n(A) = n(B)$

So, (1) = (2)

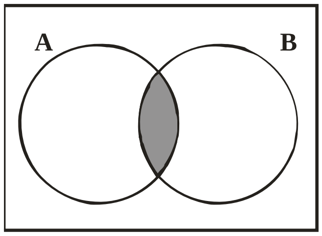
$\Rightarrow 14 + 2x = 4x$

$\therefore x = 7$



OR

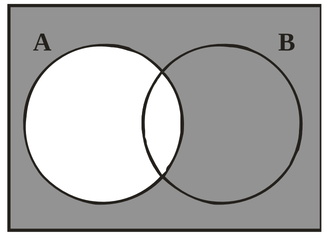
∪



(1)

A∩B

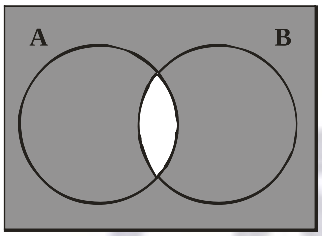
∪



(3)

A

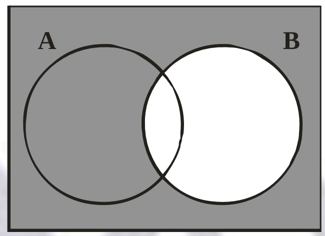
∪



(2)

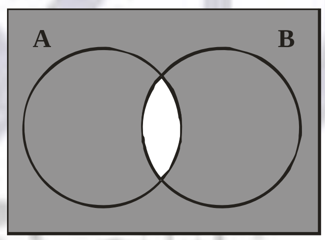
A∩B

∪



(4)

B



(5)

A∪B

(i) (A∩B)′ = (A′∪ B′) **(ii)** (A∪B)′ = (A′∩B′)

31. 64

SECTION D

(LA-4 Marks each)

32. $\therefore \cot(105)^\circ = \cot(60^\circ + 45^\circ)$

We know $\cot(A+B) = \frac{\cot A \cot B - 1}{\cot B + \cot A}$

So, Applying the formula in $\cot(60^\circ + 45^\circ)$

We get, $\cot(60^\circ + 45^\circ) = \frac{\cot 60^\circ \cot 45^\circ - 1}{\cot 60^\circ + \cot 45^\circ}$

$= \frac{\frac{1}{\sqrt{3}} \times 1 - 1}{\frac{1}{\sqrt{3}} + 1} \left\{\cot 60^\circ = \frac{1}{\sqrt{3}}, \cot 45^\circ = 1\right\}$

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

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

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

$= -2+\sqrt{3} = \sqrt{3}-2$

Now, cot 15°

We have, $\cot(A-B) = \frac{\cot A - \cot B + 1}{\cot B - \cot A}$

$$\Rightarrow \ (\cot 60° - 45°) = \frac{\cot 60° \cdot \cot 45° + 1}{\cot 45° - \cot 60°}$$

$$\Rightarrow \cot(15°) = \frac{\frac{1}{\sqrt{3}} \times 1 + 1}{1 - \frac{1}{\sqrt{3}}}$$

$$\Rightarrow \cot(15°) = \frac{\frac{1}{\sqrt{3}} + 1}{1 - \frac{1}{\sqrt{3}}}$$

$$\Rightarrow \cot(15°) = \frac{\frac{1+\sqrt{3}}{\sqrt{3}}}{\frac{\sqrt{3}-1}{\sqrt{3}}}$$

$$\Rightarrow \ \cot(15°) = \frac{\sqrt{3}+1}{\sqrt{3}-1}$$

$\Rightarrow \cot(15°) = \frac{(\sqrt{3}+1)^2}{(\sqrt{3})^2-1^2}$ [On Rationalisation]

$\Rightarrow \cot(15°) = \frac{3+1+2\sqrt{3}}{3-1}$

$\Rightarrow \ \cot(15°) = \frac{4+2\sqrt{3}}{2} = \frac{2(2+\sqrt{3})}{2}$

$\therefore \cot 15° = 2+\sqrt{3}$

OR

L.H.S. $= \cos\theta \cos\dfrac{\theta}{2} - \cos 3\theta \cos\dfrac{9\theta}{2}$

