

CBSE Sample Paper Class 11 Maths Set 2 Solution

ANSWERS

Section A

1. **Solution:**

$$\begin{aligned}\frac{3+2i}{1-i} &= \frac{3+2i}{1-i} \cdot \frac{1+i}{1+i} \\ &= \frac{3+2i+3i+2i^2}{1-i^2} = \frac{1}{2} + \frac{5}{2}i \\ (1+2i)i - \frac{3+2i}{1-i} &= (-2+i) - \left(\frac{1}{2} + \frac{5}{2}i\right) = -\frac{5}{2} - \frac{3}{2}i\end{aligned}$$

2. **Solution:**

$$\text{Domain} = [-1, 1] \quad \text{Range} = [0, \pi]$$

3. **Solution :**

$$0 \leq \cos^{-1} x \leq \pi$$

sin in this interval is positive and hence y is positive

4. **Solution:**

$$\begin{aligned}\sin^{-1}\left(\sin\left(\frac{6\pi}{7}\right)\right) &= \sin^{-1}\left(\sin\left(\pi - \frac{\pi}{7}\right)\right) \\ &= \sin^{-1}\left(\sin\left(\frac{\pi}{7}\right)\right) \\ &= -\frac{\pi}{2} \leq \frac{\pi}{7} \leq \frac{\pi}{2} \\ &= \frac{\pi}{7}\end{aligned}$$

5. **Solution:** $(a, 2a)$, $(a, -2a)$

6. **Solution:**

$$x + 7 = 10$$

$$x = 3$$

$$x + y = 8$$

$$y = 5$$

Section B

7. **Solution:**

$$\frac{1 - \cos 2x}{2} + \frac{1 - \cos 4x}{2} = 1$$

$$\cos 2x + \cos 4x = 0$$

$$2 \cos 3x \cos x = 0$$

$$\cos 3x = 0$$

$$x = \frac{\pi}{6} + \frac{\pi}{3}n$$

$$\cos x = 0$$

$$x = \frac{\pi}{2} + \pi k = \frac{\pi}{6} + \frac{\pi}{3}n \quad n \text{ is integer}$$

8. Solution:

$$i^{30} + i^{40} + i^{60} = (i^4)^7 \cdot i^2 + (i^4)^{10} + (i^4)^{15}$$

$$i^4 = 1 = -1 + 1 + 1 = 1$$

9. Solution:

Substituting the points (0, 0) and (5, 5) on the given line

$$x + y - 8 = 0$$

$$0 + 0 - 8 = -8$$

$$5 + 5 - 8 = 2$$

Since the signs of the resulting numbers are different the given points lie on opposite sides of the given line.

10. Solution :

$$\tan^{-1} x = A$$

$$\tan A = x$$

$$\cot^{-1} x = B$$

$$\cot B = x$$

$$\tan\left(\frac{\pi}{2} - B\right) = x$$

$$\tan^{-1} x = \frac{\pi}{2} - B$$

$$\tan^{-1} x = A$$

$$A = \frac{\pi}{2} - B$$

$$A + B = \frac{\pi}{2}$$

$$\tan^{-1} x + \cot^{-1} x = \frac{\pi}{2}$$

11.Solution:

$11^{n+2} + 12^{2n+1}$ is divisible by 133

$$n = 1$$

$$11^3 + 12^3 = (11+12)(11^2 - 11 \cdot 12 + 12^2)$$

$$= 23 \cdot 133$$

Let it be true for k

$11^{k+2} + 12^{2k+1}$ is divisible by 133

For k = k + 1

$$11^{k+3} + 12^{2k+3} = 11 \cdot 11^{k+2} + 12^2 \cdot 12^{2k+1}$$

$$= 11 \cdot 11^{k+2} + 144 \cdot 12^{2k+1}$$

$$= 11 \cdot 11^{k+2} + 133 \cdot 12^{2k+1} + 11 \cdot 12^{2k+1}$$

$$= 11 \cdot 11^{k+2} + 11 \cdot 12^{2k+1} + 133 \cdot 12^{2k+1}$$

Is divisible by 133 since $11^{k+2} + 12^{2k+1}$ is divisible by 133

12.Solution:

$$n(A' \cap B') = n(A \cup B)' = n(U) - n(A \cup B)$$

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

$$800 - [200 + 300 - 100]$$

$$= 400$$

13.Solution: $\alpha + \beta = b$

$$\alpha\beta = c$$

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

$$= b^2 - 2c$$

14.Solution:

$$(x+a)^n = P+Q$$

$$(x-a)^n = P-Q$$

$$(P+Q)(P-Q) = (x+a)(x-a)$$

$$P^2 - Q^2 = (x^2 - a^2)^n$$

15.Solution:

Discriminant of numerator = $9 - 24 <$ and

Coefficient of x^2 is positive. Hence Numerator is always positive

Hence dividing by the numerator on both sides of

The equality does not change the sign of the inequality

Hence we need only consider $\frac{1}{3x+4} < 0$

$$x < -\frac{4}{3}$$

$$x \in (-\infty, -\frac{4}{3})$$

16.Solution:

$$\begin{aligned}\cot(A+15) - \tan(A-15) &= \frac{\cos(A+15)}{\sin(A+15)} - \frac{\sin(A-15)}{\cos(A-15)} \\ &= \frac{\cos(A+15)\cos(A-15) - \sin(A+15)\sin(A-15)}{\sin(A+15)\cos(A-15)} \\ &= \frac{\cos 2A}{\frac{1}{2}(\sin 2A + \frac{1}{2})} \\ &= \frac{2\cos 2A}{\sin 2A + \frac{1}{2}} \\ &= \frac{4\cos 2A}{1 + 2\sin 2A}\end{aligned}$$

