MATHEMATICS

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2017

2017 (A)

MATHEMATICS

Section-I (Objective Type)

Time : 1 Hour 10 Minutes] [Marks : 40

Instructions to the Candidates :

1. Fill in your Roll No. in the space provided on the first page of this question paper.
2. This question paper consists of **40** objective type questions. Total marks allotted is **40.**
3. The candidate has to answer all the questions in the **OMR** Answer-Sheet provided along with this question paper.
4. Before answering the candidate has to ensure that the **OMR** Answer-Sheet is available along with the question paper.
5. All entries must be confined to the area provided in the **OMR** Answer-Sheet.
6. Answer all the questions by completely darkening the circles against the question numbers in the **OMR** Answer-Sheet using Black/Blue Ball point pen only.
7. Do not fold or make any stray marks on the OMR Answer Sheet, failing which it would be difficult to evaluate the Answer Sheet.
8. Read all the instructions provided in the OMR Answer-Sheet carefully before the answering. After you finish answering, hand over the OMR Answer-Sheet to the Invigilator. You are permitted to carry the question paper only along with you.

For the following Question Nos. 1 to 40 there is only one correct answer against each question. For each question, mark the correct option on the answer sheet.

$40 \times 1 = 40$

1. If $A = \{1, 2, 3\}$, then how many equivalence relation can be defined on A containing (1, 2)

(A) 2 (B) 3 (C) 8 (D) 6

2. If $n(A) = 3$ and $n(B) = 2$ then $n(A \times B) =$ ....

(A) 6 (B) 4 (C) 2 (D) 0

3. If $f : R \to R$ such that $f(x) = 3x - 4$ then which of the following $f^{-1}(x)$?

(A) $\frac{x+4}{3}$ (B) $\frac{1}{3}x - 4$ (C) $3x - 4$ (D) $3x + 5$

4. $\frac{d}{dx}(\sin x) =$

(A) $\cos x$ (B) $-\sin x$ (C) $-\cos x$ (D) $\tan x$

5. $\frac{d}{dx}(\tan ax) =$

(A) $a \tan ax$ (B) $a \sec^2 ax$ (C) $a \sec x$ (D) $a \cot ax$

6. $\begin{vmatrix} 1 & 1 & 2 \\ 2 & 2 & 4 \\ 3 & 5 & 6 \end{vmatrix} =$ .... ?

(A) 5 (B) 7 (C) 0 (D) 9

7. $\tan^{-1}(1) =$ .... ?

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{8}$

8. $\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{1}{4} =$ ....

(A) $\tan^{-1}\frac{3}{2}$ (B) $\tan^{-1}\frac{6}{7}$ (C) $\tan^{-1}\frac{5}{6}$ (D) $\tan^{-1}\frac{1}{2}$

9. If $\begin{vmatrix} x & 5 \\ 5 & x \end{vmatrix} = 0$ then $x =$ .....

(A) ± 5 (B) 6 (C) 0 (D) 4

10. $\begin{vmatrix} 10 & 2 \\ 35 & 7 \end{vmatrix} =$ ....

(A) 4 (B) 0 (C) 3 (D) 6

11. If $A = \begin{bmatrix} 9 & 10 & 11 \\ 12 & 13 & 14 \end{bmatrix}$, and $B = \begin{bmatrix} 11 & 10 & 9 \\ 8 & 7 & 6 \end{bmatrix}$ then $A + B =$

(A) $\begin{bmatrix} 20 & 20 & 20 \\ 20 & 20 & 20 \end{bmatrix}$ (B) $\begin{bmatrix} 10 & 10 & 10 \\ 10 & 10 & 10 \end{bmatrix}$ (C) $\begin{bmatrix} 10 & 5 & 10 \\ 5 & 10 & 10 \end{bmatrix}$ (D) $\begin{bmatrix} 25 & 10 & 15 \\ 15 & 10 & 25 \end{bmatrix}$

12. $\frac{d}{dx}(\sec x) =$ ....

