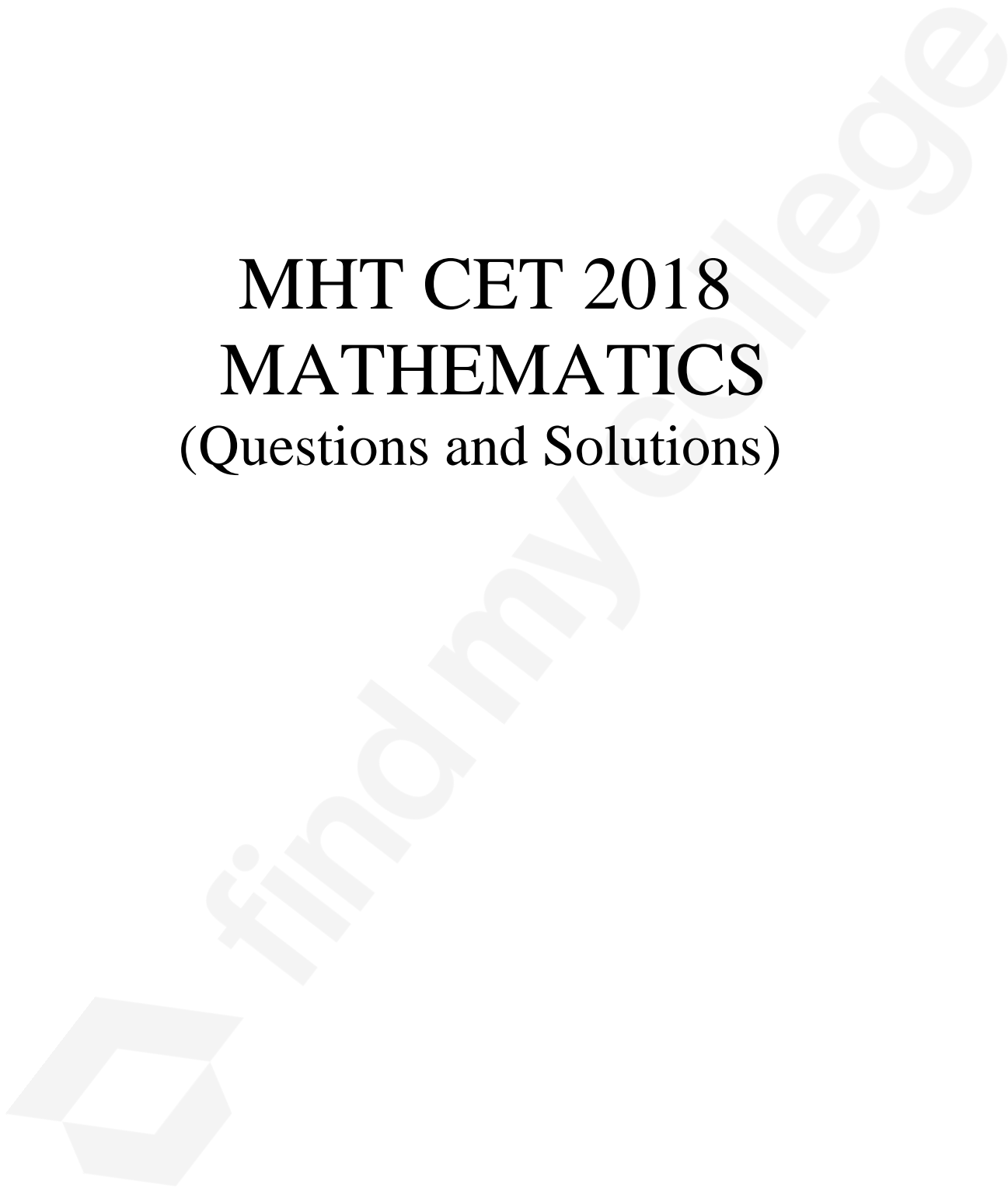


MHT CET 2018
MATHEMATICS
(Questions and Solutions)



