WARNING	Any malpractice or any attempt to comme any kind of malpractice in the Examination will DISQUALIFY THE CANDIDATE.				
	PAPE	1 – 1	I MATHEMATICS	5 - 2021	
Version Code	E	32	Question Booklet Serial Number:	7218187	
Time: 150 Minutes		Number of Questions: 120		Maximum Marks: 480	
Name of the Can	didate				
Roll Number					
Signature of the C	Candidate		,		
	IN	STRU	CTIONS TO CANDIDATE	ES	

at to commit one t

- Please ensure that the VERSION CODE shown at the top of this Question Booklet is same as that shown in the OMR Answer Sheet issued to you. If you have received a Question Booklet with a different Version code, please get it replaced with a Question Booklet with the same Version Code as that of OMR Answer Sheet from the Invigilator. THIS IS VERY IMPORTANT.
- Please fill the items such as Name, Roll Number and Signature in the columns given above. Please also write Question Booklet Serial Number given at the top of this page against item 3 in the OMR Answer Sheet.
- 3. This Question Booklet contains 120 questions. For each question five answers are suggested and given against (A), (B), (C), (D) and (E) of which only one will be the 'Most Appropriate Answer'. Mark the bubble containing the letter corresponding to the 'Most Appropriate Answer' in the OMR Answer Sheet, by using either Blue or Black Ball Point Pen only.
- 4. Negative Marking: In order to discourage wild guessing the score will be subjected to penalization formula based on the number of right answers actually marked and the number of wrong answer marked. Each correct answer will be awarded FOUR marks. ONE mark will be deducted for each incorrect answer. More than one answer marked against a question will be deemed as incorrect answer and will be negatively marked.
- Please read the instructions in the OMR Answer Sheet for marking the answers. Candidates are advised to strictly follow the instruction contained in the OMR Answer Sheet.

IMMEDIATELY AFTER OPENING THE QUESTION BOOKLET, THE CANDIDATE SHOULD VERIFY WHETHER THE QUESTION BOOKLET CONTAINS ALL THE 120 QUESTIONS IN SERIAL ORDER. IF NOT, REQUEST FOR REPLACEMENT.

DO NOT OPEN THE SEAL UNTIL THE INVIGILATOR ASKS YOU TO DO SO.

PLEASE ENSURE THAT THIS QUESTION BOOKLET CONTAINS 120 QUESTIONS SERIALLY NUMBERED FROM 1 TO 120 PRINTED PAGES 32

1.	The set of all integer	values of x that satisfy the i	nequality	$19 \le -3x \le 27$	is

(A)
$$\{-9, -8, -7, -6\}$$

(B)
$$\{-9, -6\}$$

(D)
$$\{-9, -8, -7, \dots, 4, 5, 6\}$$

2. Let X be the set
$$\{1, \pi, \{42, \sqrt{2}\}, \{1,3\}\}$$
. Which of the following statement(s) is/are true? $P: \pi \in X$ $Q: \{1,3\} \subseteq X$ $R: \{1,\pi\} \subseteq X$

(B)
$$Q$$
 only

(C) R only

(A)
$$P$$
 only (D) P and R only

(E)
$$P$$
, Q and R

3. The value of
$$\theta$$
 in the range $0 \le \theta \le \frac{\pi}{2}$ which satisfies the equation $\sin \left(\theta + \frac{\pi}{6}\right) = \cos \theta$ is equal to

$$(A) \frac{\pi}{6}$$

(B)
$$\frac{\pi}{4}$$

(B)
$$\frac{\pi}{4}$$
 (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{8}$ (E) $\frac{\pi}{5}$

(D)
$$\frac{\pi}{9}$$

(E)
$$\frac{\pi}{5}$$

4. If cosec
$$\theta$$
 + cot θ = 5, then the value of tan θ is equal to

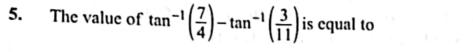
(A)
$$\frac{13}{24}$$

(B)
$$\frac{5}{12}$$

(C)
$$\frac{7}{12}$$

(C)
$$\frac{7}{12}$$
 (D) $\frac{1}{12}$ (E) $\frac{3}{12}$

(E)
$$\frac{3}{12}$$



(A)
$$\frac{-\pi}{3}$$

(B)
$$\frac{-\pi}{4}$$

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

(D)
$$\frac{\pi}{3}$$

(E)
$$\pi$$

6. If $0 < \theta < \frac{\pi}{2}$ and $\tan \theta = \frac{\sqrt{5}}{2}$, then $\cos \theta$ is equal to

$$(A)\frac{1}{2}$$

$$(B)\frac{\sqrt{3}}{2}$$

(C)
$$\frac{1}{3}$$

(A)
$$\frac{1}{2}$$
 (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{1}{3}$

(E)
$$\frac{\sqrt{5}}{3}$$

The value of $\sin^2\left(\cos^{-1}\left(\frac{3}{5}\right)\right)$ is equal to

$$(A)\frac{4}{5}$$

(A)
$$\frac{4}{5}$$
 (B) $\frac{16}{25}$ (C) $\frac{9}{25}$ (D) $\frac{5}{3}$

(C)
$$\frac{9}{25}$$

(D)
$$\frac{5}{3}$$

(E)
$$\frac{25}{9}$$

8. $\cos^4 \frac{\pi}{12} - \sin^4 \frac{\pi}{12}$ is equal to

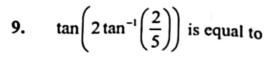
(A)
$$\frac{1}{2}$$

(B)
$$\frac{\sqrt{3}}{2}$$

(C)
$$\frac{\sqrt{3}+1}{2}$$

(A)
$$\frac{1}{2}$$
 (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{\sqrt{3}+1}{2}$ (D) $\frac{\sqrt{3}-1}{2}$ (E) $\frac{\sqrt{2}}{2}$