17.Solution:

$$4 - x^2 \geq 0$$

$$x^2 - 4 \leq 0$$

Domain of $x \in [-2, 2]$

$$y^2 = 4 - x^2$$

$$x^2 = 4 - y^2$$

$$x = \sqrt{4 - y^2}$$

$$4 - y^2 \geq 0$$

$$y^2 - 4 \leq 0$$

$$y \in [-2, 2]$$

Also for all values of $x \in [-2, 2]$

$$y = \sqrt{4 - x^2} \geq 0$$

Range $y \in [0, 2]$

18.Solution:

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

$$\cos \theta = \frac{1 - 4}{1 + 4} = \frac{-3}{5}$$

$$\sin \theta = \frac{2 \tan \frac{\theta}{2}}{1 + \tan^2 \frac{\theta}{2}} = \frac{2 \cdot 2}{1 + 4} = \frac{4}{5}$$

$$\frac{1}{2 + \cos \theta + \sin \theta} = \frac{1}{2 - \frac{3}{5} + \frac{4}{5}} = \frac{11}{5}$$

19.Solution:

$$\lim_{x \rightarrow 0} \frac{\sin 5x}{x + x^3} = \lim_{x \rightarrow 0} \frac{5 \sin 5x}{5x(1 + x^2)}$$

$$= \lim_{x \rightarrow 0} \frac{5 \sin 5x}{5x} \lim_{x \rightarrow 0} \frac{1}{(1 + x^2)}$$

$$= 5 \cdot 1 \cdot 1$$

$$= 5$$

Section C

20.Solution :

$$y = \log_{10} x$$

$$x = 10^y$$

$$\log_e x = y \log_e 10$$

$$y = \frac{\log_e x}{\log_e 10}$$

$$\frac{dy}{dx} = \left(\frac{1}{\log_e 10} \right) \frac{1}{x}$$

21.Solution:

There are 3 even numbers 2, 4, 6

So the units place, 10th places can be filled in $3P_2$ ways

Remaining 5 digits can be used to fill 4 places in $5P_4$ ways.

Hence the total numbers satisfying the above condition is $3P_2 \times 5P_4 = 720$

22.Solution:

Let the origin be shifted to (h, k)

$$x = x' + h$$

$$y = y' + k$$

Then

$$(x' + h)^2 + (y' + k)^2 - 4(x' + h) + 6(y' + k) = 36$$

$$x'^2 + 2hx' + h^2 + y'^2 + 2ky' + k^2 - 4(x' + h) + 6(y' + k) = 36$$

$$x'^2 + y'^2 + x'(2h - 4) + y'(2k + 6) + h^2 + k^2 - 4h + 6k - 36 = 0$$

$$2h - 4 = 0$$

$$h = 2$$

$$2k + 6 = 0$$

$$k = -3$$

$$x'^2 + y'^2 + 2^2 + (-3)^2 - 8 - 18 - 36 = 0$$

$$x'^2 + y'^2 + 13 - 62 = 0$$

$$x'^2 + y'^2 = 49$$

23.Solution:

$$\frac{2+4+12+14+11+x+y}{7} = 8$$

$$43+x+y=56$$

$$x+y=13$$

$$\frac{2^2+4^2+12^2+14^2+11^2+x^2+y^2}{7} - (\text{mean})^2 = 19$$

$$\frac{4+16+144+196+121+x^2+y^2}{7} - 64 = 19$$

$$\frac{481+x^2+y^2}{7} = 83$$

$$481+x^2+y^2 = 581$$

$$x^2+y^2 = 100$$

$$(x+y)^2 + (x-y)^2 = 2(x^2+y^2)$$

$$169+(x-y)^2 = 200$$

$$(x-y)^2 = 31$$

$$x-y = 5.57$$

$$x+y = 13$$

$$x = 9.285$$

$$y = 3.715$$

24.Solution:

$$\frac{1}{\log_a b} = \log_b a$$

$$\frac{1}{\log_{2a} b} = \log_b 2a$$

$$\frac{1}{\log_{4a} b} = \log_b 4a$$

$$\frac{\log_b a + \log_b 4a}{2} = \frac{\log_b (2a)^2}{2}$$

$$= 2 \frac{\log_b 2a}{2}$$

$$= \log_b 2a$$

Thus, $\frac{1}{\log_{2a} b}$ is the AM, between $\frac{1}{\log_a b}$, $\frac{1}{\log_{4a} b}$

25.Solution:

$$\text{Probability of surviving} = \frac{9}{10}$$

Required to find out the probability of 4 are safe or 5 are safe

$$\text{Probability of 5 is safe} = \left(\frac{9}{10}\right)^5$$

$$\text{Probability of 4 is safe} = {}^5C_4 \left(\frac{9}{10}\right)^4 \frac{1}{10}$$

$$\text{Required Probability} = \left(\frac{9}{10}\right)^5 + 5 \left(\frac{9}{10}\right)^4 \frac{1}{10} = \frac{45927}{5000}$$

26.Solution:

$$T_{2r+1} = {}^{40}C_{2r}$$

$$T_{r+2} = {}^{40}C_{r+1}$$

$${}^{40}C_{2r} = {}^{40}C_{r+1}$$

$$2r + r + 1 = 40$$

$$3r = 39$$

$$r = 13$$