SUBJECT : PAPER I – MATHEMATICS**Instruction to Candidates**

1. This question booklet contains 50 Objective Type Questions (Single Best Response Type) in the subject of Mathematics.
2. The question paper and OMR (Optical Mark Reader) Answer Sheet are issued to examinees separately at the beginning of the examination session.
3. Choice and sequence for attempting questions will be as per the convenience of the candidate.
4. Candidate should carefully read the instructions printed on the Question Booklet and Answer Sheet and make the correct entries on the Answer Sheet. As Answer Sheets are designed to suit the OPTICAL MARK READER (OMR) SYSTEM, special care should be taken to mark appropriate entries/answers correctly. Special care should be taken to fill QUESTION BOOKLET VERSION, SERIAL No. and Roll No. accurately. The correctness of entries has to be cross-checked by the invigilators. **The candidate must sign on the Answer Sheet and Question Booklet.**
5. Read each question carefully.
6. Determine the correct answer from out of the four available options given for each question.
7. Fill the appropriate circle completely like this ● for answering the particular question, with Black ink ball point pen only, in the OMR Answer Sheet.
8. Each answer with correct response shall be awarded **two (2) marks**. There is **no Negative Marking**. If the examinee has marked two or more answers or has done scratching and overwriting in the Answer Sheet in response to any question, or has marked the circles inappropriately e.g. half circle, dot, tick mark, cross etc, mark/s shall NOT be awarded for such answer/s, as these may not be read by the scanner. Answer sheet of each candidate will be evaluated by computerized scanning method only (Optical Mark Reader) and there will not be any manual checking during evaluation or verification.
9. Use of whitener or any other material to erase/hide the circle once filled is not permitted. Avoid overwriting and/or striking of answers once marked.
10. Rough work should be done only on the blank space provided in the Question Booklet. **Rough work should not be done on the Answer Sheet.**
11. The required mathematical tables (Log etc.) are provided within the question booklet.
12. Immediately after the prescribed examination time is over, the Answer Sheet is to be returned to the Invigilator. Confirm that both the Candidate and Invigilator have signed on question booklet and answer sheet.
13. No candidate is allowed to leave the examination hall till the examination session is over.

Questions and Solutions

1. If $\int_0^k \frac{dx}{2+18x^2} = \frac{\pi}{24}$, then the value of K is

(A) 3

(B) 4

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

 (D) $\frac{1}{4}$

1. (C)

$$\int_0^k \frac{dx}{2+18x^2} = \frac{\pi}{24}$$

$$\begin{aligned} \therefore \frac{\pi}{24} &= \frac{1}{18} \int_0^k \frac{dx}{\left(\frac{1}{9}\right) + x^2} = \frac{1}{18} \int_0^k \frac{dx}{\left(\frac{1}{3}\right)^2 + x^2} \\ &= \frac{1}{18} \times \frac{1}{\left(\frac{1}{3}\right)} \tan^{-1} \left[\frac{x}{\left(\frac{1}{3}\right)} \right]_0^k \\ &= \frac{3}{18} \tan^{-1} [3x]_0^k = \frac{1}{6} \left[\tan^{-1} 3k - \tan^{-1} 0 \right] \\ &= \frac{1}{6} \left[\tan^{-1} 3k - 0 \right] \\ \therefore \frac{6\pi}{24} &= \tan^{-1} 3k \Rightarrow \tan \frac{\pi}{4} = 3k = 1 \Rightarrow k = \frac{1}{3} \end{aligned}$$

2. The cartesian co-ordinates of the point on the parabola $y^2 = -16x$, whose parameter is $\frac{1}{2}$, are

(A) (-2, 4)

(B) (4, -1)

(C) (-1, -4)

(D) (-1, 4)