$= \frac{1}{2}\left[2\cos\theta\cos\frac{\theta}{2} - 2\cos 3\theta\cos\frac{9\theta}{2}\right]$

$= \frac{1}{2}\left[\cos\left(\theta+\frac{\theta}{2}\right)+\cos\left(\theta-\frac{\theta}{2}\right)-\begin{Bmatrix}\cos\left(3\theta+\frac{9\theta}{2}\right)+\\ \cos\left(3\theta-\frac{9\theta}{2}\right)\end{Bmatrix}\right]$

$[\because 2\cos A\cos B = \cos(A+B)+\cos(A-B)]$

$= \frac{1}{2}\left(\cos\frac{3\theta}{2}+\cos\frac{\theta}{2}-\cos\frac{15\theta}{2}-\cos\frac{3\theta}{2}\right)$

$= \frac{1}{2}\left(\cos\frac{\theta}{2}-\cos\frac{15\theta}{2}\right)$

$= -\frac{1}{2}\left[2\sin\left(\frac{\theta+15\theta}{2}\right)\sin\left(\frac{2-152}{2}\right)\right]$

$\left[\because \cos C-\cos D = -2\sin\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)\right]$

$= -\left\{\sin 4\theta \sin\left(-\frac{7\theta}{2}\right)\right\}$

$= \sin 4\theta\cdot\sin\frac{7\theta}{2}$ $[\because \sin(-\theta) = -\sin\theta]$

$=$ RHS.

33. Given, $x - iy = \frac{(a+7)^2}{2a+i}$

We know that if two complex numbers are equal, then their conjugates are also.

Taking conjugate of both sides, we get

$x + iy = \dfrac{(a+7)^2}{2a-i}$

Multiplying corresponding sides of both equations (1) and (2), we get

$(x-iy)(x+iy)$

$= \dfrac{(a+7)^2}{2a+i}\times\dfrac{(a+7)^2}{2a-i}$

$\Rightarrow\ x^2 - i^2y^2 = \frac{(a+7)^4}{(2a)^2-i^2}$

$\Rightarrow\ x^2 + y^2 = \frac{(a+7)^4}{4a^2+1}$

34. Mean 42.5,Variance =30.84,SD= 5.55

35.

Let x be the number of litres of 4% boric acid solution.

∴ Total mixture = (750 + x) liters

∴ 4% of x + 10% of 750 > 5% of (750 + x)

$\Rightarrow \frac{4x}{100}+\frac{10}{100}(750) > \frac{5}{100}(750+x)$

$\Rightarrow 4x + 7500 > 3750 + 5x$

$\Rightarrow 7500 - 3750 > 5x - 4x$

$\Rightarrow x < 3750$ ... (1)

Also, 4% of x + 10% of 750 < 8% of (750 + x)

$\Rightarrow \frac{4x}{100}+\frac{10}{100}(750) < \frac{8}{100}(750+x)$

$\Rightarrow 4x + 7500 < 6000 + 8x$

$\Rightarrow 7500 - 6000 < 8x - 4x$

$\Rightarrow 1500 < 4x$

$\Rightarrow x > 375$ ... (2)

From (1) and (2), we have $375 < x < 3750$

∴ Quantity of the 4% solution that has to be added will lie between 375 litres and 3750 litres.

SECTION E

(Long answer type questions (LA) of 5 marks each)

36. (A) A History book can be selected in 5 ways and a Math book can be selected in 3 ways.

Required number of ways = 5 + 3 = 8

[Using addition Principle]

(B) Now, 2 History books can be chosen in ${}^5P_2$ ways, 1 Maths book can be chosen in ${}^3P_1$ ways and 1 Science book can be chosen in ${}^4P_1$ ways.