(A) $\sec^2 x$ (B) $\tan^2 x$ (C) $\sec x \tan x$ (D) 0

13. $\frac{d}{dx}(\sin^{-1} x) =$ ....

(A) $\frac{1}{1+x^2}$ (B) $\frac{1}{1-x^2}$ (C) $\frac{1}{\sqrt{1-x^2}}$ (D) $\frac{1}{\sqrt{1+x^2}}$

14. $\frac{d}{dx}(\sin^{-1} x + \cos^{-1} x) =$ ....

(A) $\frac{2}{1+x^2}$ (B) 0 (C) 2 (D) 1

15. If $y = \sin(\log x)$, then $\frac{dy}{dx} =$ ....

(A) $\frac{1}{x}\cos(\log x)$ (B) $\frac{1}{x}\sin(\log x)$ (C) 0 (D) 1

16. If $y = x^5$ then $\frac{dy}{dx} =$ ....

(A) $5x$ (B) $6x$ (C) $5x^4$ (D) $5x^2$

17. $\int x^5\, dx =$ ....

(A) $\frac{x^6}{6} + k$ (B) $\frac{x^5}{5} + k$ (C) $\frac{x^7}{7} + k$ (D) $\frac{x^8}{8} + k$

18. $\int 0 \cdot dx =$ ....

(A) k (B) 0 (C) 1 (D) -1

19. $\int \frac{dx}{x} = ...$

(A) $x + k$ (B) $\frac{1}{x^2} + k$ (C) $-\frac{1}{x^2} + k$ (D) $\log x + k$

20. $\int_a^b x^3\, dx = ...$

(A) $\frac{b^3 - a^3}{3}$ (B) $\frac{b^4 - a^4}{4}$ (C) $\frac{b^2 - a^2}{2}$ (D) 0

21. The solution of $\frac{dy}{dx} = \frac{x}{y}$

(A) $\frac{y^2}{2} - \frac{x^2}{2} = k$ (B) $\frac{x^2}{2} + \frac{y^2}{2} = k$ (C) $\frac{x - y}{2} = k$ (D) $\frac{x + y}{5} = k$

22. The solution of the differential equation $\frac{dy}{dx} = e^{x-y}$

(A) $e^x + e^{-y} + k = 0$ (B) $e^{2x} = ke^y$

(C) $e^x - e^y = k$ (D) $e^{x+y} = k$

23. The order of the differential equation $\frac{dy}{dx} + 4y = 2x$ is

(A) 0 (B) 1 (C) 2 (D) 3

24. The degree of equation $\left(\frac{d_2 y}{dx^2}\right) - 4\frac{dy}{dx} = 2$ is

(A) 0 (B) 1 (C) 2 (D) 3

25. The position vector of the point (4, 5, 6) is

(A) $4\vec{i} + 5\vec{j} + 6\vec{k}$ (B) $4\vec{i} - 5\vec{j} - 6\vec{k}$

(C) $2\vec{i} + \vec{j} + \vec{k}$ (D) $\vec{i} + \vec{j} + \vec{k}$

26. $|2\vec{i} - 3\vec{j} + \vec{k}| =$

(A) 14 (B) $\sqrt{14}$ (C) $\sqrt{3}$ (D) 2

27. If $\vec{OA} = 2\vec{i} + 5\vec{j} - 6\vec{k}$ and $\vec{AB} = 3\vec{i} + 6\vec{j} + 5\vec{k}$ then $\vec{AB} =$

(A) $\vec{i} + \vec{j} + 7\vec{k}$ (B) $5\vec{i} - 2\vec{j} - \vec{k}$

(C) $\vec{i} + 2\vec{j} - 7\vec{k}$ (D) $\vec{i} - \vec{j} - \vec{k}$

28. If $\vec{a} = \vec{i} + \vec{j} + 3\vec{k}$; $\vec{b} = 2\vec{i} + 3\vec{j} - 5\vec{k}$ then $\vec{a} \cdot \vec{b} =$