(E)
$$\frac{\sqrt{2}}{2}$$



(A)
$$\frac{8}{5}$$

(B)
$$\frac{10}{21}$$

(A)
$$\frac{8}{5}$$
 (B) $\frac{10}{21}$ (C) $\frac{20}{21}$ (D) $\frac{21}{25}$ (E) $\frac{4}{25}$

(D)
$$\frac{21}{25}$$

(E)
$$\frac{4}{25}$$

The values of x in the interval $[0, \pi]$ such that $\sin 2x = \frac{\sqrt{3}}{2}$ are

(A)
$$\frac{\pi}{6}$$
, $\frac{\pi}{3}$ (B) $\frac{\pi}{6}$, $\frac{2\pi}{3}$ (C) $\frac{\pi}{3}$, $\frac{2\pi}{3}$ (D) $\frac{\pi}{6}$, $\frac{5\pi}{6}$ (E) $\frac{\pi}{3}$, $\frac{5\pi}{6}$

(B)
$$\frac{\pi}{6}$$
, $\frac{2\pi}{3}$

(C)
$$\frac{\pi}{3}$$
, $\frac{2\pi}{3}$

(D)
$$\frac{\pi}{6}$$
, $\frac{5\pi}{6}$

(E)
$$\frac{\pi}{3}$$
, $\frac{5\pi}{6}$

If $\sin \alpha + \sin \beta = \frac{\sqrt{6}}{2}$ and $\cos \alpha + \cos \beta = \frac{\sqrt{2}}{2}$, then $\cos(\alpha - \beta)$ is equal to

$$(A)\frac{1}{2}$$

(B)
$$\frac{3}{2}$$

(C)
$$\frac{-1}{2}$$

(C)
$$\frac{-1}{2}$$
 (D) $\frac{-3}{2}$ (E) 0

If ay = x + b is the equation of the line passing through the points (-5, -2) and (4, 7), then the value of 2a + b is equal to

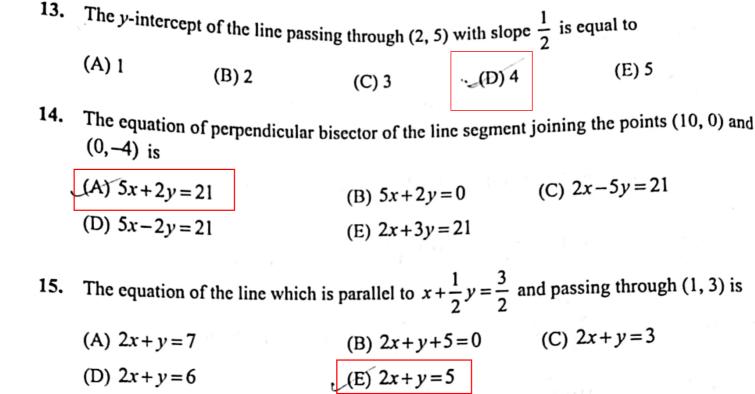
(A) 1

(B) 3

(C) 5

(D) -3

(E)-1



If x-intercept of the straight line $\alpha x + 2\alpha y = 30$ is 10, then the y-intercept is

(C) 15

(E) 30

(D) 20

13.

16.

(D) 2x + y = 6

(B) 10

(A)5

A straight line makes an angle α with the positive direction of x-axis, where $\cos \alpha = \frac{\sqrt{3}}{2}$. If it passes through (0, -2), then its equation is

(A)
$$\sqrt{3}x + y + 2 = 0$$

(B)
$$\sqrt{3}y + x + 2 = 0$$

(C)
$$\sqrt{3}y + x + 2\sqrt{3} = 0$$

(A)
$$\sqrt{3}x+y+2=0$$

(B) $\sqrt{3}y+x+2=0$
(C) $\sqrt{3}y+x+2\sqrt{3}=0$
(E) $\sqrt{3}x+y-2\sqrt{3}=0$

(E)
$$\sqrt{3}x + y - 2\sqrt{3} = 0$$

18. The equation of the circle is $3x^2 + 3y^2 + 6x - 4y - 1 = 0$. Then its radius is

(A)
$$\frac{1}{3}$$

(B)
$$\frac{4}{3}$$
 (C) $\frac{2}{3}$ (D) $\frac{16}{3}$ (E) $\frac{8}{3}$

(C)
$$\frac{2}{3}$$

(D)
$$\frac{16}{3}$$

(E)
$$\frac{8}{3}$$

19. The end-points of a diameter of a circle are (-1, 4) and (5, 4). Then the equation of the circle is

(A)
$$(x-3)^2 + y^2 = 9$$

(B)
$$(x-3)^2 + (y+4)^2 = 3$$

(A)
$$(x-3)^2 + y^2 = 9$$

(B) $(x-3)^2 + (y+4)^2 = 3$
(D) $(x+3)^2 + (y+4)^2 = 9$
(E) $(x-3)^2 + (y-4)^2 = 4$

(D)
$$(x+3)^2 + (y+4)^2 = 9$$

(E)
$$(x-3)^2 + (y-4)^2 = 4$$

20. The two diameters of a circle are segments of the straight lines x - y = 5 and 2x + y = 4. If the radius of the circle is 5, then the equation of the circle is

(A)
$$x^2 + y^2 - 6x + 4y = 12$$
 (B) $x^2 + y^2 - 3x + 2y = 12$ (C) $x^2 + y^2 - 6x + 2y = 12$