2. (D)

$$y^2 = -16x \Rightarrow y^2 = -4ax$$

$$\therefore a = 4$$

Parametric equations are

$$x = -at^2, y = 2at \text{ i.e.}$$

$$x = -4\left(\frac{1}{2}\right)^2, y = 2(4)\left(\frac{1}{2}\right) \text{ i.e. } x = -1, y = 4$$

3. $\int \frac{1}{\sin x \cdot \cos^2 x} dx =$

 (A) $\sec x + \log |\sec x + \tan x| + c$

 (B) $\sec x \cdot \tan x + c$

 (C) $\sec x + \log |\sec x - \tan x| + c$

 (D) $\sec x + \log |\operatorname{cosec} x - \cot x| + c$

3. (D)

$$\begin{aligned} \int \frac{dx}{\sin x \cos^2 x} &= \int \frac{\sin^2 x + \cos^2 x}{\sin x \cos^2 x} dx \\ &= \int \frac{\sin x}{\cos^2 x} dx + \int \frac{dx}{\sin x} = \int \tan x \sec x + \int \operatorname{cosec} x dx \\ &= \sec x + \log |\operatorname{cosec} x - \cot x| + c \end{aligned}$$

4. If $\log_{10} \left| \frac{x^3 - y^3}{x^3 + y^3} \right| = 2$ then $\frac{dy}{dx} =$
- (A) $\frac{x}{y}$ (B) $-\frac{y}{x}$ (C) $-\frac{x}{y}$ (D) $\frac{y}{x}$

4. (D)

$$\log_{10} \left| \frac{x^3 - y^3}{x^3 + y^3} \right| = 2$$

$$\therefore \log (x^3 - y^3) - \log (x^3 + y^3) = 2 \left[3x^2 + 3y^2 \frac{dy}{dx} \right]$$

$$\frac{3x^2}{x^3 - y^3} - \frac{3y^2}{x^3 + y^3} \frac{dy}{dx} = \frac{3x^2}{x^3 + y^3} + \frac{3y^2}{x^3 + y^3} \frac{dy}{dx}$$

$$\frac{3x^2}{x^3 - y^3} - \frac{3x^2}{x^3 + y^3} = \left[\frac{3y^2}{x^3 + y^3} + \frac{3y^2}{x^3 + y^3} \right] \frac{dy}{dx}$$

$$3x^2 \left[\frac{y^3}{x^3 - y^3} - \frac{1}{x^3 + y^3} \right] = 3y^2 \left[\frac{x^3 - y^3}{x^3 + y^3} + \frac{1}{x^3 + y^3} \right] \frac{dy}{dx}$$

$$3x^2 \left[\frac{y^3 - (x^3 - y^3)}{(x^3 - y^3)(x^3 + y^3)} \right] = 2 \left[\frac{2x^3}{(x^3 + y^3)(x^3 - y^3)} \right] \frac{dy}{dx}$$

$$\therefore \frac{y}{x} = \frac{dy}{dx}$$

Alternative Method

$$\log_{10} \left| \frac{x^3 - y^3}{x^3 + y^3} \right| = 2$$

$$\left| \frac{x^3 - y^3}{x^3 + y^3} \right| = 2^{10} = 100$$

$$x^3 - y^3 = 100x^3 + 100y^3$$

$$-99x^3 = 101y^3 \dots\dots\dots (1)$$

$$-99(3x^2) = 101(3y^2) \frac{dy}{dx}$$

$$\frac{dy}{dx} = \frac{-99x^2}{101y^2}$$

$$\frac{dy}{dx} = \left(\frac{y^3}{x^3} \right) \left(\frac{x^2}{y^2} \right) = \frac{y}{x}$$

5. If $f : \mathbb{R} - \{2\} \rightarrow \mathbb{R}$ is a function defined by $f(x) = \frac{x^2 - 4}{x - 2}$, then its range is
- (A) \mathbb{R} (B) $\mathbb{R} - \{2\}$ (C) $\mathbb{R} - \{4\}$ (D) $\mathbb{R} - \{-2, 2\}$