(A) 10 (B) – 10 (C) 20 (D) 5

29. If $\vec{a}$ and $\vec{b}$ are mutually perpendicular then $\vec{a} \cdot \vec{b} =$

(A) 1 (B) 0 (C) 2 (D) 3

30. $\vec{j} \times \vec{k} =$

(A) $\vec{i}$ (B) $-\vec{i}$ (C) $\vec{0}$ (D) 1

31. The direction cosines of z-axis are

(A) (0, 0, 0) (B) (1, 0, 0) (C) (0, 0, 1) (D) (0, 1, 0)

32. $\vec{k}\cdot\vec{k} =$

(A) 1 (B) 0 (C) 2 (D) − 1

33. Let l_1, m_1, n_1 and l_2, m_2, n_2 be the direction cosines of two straight lines. Both the lines perpendicular to each other, if

(A) $l_1l_2 + m_1m_2 + n_1n_2 = 0$
(B) $l_1l_2 + m_1m_2 + n_1n_2 = 1$
(C) $\frac{l_1}{l_2} = \frac{m_1}{m_2} = \frac{n_1}{n_2}$
(D) $\frac{l_1}{l_2} + \frac{m_1}{m_2} + \frac{n_1}{n_2} = 0$

34. Let a, b, c be the direction ratios of a line then direction cosines are

(A) $\frac{a}{\sqrt{\Sigma a^2}}, \frac{b}{\sqrt{\Sigma a^2}}, \frac{c}{\sqrt{\Sigma a^2}}$
(B) $\frac{1}{\sqrt{\Sigma a^2}}, \frac{2}{\Sigma a^2}, \frac{3}{\Sigma a^2}$
(C) $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$
(D) $\frac{a}{\sqrt{\Sigma a^2}}, \frac{b}{\sqrt{\Sigma b^2}}, \frac{c}{\sqrt{\Sigma c^2}}$

35. A lines is passing through (α, β, γ) and its direction cosines are l, m, n then the equations of the line are

(A) $\frac{x}{l} = \frac{\gamma}{m} = \frac{z}{n}$
(B) $\frac{x-\alpha}{l} = \frac{y-\beta}{m} = \frac{z-\gamma}{n}$
(C) $\frac{x+\alpha}{l} = \frac{y+\beta}{m} = \frac{z+\gamma}{n}$
(D) $\frac{x-\alpha}{l} = \frac{y+\beta}{m} = \frac{z-\gamma}{n}$

36. The direction ratio of the normal to the plane $7x + 4y - 2z + 5 = 0$

(A) 7, 4, −2 (B) 7, 4, 5 (C) 7, 4, 2 (D) 4, −2, 5

37. If A and B are two independent events then $P(A \cap B) =$

(A) $P(A)\cdot P(B)$
(B) $P(A/B)$
(C) $P(A) + P(B)$
(D) $P(A) + P(B) - P(A \cap B)$

38. If S be the sample space and E be the event then $P(E) = ...$

(A) $\frac{n(E)}{n(S)}$ (B) $\frac{n(S)}{n(E)}$ (C) $n(E)$ (D) $n(S)$

39. If A, B, and C are three events independent of each other then $P(A \cap B \cap C) =$

(A) $P(A) + P(B) + P(C)$
(B) $P(A) - P(B) + P(C)$
(C) $P(A) + P(B) - P(A \cap B)$
(D) $P(A)P(B)P(C)$

40. If $P(A) = \frac{3}{8}$; $P(B) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{4}$ then $P(A \cup B) = ...$

(A) 0 (B) $\frac{5}{8}$ (C) 1 (D) 4

ANSWERS

1. (A)	2. (A)	3. (A)	4. (A)	5. (B)	6. (C)	7. (A)
8. (B)	9. (A)	10. (B)	11. (A)	12. (C)	13. (C)	14. (B)
15. (A)	16. (C)	17. (A)	18. (A)	19. (D)	20. (B)	21. (A)
22. (C)	23. (B)	24. (D)	25. (A)	26. (B)	27. (A)	28. (B)
29. (B)	30. (A)	31. (C)	32. (A)	33. (A)	34. (A)	35. (B)
36. (A)	37. (A)	38. (A)	39. (D)	40. (B)		