(B)
$$x^2 + y^2 - 3x + 2y = 12$$

(C)
$$x^2 + y^2 - 6x + 2y = 12$$

(D)
$$x^2 + y^2 - 8x + 6y - 18 = 0$$
 (E) $x^2 + y^2 - 8x + 6y - 7 = 0$

(E)
$$x^2 + y^2 - 8x + 6y - 7 = 0$$

The equation of the parabola with vertex (-6, 2), passing through (-3, 5) and having 21. axis parallel to x-axis is

$$(A)(y+2)^2 = 3x+16$$

(B)
$$(x+6)^2 = 3y-6$$

$$(C)(y+2)^2 = 4x+48$$

(D)
$$(x-6)^2 = 4y-8$$

(B)
$$(x+6)^2 = 3y-6$$

(E) $(y-2)^2 = 3x+18$

One of the vertices of the major axis of an ellipse is (1, 1) and one of the vertices of its 22. minor axis is (-2, -1). If the centre of the ellipse is (-2, 1), then the equation of the ellipse is

$$(A)\frac{(x+2)^2}{9} + \frac{(y-1)^2}{4} = 1$$
 (B) $\frac{(x+2)^2}{16} + \frac{(y-1)^2}{4} = 1$ (C) $\frac{(x-2)^2}{9} + \frac{(y+1)^2}{4} = 1$

(B)
$$\frac{(x+2)^2}{16} + \frac{(y-1)^2}{4} = 1$$

(C)
$$\frac{(x-2)^2}{9} + \frac{(y+1)^2}{4} = 1$$

(D)
$$\frac{(x-2)^2}{16} + \frac{(y+1)^2}{4} = 1$$

(D)
$$\frac{(x-2)^2}{16} + \frac{(y+1)^2}{4} = 1$$
 (E) $\frac{(x+2)^2}{9} + \frac{(y-1)^2}{2} = 1$

23. The equation of the parabola with focus (3, 0) and directrix x + 3 = 0 is

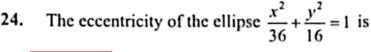
(A)
$$y^2 = 3x - 9$$

(B)
$$y^2 = 4x - 12$$

$$\mathcal{L}(C)y^2 = 12x$$

(D)
$$y^2 = 12x - 36$$

(E)
$$y^2 = 12x - 9$$



$$_{2}(A)\frac{\sqrt{5}}{3}$$

(B)
$$\frac{\sqrt{5}}{6}$$

(B)
$$\frac{\sqrt{5}}{6}$$
 (C) $\frac{\sqrt{30}}{6}$ (D) $\frac{\sqrt{10}}{6}$ (E) $\frac{\sqrt{30}}{7}$

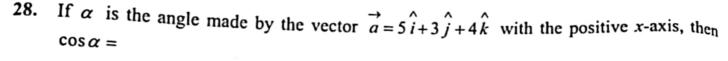
(D)
$$\frac{\sqrt{10}}{6}$$

(E)
$$\frac{\sqrt{30}}{7}$$

- The foci of a hyperbola are (8, 3) and (0, 3) and eccentricity is $\frac{4}{3}$. Then the length of 25. the transverse axis is
 - (A) $\frac{32}{2}$
- (B) 4
- (C) 8
- $(D) \frac{8}{3} \qquad (E) 6$
- The co-ordinates of the points P and Q are (2, 6, 4) and (8, -3, 1) respectively. If the 26. point R lies on the line segment PQ such that $2|\overrightarrow{PR}| = |\overrightarrow{RQ}|$, then the co-ordinates of R are

- (A) (4,-3, 3) (B) (4,3,-3) (C) (2,-3,1) (D) (4,3,3) (E) (2,3,3)
- 27. If $|\vec{a}| = 2$, $\vec{b} = 2\hat{i} \hat{j} 3\hat{k}$ and the angle between \vec{a} and \vec{b} is $\frac{\pi}{4}$, then $\vec{a} \cdot \vec{b}$ is equal to

 - $(A)14\sqrt{2} \qquad (B)2\sqrt{7}$
- (C) $\sqrt{30}$ (D) $\sqrt{7}$
- (E) $\sqrt{14}$



(A)
$$\frac{5}{12}$$

(B)
$$\frac{1}{2}$$

(A)
$$\frac{5}{12}$$
 (B) $\frac{1}{2}$ (C) $\frac{\sqrt{2}}{2}$ (D) $\frac{\sqrt{5}}{5}$ (E) $\frac{\sqrt{2}}{10}$

(D)
$$\frac{\sqrt{5}}{5}$$

$$(E)\frac{\sqrt{2}}{10}$$

29. If
$$|\overrightarrow{a}| = 3$$
, $|\overrightarrow{b}| = 4$ and $|\overrightarrow{a} - \overrightarrow{b}| = \sqrt{7}$, then $|\overrightarrow{a} \cdot \overrightarrow{b}|$ is equal to

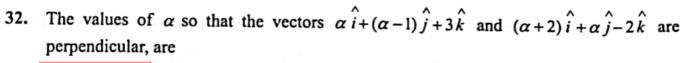
- (A)7
- (B) 8
- (C)9
- (D) 10
- (E) 12

30. If
$$\vec{a} = \hat{i} + \lambda \hat{j} - 2\hat{k}$$
, $\vec{b} = 2\hat{i} - 3\hat{j} + 5\hat{k}$ and $\vec{a} \cdot \vec{b} = -20$, then the value of λ is equal to

- (A) 2
- (B)-2
- $(C) -4 \qquad (D) 4$
- (E) 5

31. If
$$\vec{a} = \hat{i} - 3\hat{j} + \alpha \hat{k}$$
, $\vec{b} = \hat{i} - 2\hat{j} + 4\hat{k}$ and $\vec{a} \times \vec{b} = -2\hat{i} + \hat{j} + \beta \hat{k}$, then the value of β is equal to

- (A) -2
- (B) 2
- (C) -1
- (D) 1
- (E) -3



(A)
$$\frac{3}{2}$$
, -2 (B) 2, $\frac{3}{2}$ (C) -2, $\frac{-3}{2}$ (D) 2, $\frac{-3}{2}$ (E) -4, $\frac{3}{2}$

(B) 2,
$$\frac{3}{2}$$

(C)
$$-2$$
, $\frac{-3}{2}$

(D) 2,
$$\frac{-3}{2}$$

(E)
$$-4, \frac{3}{2}$$

- 33. If $|\overrightarrow{u}| = 5$, $|\overrightarrow{v}| = 4$ and the angle between \overrightarrow{u} and \overrightarrow{v} is $\frac{\pi}{6}$, then $|\overrightarrow{u} \times \overrightarrow{v}|$ is equal to
 - (A) $10\sqrt{3}$
- (B) $10\sqrt{2}$
- (C) 20
- (D) $5\sqrt{2}$