∴ Required number of ways $= {}^5P_2 \times {}^3P_1 \times {}^4P_1$
$= 240$

(C) Number of ways of arranging History books

$= 5!$

Number of ways of arranging Maths books

$= 3\,!$

Number of ways of arranging Science books

$= 4\,!$

∴ Required number of ways if the books of same subject are put together = 3 ! -5 ! 4 !

OR

The number of selection of books ${}^5p_1 \times {}^3P_2 \times {}^4P_2$ represents the arrangement of 1 History book, 2 Maths books and 2 Science books respectively.

37. **(i)** We know that,

Angle traced by the minute hand in 60 min $= (2\pi)^c$

Angle traced by the minute hand in 45 min $= \left(\frac{2\pi}{60} \times 45\right)^c = \left(\frac{3\pi}{2}\right)^c$

$\Rightarrow$ r = 2 cm and $\theta = \left(\frac{3z}{2}\right)^c$

$\Rightarrow l = r \times \theta$

$\Rightarrow I = \left(2 \times \frac{3\pi}{2}\right)$

$\Rightarrow l = 3\pi$

$\Rightarrow I = 3 \times 3.14$

$\Rightarrow l = 9.42$

$\therefore$ It tip moves 9.42 in 45 minutes.

(ii) Let r_1 and r_2 be the radii of the two circles and let their arcs of same length S subtend angles of 65° and 110° at their centres.

Angle subtended at the centre of the first circle,

$\theta_1 = 65^\circ$

$= \left(65 \times \frac{\pi}{180}\right)^c$

$= \left(\frac{13\pi}{36}\right)^c$

$\therefore S = r_1\theta_1 = r_1\left(\frac{13\pi}{36}\right) \ldots$ (i)

$\theta_2 = 110^\circ$

$= \left(110 \times \frac{\pi}{180}\right)^c$

$= \left(\frac{11\pi}{18}\right)^c$

$\therefore S = r_2\theta_2 = r_2\left(\frac{11\pi}{18}\right) \dots$ (ii)

From (i) and (ii), we get

$r_1\left(\frac{13\pi}{36}\right) = r_2\left(\frac{11\pi}{18}\right)$

$\therefore \frac{r_1}{r_2} = \frac{22}{13}$

(iii) $\therefore\ \theta = \frac{l}{r} = \frac{22}{100} = \frac{11}{50}$ radians

$= \frac{11}{50} \times \frac{180}{\pi} = \frac{11}{50} \times \frac{180}{22} \times 7 = \frac{63}{5}$ Or $= \left(12\frac{3}{5}\right)^\circ = 12^\circ 36'$

$\theta = ?\, r = 75$ cm, s = 10 cm

S = rθ, (formula) $10 = 75 \times \theta$.

$\therefore \theta = 10/75 = 2/15 \Rightarrow \therefore \theta =$ [0.133 radian.]

38. **(i)** $6 \times 5 \times 4 \times 3 \times 2 \times 1$

(ii) A hexagon has 6 sides. We obtain the diagonals by joining the vertices in pairs.

Total number of sides and diagonals =

$C(6,2) = 15$. This includes its 6 sides also. So, diagonals $= 15 - 6 = 9$. Hence, the number of diagonals is 9.1

(iii) The given word contains 7 letters, which may be arranged among themselves in 7! = 5040 ways.

The given word contains 3 vowels and 4 consonants.

Taking the 3 vowels E,A.O as one letter, this letter and 4 more letters can be arranged in 5 ! = 120 ways.

The 3 vowels can be arranged among themselves in 3! = 6 ways.

Required number of arrangements with vowels together = (120x6) = 720.

Hence Arrangements with no vowel together = $5040 - 720 = 4320$.

Or

Word TESSELLATIONS has 13 letters together in which T repeat 2 times, E repeats 2 times =, S repeat 3 times,L repeats 2 times,letter A, I, O, N occurs once

Total ways would be 8!

Note for students/Teachers

It would really be appreciable to update us with any kind of error in answer key. It's a humble request to kindly share your opinion or feedback or any suggestion related to any kind of error or updations directly by connecting on whatsapp (Text Only) at 8743011101.

Regards

Deepika Bhati