Section-II (Non-Objective Type)

Time : 2 Hour 05 Minutes] [Marks : 60

Instructions to the Candidates :

1. Candidates are required to give their answers in their own words as far as practicable.
2. Figures in the right-hand margin indicate full marks.
3. Section II of this question paper consists of 12 non-objective type questions having total marks 60.
4. The candidate has to answer all the short answer questions from Q. No. 1 to Q. No. 8 and all 4 long answer type questions from Q. No. 9 to Q. No. 12 in his/her answer-book which is provided separately. Q.Nos. 1 to 8 carry 4 marks each and Q. Nos. 9 to 12 carry 7 marks each.
5. Write the question number with every answer.

Question Nos. 1 to 8 are of short answer type. Each question carries 4 marks.

$8 \times 4 = 32$

Short Answer Type Questions

1. If $f : R \to R$ be a function defined by $f(x) = x^2$ show that the function f is many one into.

Soln. $f : R \to R$, given by $f(x) = x^2$

(a) f is one-one since $f(-1) = f(1) = 1$

-1 and 1 have the same image.

i.e., f is not injective.

(b) $-2 \in$ codomains R of f but $\sqrt{-2}$ does not belong to domain R of f.

$\therefore$ f is not into i.e., f is many one into function.

2. If $A = \begin{bmatrix} 2 & 5 \\ 3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 5 \\ 6 & 2 \end{bmatrix}$ then find $(A + B)$ and $(A - B)$.

Soln. $A = \begin{bmatrix} 2 & 5 \\ 3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 5 \\ 6 & 2 \end{bmatrix}$

$\therefore A + B = \begin{bmatrix} 2 & 5 \\ 3 & 1 \end{bmatrix} + \begin{bmatrix} 1 & 5 \\ 6 & 2 \end{bmatrix} = \begin{bmatrix} 3 & 10 \\ 9 & 3 \end{bmatrix}$ and $A - B = \begin{bmatrix} 2 & 5 \\ 3 & 1 \end{bmatrix} - \begin{bmatrix} 1 & 5 \\ 6 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ -3 & -1 \end{bmatrix}$

3. Prove that $\tan^{-1} x + \cot^{-1} x = \frac{\pi}{2}$

Soln. L.H.S. $= \tan^{-1} x + \cot^{-1} x = \tan^{-1} x + \tan^{-1} \frac{1}{x}$

$$= \tan^{-1}\left(\frac{x + \frac{1}{x}}{1 - x\frac{1}{x}}\right) = \tan^{-1}\left(\frac{1 + \frac{1}{x}}{1 - 1}\right) = \tan^{-1}(\infty) = \tan^{-1}\left(\tan \frac{\pi}{2}\right)$$

$= \frac{\pi}{2}$ **Proved.**

4. If $y = \tan(\sin^{-1} x)$ then find $\frac{dy}{dx}$.

Soln. Let $\sin^{-1} x = \theta$ then $\sin \theta = x$

$\therefore \cos \theta = \sqrt{1 - x^2}$ $\therefore \tan \theta = \frac{x}{\sqrt{1 - x^2}} \Rightarrow \tan^{-1} \frac{x}{\sqrt{1 - x^2}} = \theta$

Now, $y = \tan\left(\tan^{-1}\dfrac{x}{\sqrt{1-x^2}}\right) \Rightarrow y = \dfrac{x}{\sqrt{1-x^2}}$