- If the point P(x,1,4) lies on the line $r = \hat{i}+3\hat{j}+4\hat{k}+\lambda(2\hat{i}-\hat{j})$, then the value of x is 34. equal to

- (A) 2 (B) -2 (C) 3 (D) -3
- (E) 5
- 35. The equation of the plane through the point (2, 1, 3) and perpendicular to the vector $4\hat{i} + 5\hat{j} + 6\hat{k}$ is
 - (A) 4x+5y+6z=28
- (B) 2x+y+3z=17 (C) 4x+5y+6z=33
- (D) 8x+5y+18z=21
- (E) 4x + 5y + 6z = 31

36. The angle between the line $\vec{r} = \hat{i} + 2\hat{j} + t(3\hat{i} + 2\hat{j} - \hat{k})$ and the plane 2x - 3y - z = 1 is

(A) $\sin^{-1}\left(\frac{1}{196}\right)$ (B) $\sin^{-1}\left(\frac{1}{14}\right)$ (C) $\cos^{-1}\left(\frac{1}{14}\right)$ (D) $\cos^{-1}\left(\frac{13}{14}\right)$ (E) $\sin^{-1}\left(\frac{13}{14}\right)$

37. If the line $\vec{r} = 2\hat{i} + \hat{j} + t(3\hat{i} + \hat{j} - 2\hat{k})$ is parallel to the plane $2x + 4y + \alpha z = 8$, then the value of a is equal to

(E)6

(A) 2 (B) 3 (C) 4 (D) 5

38. The angle between the lines $\vec{r} = \hat{i} + 4\hat{k} + \lambda(2\hat{i} + \hat{j} - \hat{k})$ and $\vec{r} = 2\hat{i} - \hat{j} + 3\hat{k} + \mu(3\hat{i} + \hat{k})$ is

(A) $\cos^{-1}\left(\frac{\sqrt{5}}{6}\right)$ (B) $\cos^{-1}\left(\frac{\sqrt{15}}{6}\right)$ (C) $\cos^{-1}\left(\frac{1}{12}\right)$ (D) $\cos^{-1}\left(\frac{\sqrt{15}}{15}\right)$ (E) $\cos^{-1}\left(\frac{\sqrt{3}}{30}\right)$

39. The Cartesian equation of the line passing through (7, 5, 3) and perpendicular to the plane 3x+2y+z=6 is

(A) $\frac{x-7}{3} = \frac{y-5}{2} = \frac{z-3}{1}$ (B) $\frac{x-3}{7} = \frac{y-2}{5} = \frac{z-1}{3}$ (C) $\frac{x-3}{7} = \frac{y-2}{5} = \frac{z}{3}$

(D) $\frac{x-7}{3} = \frac{y-5}{1} = \frac{z-3}{2}$ (E) $\frac{x-4}{4} = \frac{y-3}{3} = \frac{z-2}{2}$

The acute angle between the planes 2x-y-3z=7 and x+2y+2z=0 is 40.

$$(A)\cos^{-1}\left(\frac{-\sqrt{14}}{14}\right)$$

$$(B)\pi - \cos^{-1}\left(\frac{-\sqrt{14}}{7}\right) \qquad (C)\cos^{-1}\left(\frac{\sqrt{14}}{11}\right)$$

$$(C)\cos^{-1}\left(\frac{\sqrt{14}}{11}\right)$$

(D)
$$\pi - \cos^{-1}\left(\frac{-\sqrt{14}}{21}\right)$$
 (E) $\pi - \cos^{-1}\left(\frac{\sqrt{14}}{7}\right)$

$$(E) \pi - \cos^{-1} \left(\frac{\sqrt{14}}{7} \right)$$

41. The vector equation of the line joining the points (2, 1, 3) and (-2, 4, 1) is

(A)
$$\vec{r} = 2\hat{i} + \hat{j} + 3\hat{k} + \lambda \left(-4\hat{i} + 3\hat{j} - 2\hat{k} \right)$$
 (B) $\vec{r} = 2\hat{i} + \hat{j} + 3\hat{k} + \lambda \left(4\hat{i} + 3\hat{j} + 2\hat{k} \right)$

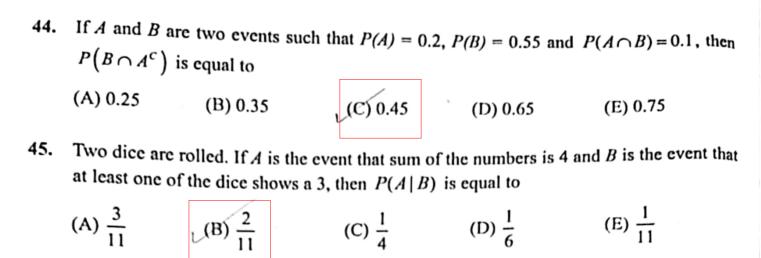
(B)
$$\vec{r} = 2 \hat{i} + \hat{j} + 3 \hat{k} + \lambda (4 \hat{i} + 3 \hat{j} + 2 \hat{k})$$

(C)
$$\vec{r} = -2\hat{i} + \hat{j} + 3\hat{k} + \lambda \left(-4\hat{i} - 3\hat{j} - 2\hat{k} \right)$$
 (D) $\vec{r} = 2\hat{i} + \hat{j} + 3\hat{k} + \lambda \left(3\hat{i} - 4\hat{j} - 2\hat{k} \right)$

(D)
$$\vec{r} = 2 \hat{i} + \hat{j} + 3 \hat{k} + \lambda (3 \hat{i} - 4 \hat{j} - 2 \hat{k})$$

(E)
$$\vec{r} = -4 \hat{i} + 3 \hat{j} - 2 \hat{k} + \lambda (2 \hat{i} + \hat{j} + 3 \hat{k})$$

- 42. A bag contains 5 yellow, 3 green, 2 blue and 7 white balls. If 4 balls are chosen at random, then the probability that none of them are white is
 - (A) $\frac{3}{37}$
- (B) $\frac{7}{34}$
- (C) $\frac{5}{34}$ (D) $\frac{5}{37}$
- 43. An urn contains 25 marbles which are numbered from 1 to 25 and a marble is chosen at random two times with replacement. Then the probability that both times the marble has the same number is
- (B) $\frac{24}{25}$ (C) $\frac{1}{625}$
- (D) $\frac{624}{625}$



Assume that n distinct values $x_1, x_2, ..., x_n$ occur with frequencies $f_1, f_2, ..., f_n$ 46. respectively. If $\bar{x} = 7$ and $\sum_{i=1}^{8} f_i x_i = 315$, then $\sum_{i=1}^{8} f_i = 315$ (C) 48 (D) 42

(A) 35

(B) 45

(E) 40

The variance of the data $x_1, x_2, ..., x_{50}$ with $\sum_{i=1}^{50} x_i = 650$ and $\sum_{i=1}^{50} x_i^2 = 10000$ is 47.

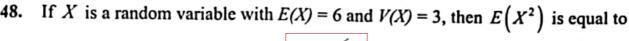
(A) 30

(B) 40

(C)39

(D) 41

(E) 31



- (A) 33
- (C) 39
- (E) 27

49. Let
$$f(x) = \frac{4x+3}{x+2}$$
. Then the value of $f^{-1}(-2)$ is equal to

- (A) $\frac{7}{5}$ (B) $\frac{-7}{6}$ (C) $\frac{-7}{5}$ (D) $\frac{7}{6}$ (E) $\frac{5}{6}$

50. If
$$f(x) = \begin{cases} 2x & \text{for } x < 1 \\ 5a - x & \text{for } x \ge 1 \end{cases}$$
 is continuous on \mathbb{R} , then the value of a is equal to

- (A) $\frac{1}{5}$ (B) $\frac{2}{5}$ (C) $\frac{3}{5}$ (D) $\frac{4}{5}$
- (E) 1

51.
$$\lim_{t \to 0} \frac{\sin 2t}{8t^2 + 4t}$$
 is equal to

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

- (E) 1

- 52. $\lim_{x\to 0} \frac{x}{\sqrt{9-x}-3}$ is equal to
 - (A) 6

- (B) 3 (C) -3 (D) -6
- 53. Let $f(x) =\begin{cases} 3x+2, & \text{if } x < -2 \\ x^2 3x 1, & \text{if } x \ge -2 \end{cases}$. Then $\lim_{x \to -2^-} f(x)$ and $\lim_{x \to -2^+} f(x)$ are respectively

 (A) -4, 3 (B) 6, 3 (C) -6, 3 (D) -4, 9 (E) 9, -4

- 54. $\lim_{x \to -3} \frac{x^2 + 16x + 39}{2x^2 + 7x + 3}$ is equal to
 - (A) 2

- (B) $\frac{8}{3}$ (C) $\frac{-8}{3}$ (D) -2
- 55. Let $f(x) = 6\sqrt[3]{x^5}$. If $f'(x) = ax^p$, where a and p are constants, then the value of p is equal to

 - (A) $\frac{3}{5}$ (B) $\frac{-2}{5}$
- $(C)^{\frac{2}{3}}$
- (D) $\frac{-2}{3}$ (E) $\frac{2}{5}$

56. Let
$$y = (\tan x)^{\sin x}$$
 for $0 < x < \frac{\pi}{2}$. If $\frac{dy}{dx} = (\tan x)^{\sin x} ((\cos x) \log(\tan x) + g(x))$, then $g(x) =$

(A) $\sin x \sec^2 x$

- (B) $\sec x \csc x$
- (Q) sec x

(D) cosec x

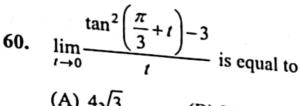
- (E) sin x tan x
- 57. If $f(x) = (x^3 + \sin \pi x)^5$, then f'(1) is equal to (A) 2^5 (B) $5(2^4)$ (C) 15 (D) $5(3+\pi)$ (E) $5(3-\pi)$

58. If
$$h(x) = 4x^3 - 5x + 7$$
 is the derivative of $f(x)$, then $\lim_{t \to 0} \frac{f(1+t) - f(1)}{t}$ is equal to

(A) 5 (B) 6 (C) 7 (D) 8 (E) 0

59. Let
$$f(x) = \begin{cases} e^x, & \text{if } x \le 1 \\ mx + 6, & \text{if } x > 1 \end{cases}$$
 be differentiable at $x = 1$. Then the value of m is

- (A) 6
- (B) e
- (D) -e
- (E) 1



- (A) $4\sqrt{3}$
- (B) 24
- (C) $16\sqrt{3}$
- (D) 8√3
- (E) 16

If the tangent line to the graph of a function f at the point x = 3 has x-intercept $\frac{5}{3}$ and 61. y-intercept -10, then f'(3) is equal to

- (A)3

- (B) 5 (C) $\frac{5}{3}$ (D) 6
- (E) -10

The slope of tangent line to the curve $4x^2 + 2xy + y^2 = 12$ at the point (1, 2) is 62.