Differentiate both sides w.r.t., x we get

$$\frac{dy}{dx} = \frac{\sqrt{1-x^2}\,\dfrac{dx}{dy} - \dfrac{d\sqrt{1-x^2}}{d(1-x^2)} \times \dfrac{d(1-x^2)}{dx}}{(\sqrt{1-x^2})^2}$$

$$\Rightarrow \frac{dy}{dx} = \frac{\sqrt{1-x^2}\cdot 1 - x \times \dfrac{1}{2\sqrt{1-x^2}} \times (0-2x)}{1-x^2}$$

$$\Rightarrow \frac{dy}{dx} = \frac{1-x^2+x^2}{\sqrt{1-x^2}(1-x^2)} \Rightarrow \frac{dy}{dx} = \frac{1}{(1-x^2)^{3/2}}.$$

5. If $y = \sin[\cos\{\tan(\cot x)\}]$ then find $\dfrac{dy}{dx}$.

Soln. $\because$ $y = \sin[\cos\{\tan(\cot x)\}]$

$$\therefore \frac{dy}{dx} = \frac{d[\sin\{\cos\{\tan(\cot x)\}]}{dx}$$

$$= \frac{d[\sin\{\cos\{\tan(\cot x)\}\}]}{d[\cos\{\tan(\cot x)\}]} \times \frac{d[\cos\{\tan(\cot x)\}]}{d[\tan(\cot x)]}$$

$$\times \frac{d[\tan(\cot x)]}{d[\cot x]} \times \frac{d[\cot x]}{dx}$$

$$= \cos\{\cos\{\tan(\cot x)\} - \sin\{\tan(\cot x)\} \times \sec^2(\cot x) \times -\operatorname{cosec}^2 x$$

$$= \cos\{\cos\{\tan(\cot x)\} \cdot \sin\{\tan(\cot x)\} \cdot \sec^2(\cot x) \cdot \operatorname{cosec}^2 x$$

6. Integrate : $\int \sin^2 x \cdot \cos^2 x dx$

Soln. $\because \int \sin^2 x \cos^2 x\, dx$

$$= \frac{1}{4}\int 4\sin^2 x\cos^2 x dx = \frac{1}{4}\int \sin^2 2x dx = \frac{1}{4}\int \frac{1-\cos 4x}{2} dx$$

$$= \frac{1}{4}\left[\frac{1}{2}\int dx - \frac{1}{2}\int \cos 4x\, dx\right] = \frac{1}{4}\left[\frac{1}{2}x - \frac{1}{2}\frac{\sin 4x}{4}\right] + C$$

$$= \frac{x}{8} - \frac{\sin 4x}{32} + C.$$

7. Evaluate : $\int_0^a \dfrac{xdx}{\sqrt{a^2 - x^2}}$

Soln. Put $a^2 - x^2 = t$

Differentiate both sides w.r.t., x we get

$$0 - 2x = \frac{dt}{dx} \Rightarrow xdx = -\frac{dt}{2}$$

when $x = 0$ then $t = a^2 - 0 = a^2$

when $x = a$ then $t = a^2 - a^2 = 0.$

$$\text{Now, } \int_{a^2}^{0} \frac{1}{t^{1/2}} \times -\frac{dt}{2} = \frac{1}{2}\int_0^{a^2} t^{-1/2}\, dt = \frac{1}{2}\left[\frac{t^{\frac{-1}{2}+1}}{\frac{-1}{2}+1}\right]_0^{a^2}$$

$$= \frac{1}{2}\frac{\left[t^{1/2}\right]_0^{a^2}}{\frac{1}{2}} = \sqrt{a^2} - \sqrt{0} = a.$$

8. If $\vec{a} = \vec{i} - 2\vec{j} - 3\vec{k}$, $\vec{b} = 2\vec{i} + \vec{j} - \vec{k}$ and $\vec{c} = \vec{i} + 3\vec{j} - 2\vec{k}$ then find $\vec{a} \times (\vec{b} \times \vec{c})$.