- (A) 2
- (B) 1
- (C) -1 . (D) -2
- (E) 0

Let $f(x) = \sqrt{x} + 5$ for $1 \le x \le 9$. Then the value of c whose existence is guaranteed by 63. the Mean Value Theorem is

- (A) 2

- (D) 5
- (E) 6

The derivative of a function f is given by $f'(x) = \frac{x-5}{\sqrt{x^2+4}}$. Then the interval in which 64.

f is increasing, is

- $(A)(5,\infty)$
- (B) $(0,\infty)$
- $(C)(-4,\infty)$
- $(D)(-\infty,-4)$
- $(E)(-\infty,5)$

(C) -2e

(D) \sqrt{e}

 $(E) \frac{-1}{2e}$

66. A cube is expanding in such a way that its edge is increasing at a rate of 2 inches per second. If its edge is 5 inches long, then the rate of change of its volume is

(A) 150 in³/sec

(B) 75 in³/sec

(C) 50 in³/sec

(D) 30 in³/sec

(E) 45 in³/sec

67. $\int x^5 e^{1-x^6} dx =$

(A) $\frac{1}{6}e^{1-x^6} + C$

(B) $-e^{1-x^6} + C$

 $(C)^{\frac{1}{6}}e^{1-x^6}+C$

(D) $\frac{x^5}{5}e^{1-x^6}+C$

 $(E) \frac{x^6}{6} e^{1-x^6} + C$

 $68. \quad \int (5-4x)e^{-x}dx =$

 $(A) e^{-x}(4x-1)+C$

(B) $e^{-x}(9-4x)+C$

(C) $e^{-x}(4x-5)+C$

(D) $e^{-x}(4x-9)+C$

(E) $e^{-x}(5-4x)+C$

$$69. \quad \int \frac{\cos(\tan x)}{\cos^2 x} dx =$$

(A)
$$(\tan x)\sin(\tan x) + C$$

(D)
$$(\cos x)\sin(\tan x) + C$$

(B)
$$\sin(\tan x) + C$$

(E)
$$\cos^2(\tan x) + C$$

(C)
$$sec(tan x) + C$$

$$70. \quad \int \frac{1}{e^{2x}-1} dx =$$

(A)
$$2\log |e^{2x}-1|-x+C$$

(B)
$$x - \frac{1}{2} \log |e^{2x} - 1| + C$$

(C)
$$x + \frac{1}{2} \log |e^{2x} - 1| + C$$

(D)
$$x - \log |e^{2x} - 1| + C$$

(E)
$$\frac{1}{2} \log |e^{2x} - 1| - x + C$$

71.
$$\int \sin 2x \cos x \, dx =$$

$$(A) \frac{-1}{3} \cos^3 x + C$$

(D)
$$\frac{1}{3}\cos^3 x + C$$

$$(B) \frac{-2}{3} \cos^3 x + C$$

(E)
$$\frac{-4}{3}\cos^3 x + C$$

$$(C) \frac{2}{3} \cos^3 x + C$$

72.
$$\int \frac{1}{(1+\cot^2 x)\sin^2 x} dx =$$

(A)
$$tan^{-1}(\sin x) + C$$

(D)
$$\cot^{-1}(\cos x) + C$$

(B)
$$\tan^{-1}(\cos x) + C$$

$$(E) x + C$$

(C)
$$\cot^{-1}(\sin x) + C$$

$$73. \quad \int \frac{4x^9}{x^{10} - 10} dx =$$

$$(A) \frac{1}{5} \log |x^{10} - 10| + C$$

(A)
$$\frac{1}{5}\log|x^{10}-10|+C$$
 (B) $\frac{2}{5}\log|x^{10}-10|+C$ (C) $\frac{1}{10}\log|x^{10}-10|+C$

(C)
$$\frac{1}{10} \log |x^{10} - 10| + C$$

(D)
$$\frac{-2}{5} \log |x^{10} - 10| + C$$
 (E) $\frac{-1}{10} \log |x^{10} - 10| + C$

$$(E)\frac{-1}{10}\log|x^{10}-10|+C$$

The value of $\int_{0}^{\sqrt{3}} \frac{6}{9+x^2} dx$ is equal to

(A)
$$\frac{\pi}{3}$$
 (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{4}$

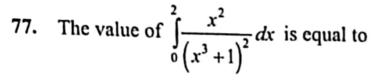
- (D) $\frac{2\pi}{3}$

The value of $\int_{1}^{3} (4-|x|)dx$ is equal to 75.

- (A) 18
- (B) 10
- (C) 12
- (D) 16

The area of the region bounded by the curves $y = x^2$ and $y = \sqrt{x}$ is (in square units) 76.

- (A) $\frac{2}{3}$
- $\sqrt{B}\left(\frac{1}{3}\right)$
- (C) $\frac{1}{6}$
- (D) $\frac{5}{6}$
- (E) 1



(A)
$$\frac{1}{27}$$

(B)
$$\frac{5}{27}$$

(C)
$$\frac{7}{27}$$

(A)
$$\frac{1}{27}$$
 (B) $\frac{5}{27}$ (C) $\frac{7}{27}$ (E) $\frac{8}{27}$

(E)
$$\frac{1}{3}$$

78. The value of
$$\int_{\pi/8}^{3\pi/8} \frac{\sin^4 x}{\sin^4 x + \cos^4 x} dx$$
 is equal to

(A)
$$\frac{\pi}{4}$$

$$(B) \frac{\pi}{8}$$
 (C) $\frac{\pi}{16}$

(C)
$$\frac{\pi}{16}$$

(D)
$$\frac{\pi}{2}$$

79. The area of the region bounded by
$$y = 5x$$
, x-axis and $x = 4$ is (in square units)

- (A) 40
- (B) 80
- (C) 20
- (D) 50
- (E) 60

80. The general solution of the differential equation
$$y - xy' = x^2 + y^2$$
 is

$$(A) y = x \tan(C - x)$$
 (B) $y = \tan x + C$

(B)
$$y = \tan x + C$$

(C)
$$y = x^2 \tan x + C$$

(D)
$$y = x \tan x + C$$

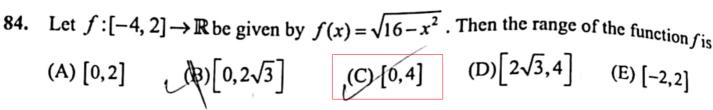
(E)
$$y = x \tan x + Cx$$

- The integrating factor of the differential equation $xy' + 2y 7x^3 = 0$ is 81.
 - (A) $\log |x|$
- (B) x²
- (C) $\frac{1}{x^2}$ (D) $\frac{1}{2}\log|x|$ (E) x
- The general solution of the differential equation $4xy+12x+(2x^2+3)y'=0$ is 82.
 - (A) $\frac{2x^2+3}{y+3} = C$
- (B) $\frac{y-3}{2x^2+3} = C$ (C) $\frac{y+2}{2x^2+3} = C$
- (D) $(y-3)(2x^2+3)=C$ (E) $(y+3)(2x^2+3)=C$
- The constraints of a linear programming problem are $x+2y \le 10$ and $6x+3y \le 18$. Which of the following points lie in the feasible region?
 - (A)(0,6)

3.

- (B)(4,3)

- (C) (5,7) (D) (1,7) (E) (1,3)



85. Let
$$f(x) = x^2$$
 and $g(x) = \sqrt{9+x}$. Then the value of $(f \circ g - g \circ f)(4)$ is equal to

(A)6

(B) $\sqrt{6}$

(C) √8 (D)/8

(E) 5

86. Let A and B be subsets of the universal set U. If
$$n(A) = 24$$
, $n(A \cap B) = 8$ and $n(U) = 63$, then $n(A' \cup B')$ is equal to

(A) 43

(B) 55

(C) 35

(D) 32

(E) 45

87. Let
$$f(x) = [x], x \in \mathbb{R}$$
, where $[x]$ denotes the greatest integer $\leq x$. Then the images of the elements -4.6 and 2.7 are respectively

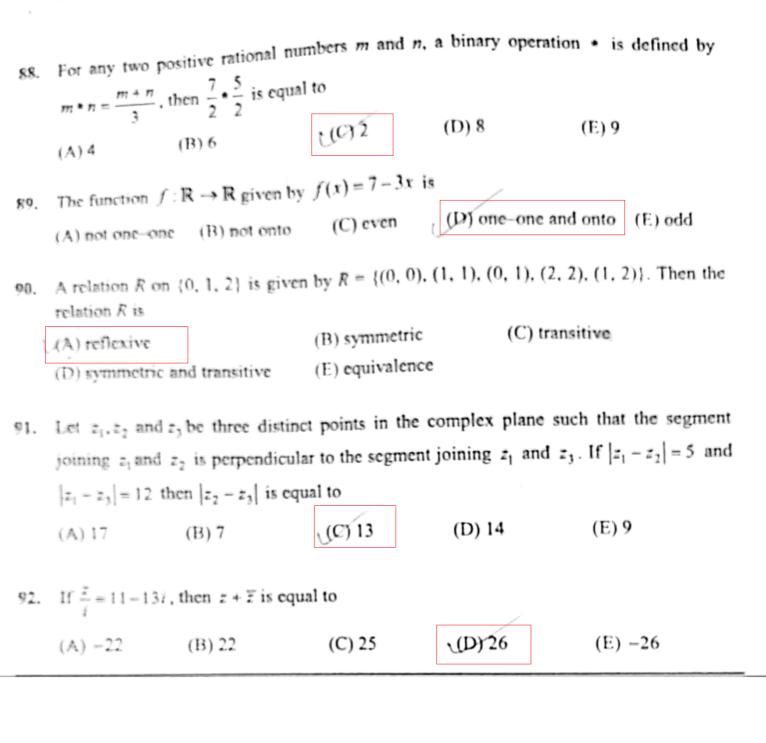
(A) - 5, 2

(B) -5, 3

(C) - 4, 2

(D) -3, 3

(E) - 4, 3



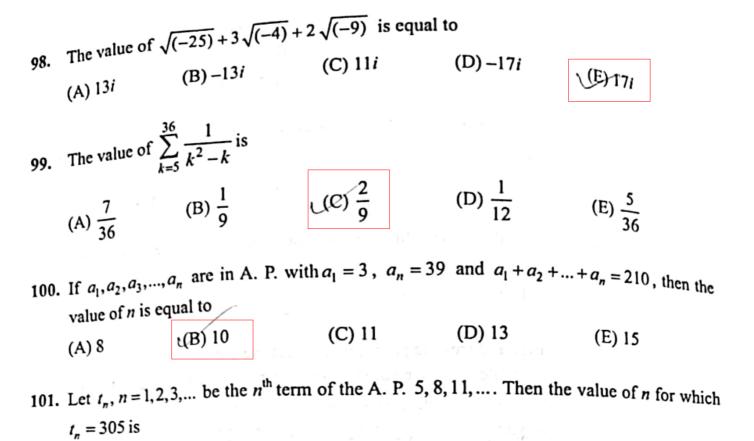


- Let $\alpha = 2 3i$ be a root of the equation $z^2 4z + k = 0$, where k is a real number. If β is the other root, then the value of $\alpha^2 + \beta^2$ is
 - (A) 26
- (B) -5
- (C)5
- (D) 10
- (E)-10

- If $z = 2 i\sqrt{3}$, then $|z^4|$ is equal to
 - (A)7
- (B) $\sqrt{7}$
- (C) 7√7
- (D) 49
- (E) 49√7

- The imaginary part of $z = \frac{2+i}{3-i}$ is 95.
 - (A) $\frac{5}{8}$
- $(B)\frac{-5}{9}$
- $(C)^{\frac{1}{2}}$
- (D) $\frac{3}{4}$
- (E) $\frac{3}{8}$
- The area of the triangle on the complex plane formed by the points z, z + iz and iz is 96. 128. Then the value of |z| is
 - (A) 12
- (B) 16
- (C) 18
- (D) 17
- (E) 19
- If the real part of the complex number $z = \frac{p+2i}{p-i}$, $p \in \mathbb{R}$, p > 0 is $\frac{1}{2}$, then the value of p is equal to
 - (A) $\sqrt{2}$