Soln. If $\vec{a} = \hat{i} - 2\hat{j} - 3\hat{k}$, $\vec{b} = 2\hat{i} + \hat{j} - \hat{k}$ and $\vec{c} = \hat{i} + 3\hat{j} - 2\hat{k}$

$$\therefore \vec{b} \times \vec{c} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 1 & -1 \\ 1 & 3 & -2 \end{vmatrix} = \hat{i}(-2+3) - \hat{j}(-4+1) + \hat{k}(6-1) = \hat{i} + 3\hat{j} + 5\hat{k}$$

$$\text{and } \vec{a} \times (\vec{b} \times \vec{c}) = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -2 & -3 \\ 1 & 3 & 5 \end{vmatrix} = \hat{i}(-10+9) - \hat{j}(5+3) + \vec{k}(3-2) = \hat{i} - 3\hat{j} + 5\hat{k}.$$

Question Nos. 9 to 12 are of long answer type. Each question carries 7 marks.

Long Answer Type Questions

4 × 7 = 28

9. If $y = x^{x^{x^{\cdots \text{to } \infty}}}$ then prove that $\frac{dy}{dx} = \frac{y^2}{x(1 - y\log x)}$

Soln. If $y = x^y$

Taking log both sides, $\log y = \log x^y \Rightarrow \log y = y \log x$

Differentiate both sides w.r.t. x, we get

$$\frac{d \log y}{dy} \times \frac{dy}{dx} = y\frac{d \log x}{dx} + \log x \frac{dy}{dx}$$

$$\Rightarrow \frac{1}{y}\frac{dy}{dx} = y \times \frac{1}{x} + \log x \frac{dy}{dx} \Rightarrow \frac{1}{y}\frac{dy}{dx} - \log x \frac{dy}{dx} = \frac{y}{x}$$

$$\Rightarrow \frac{dy}{dx}\left(\frac{1 - y\log x}{y}\right) = \frac{y}{x} \therefore \frac{dy}{dx} = \frac{y^2}{x(1 - y\log x)}.$$

10. Solve : $\frac{dy}{dx} - \frac{xy}{1-x^2} = \frac{1}{1-x^2}$

Soln. $$\frac{dy}{dx} + \frac{-x}{1-x^2}y = \frac{1}{1-x^2}$$ $\left[\because \frac{dy}{dx} + Py = \right.$

$$\because \quad P = \frac{-x}{1-x^2},\ Q = \frac{1}{1-x^2}$$

$\because$ I.F. $= e^{\int P dx} = e^{\int \frac{-x}{1-x^2}dx} = e^{\frac{1}{2}\log(1-x^2)} = \sqrt{1-x^2}$

Required differential solution

$$y \times \text{I.F.} = \int (Q \times \text{I.F.})\, dx + C$$

$$\Rightarrow \quad y / \sqrt{1-x^2} = \int \frac{1}{1-x^2} \times \sqrt{1-x^2}\, dx + C$$

$$\Rightarrow \quad y\sqrt{1-x^2} = \int \frac{1}{\sqrt{1-x^2}} dx + C \Rightarrow y\sqrt{1-x^2} = \sin^{-1} x + C.$$

11. Find the equation of the line intersecting the lines

$$\frac{x-a}{1} = \frac{y}{1} = \frac{z-a}{1} \text{ and } \frac{x+a}{1} = \frac{y}{1} = \frac{z+a}{2}$$

and parallel to the line $\frac{x-a}{2} = \frac{y-a}{1} = \frac{z-2a}{3}$.