- (B) $\sqrt{3}$ (C) $\sqrt{5}$ (D) $\frac{\sqrt{3}}{2}$
- (E) 1



(C) 103

(C) 3

102. If the first term of a G. P. is 1 and the sum of 3rd and 5th terms is 90, then the positive

(B) 100

(B) 2

common ratio of the G. P. is

(A) 101

(A) 1

(D) 99

(D) 4

(E)95

(E) 5

(A) 157	(B) 160	(C) 158	L(D) 159	(E) 140	
104. If the 10 difference	th and 12 th terms of	of an A.P. are re	spectively 15 and	d 21, then the comm	non
(A) –6	(B) 4	(C) 6	(D) –3	LIET3	
105. The first	term of a G. P. is	3 and the commo	n ratio is 2. The	n the sum of first e	ight
(A) 763	(B) 189	(C) 381	(D) 765	(E) 655	
0.1. In a c	vaccination reductity, 45% people are sen at random in the	e vaccinated. The	en the probability	19 infection from 0 that a non-vaccin	.4 to ated
(A) 0.55	(B) 0.45	(C) 0.32	(D) 0.22	(E) 0.18	
107. The number 8 men and 5	of ways a commit women is	tee of 3 women a	nd 5 men can be	formed from a pan	el of
(A) 940	(B) 1120	(C) 560	(D) 760	(E) 520	

103. In an A.P. the difference between the last and the first terms is 632 and the common

difference is 4. Then the number of terms in the A. P. is

	A set contains 9 elements. Then the number of subsets of the set which contains at most						
	4 elements is	(B) 64	(C) 128	(D) 256	(E) 512		
100	If n and o are I	positive integer	s such that $^{(p+q)}P_2$	$p_2 = 42$ and $(p-q)P_2$	$_{2} = 20$, then the va	lucs	
109.	of p and q are	respectively (B) 4, 3	(C) 7, 2	(D) 6, 1	(E) 7, 5		
110.	The number of	of 3-digit num	bers that can be	formed from the	digits 0, 2, 3, 5,	7 is	
	(repetition is a (A) 125	(B) 100	(C) 105	(D) 150	(E) 60		
111.	If x^{22} is in the	ne (r+1) th term	of the binomial of	expansion of $(3x^3)$	$(-x^2)^9$, then the	value	
	of r is equal to	(B) 4	(C) 5	(D) 6	(E) 7		

112. The term independent of x in the binomial expansion of $\left(x + \frac{2}{x^3}\right)^{20}$ is

$$(A) \binom{20}{5} 2^{15}$$

(B)
$$\binom{20}{15} 2^{10}$$
 (C) $\binom{20}{10} 2^5$

$$(C) \binom{20}{10} 2^{\frac{1}{2}}$$

(D)
$$\binom{20}{10} 2^{10}$$

$$(E) \binom{20}{5} 2^5$$

113. Let $A + B = \begin{bmatrix} 4 & 1 & 4 \\ 1 & 4 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & -2 \\ -1 & 3 & 0 \end{bmatrix}$, then $A = \begin{bmatrix} 1 & 0 & -2 \\ -1 & 3 & 0 \end{bmatrix}$

$$(A)\begin{bmatrix}3 & 1 & 2\\0 & 3 & 4\end{bmatrix}$$

$$(B)\begin{bmatrix} 5 & 1 & 2 \\ 0 & 7 & 4 \end{bmatrix}$$

(A)
$$\begin{bmatrix} 3 & 1 & 2 \\ 0 & 3 & 4 \end{bmatrix}$$
 (B) $\begin{bmatrix} 5 & 1 & 2 \\ 0 & 7 & 4 \end{bmatrix}$ (C) $\begin{bmatrix} 3 & -1 & -2 \\ 2 & 1 & 4 \end{bmatrix}$

$$(D)\begin{bmatrix} 5 & 1 & 6 \\ 2 & 1 & 4 \end{bmatrix}$$

$$(E)\begin{bmatrix} 3 & 1 & 6 \\ 2 & 1 & 4 \end{bmatrix}$$

114. The value of the determinant $\begin{vmatrix} 4 & 4^2 & 4^3 \\ 3 & 3^2 & 3^3 \\ 2 & 2^2 & 2^3 \end{vmatrix}$ is

- (A) 52
- (B) -24
- (C) 24
- (D) 48

115. If $\begin{vmatrix} 1 & 2 & 1 \\ 0 & x & -3 \\ 2 & -1 & x \end{vmatrix} = 0$, then the values of x are

- (A) 5, -3 (B) 5, 3
- (C) -5, 3
- (D) 2, 3
- (E) -2, -3

116. If
$$AB = \begin{bmatrix} 4 & 3 \\ 5 & 4 \end{bmatrix}$$
 and $A^{-1} = \begin{bmatrix} 3 & -2 \\ -1 & 1 \end{bmatrix}$, then $B = \begin{bmatrix} A & 1 \\ 1 & 2 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}$ (E) $\begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$

- 117. The matrix $\begin{bmatrix} -2 & 1 & 0 \\ 3 & 4 & 1 \\ -4 & \lambda & 0 \end{bmatrix}$ is non-singular for $\lambda \neq$ (A) 2 (B) -2 (C) 4 (D) -4 (E) 0
- 118. Let $\begin{vmatrix} x-1 & 2 & 1 \\ 2 & x-1 & 2 \\ 1 & x+2 & x-1 \end{vmatrix} = ax^3 + bx^2 + cx + d$, where a,b,c and d are constants. Then the value of d is
 - (A) -8 (B) 6 (C) 0 (D) -6 (E) 16
- 119. If the inequality $-13 \le x \le 5$ is expressed in the form $|x-a| \le b$, then the values of a and b are respectively
 - (A) 4, 8 (B) -4, 9 (C) 4, 9 (D) 5, 9 (E) -5, 9
- 120. The solution set of the inequality 5(4x+6) < 25x+10 is

 (A) $(4,\infty)$ (B) $(-\infty,4)$ (C) $(-\infty,5)$ (D) $(5,\infty)$ (E) (-4,4)