Soln. $\because \quad \frac{x-a}{1} = \frac{y}{1} = \frac{z-a}{1} = r$ (say) ... (i)

and $\quad \frac{x+a}{1} = \frac{y}{1} = \frac{z+a}{2} = \lambda$ ... (ii)

Any point on the line, (i) is $P(r+a, r, r+a)$

Any point on the line (ii) is $Q(\lambda - a, \lambda, 2\lambda - a)$

Line (i) and (ii) will intersect iff P and Q coincide for same value of λ and r

$\therefore \quad r + a = \lambda - a \Rightarrow r - \lambda = -2a$ ... (iii)

$r = \lambda \Rightarrow r - \lambda = 0$ ... (iv)

and $\quad r + a = 2\lambda - a \Rightarrow r - 2\lambda = -2a$ ... (v)

Solving (iii) and (iv), we get $\lambda = a$ and $r = a$

$P \equiv (2a, a, 2a)$

Required equation is $\frac{x-2a}{2} = \frac{y-a}{1} = \frac{z-2a}{3}$.

Or,

Maximize $Z = y - 2x$

Subject to $x \le 2$

$x + y \le 3$

$-2x + y \le 1$

$x, y \ge 0.$

Soln. Subject to $Z = y - 2x$

when $x \le 2$

Its corresponding equation $x = 2$ ... (i)

$\because \quad x + y \le 3$ ... (ii)

Its corresponding equation $x + y = 3$ ... (ii)

$\Rightarrow \quad \frac{x}{3} + \frac{y}{3} = 1$

x	3	0
y	0	3

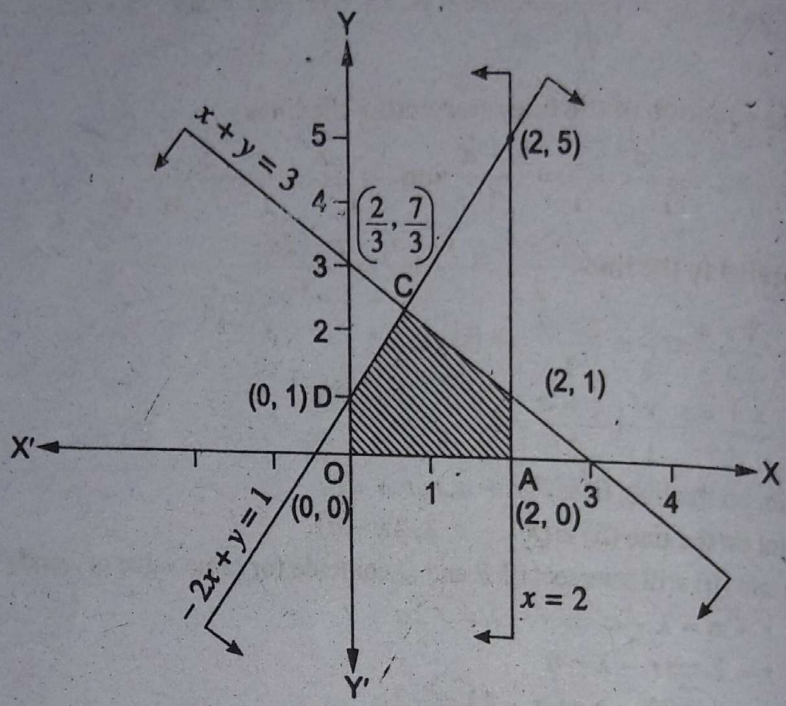
and $-2x + y \leq 1$

Its corresponding equation $-2x + y = 1 \Rightarrow \frac{x}{-5} + \frac{y}{1} = 1$ ... (ii

x	-0.5	0
y	0	1

Check (0, 0)

From (i) True (ii) True and (iii) True



Point	$Z = y - 2x$
(0, 0)	0
(2, 0)	−4
(2, 1)	−3
$\left(\frac{2}{3}, \frac{7}{3}\right)$	1

Hence maximise value at 1 at $\left(\frac{2}{3}, \frac{7}{3}\right)$.

12. A speaks the truth in 75% cases and B in 80% cases. In what percentage of cases are they likely to contradict each other in stating the same fact.

Soln. See answer Q.No. 8 in 2015 (A).