5. (A)

$$f(x) = \frac{x^2 - 4}{x - 2} = \frac{(x - 2)(x + 2)}{(x - 2)} = x + 2$$

\therefore Range is \mathbb{R}

6. If $f(x) = x^2 + \alpha$ for $x \geq 0$

$$= 2\sqrt{x^2 + 1} + \beta \text{ for } x < 0$$

is continuous at $x = 0$ and $f\left(\frac{1}{2}\right) = 2$ then $\alpha^2 + \beta^2$ is

- (A) 3 (B) $\frac{8}{25}$ (C) $\frac{25}{8}$ (D) $\frac{1}{3}$

6. (C)

$$f(x) = \begin{cases} x^2 + \alpha, & \text{if } x \geq 0 \\ 2\sqrt{x^2 + 1} + \beta, & \text{if } x < 0 \end{cases} \text{ continuous at } x = 0$$

$$\therefore f(0) = 0 + \alpha = 2 + \beta \Rightarrow \alpha - \beta = 2$$

$$f\left(\frac{1}{2}\right) = \left(\frac{1}{2}\right)^2 + \alpha = 2 \Rightarrow \alpha = 2 - \frac{1}{4} = \frac{7}{4}$$

$$\therefore \beta = \frac{7}{4} - 2 = \frac{-1}{4}$$

$$\therefore \alpha^2 + \beta^2 = \left(\frac{7}{4}\right)^2 + \left(\frac{-1}{4}\right)^2 = \frac{49+1}{16} = \frac{50}{16} = \frac{25}{8}$$

7. If $y = (\tan^{-1} x)^2$ then $(x^2 + 1)^2 \frac{d^2y}{dx^2} + 2x(x^2 + 1) \frac{dy}{dx} =$

- (A) 4 (B) 2 (C) 1 (D) 0

7. (B)

$$y = (\tan^{-1} x)^2$$

$$\therefore \frac{dy}{dx} = \frac{2 \tan^{-1} x}{1 + x^2}$$

$$\therefore (1 + x^2) \frac{dy}{dx} = 2 \tan^{-1} x = 2 \sqrt{y}$$

$$\therefore (1 + x^2)^2 \left(\frac{dy}{dx}\right)^2 = 4y$$

$$\therefore 2(1 + x^2) \left(2x \frac{dy}{dx}\right) + 2 \left(\frac{dy}{dx}\right)^2 (1 + x^2) = 4 \frac{dy}{dx}$$

$$\therefore 4x(1 + x^2) \frac{dy}{dx} + 2(1 + x^2) \left(\frac{dy}{dx}\right)^2 = 4 \frac{dy}{dx}$$

$$\therefore 4x(1 + x^2) \frac{dy}{dx} + 2(1 + x^2) \frac{d^2y}{dx^2} = 4$$

$$\therefore (x^2 + 1)^2 \frac{d^2y}{dx^2} + 2x(1 + x^2) \frac{dy}{dx} = 2$$

8. The line $5x + y - 1 = 0$ coincides with one of the lines given by $5x^2 + xy - kx - 2y + 2 = 0$ then the value of k is

- (A) -11 (B) 31 (C) 11 (D) -31

8. (C)

$$5x + y - 1 = 0 \text{ coincides } 5x^2 + xy - kx - 2y + 2 = 0$$

$$\therefore a = 5, b = 0, h = \frac{1}{2}, g = -\frac{k}{2}, f = -1, c = 2$$

$$\therefore \begin{vmatrix} 5 & \frac{1}{2} & -\frac{k}{2} \\ \frac{1}{2} & 0 & -1 \\ -\frac{k}{2} & -1 & 2 \end{vmatrix} = 0$$

$$\therefore 5(0-1) - \frac{1}{2} \left(\begin{vmatrix} 1 & -k \\ 2 & 2 \end{vmatrix} \right) + \frac{k}{2} \left(\begin{vmatrix} -1 & -0 \\ 2 & 2 \end{vmatrix} \right) = 0$$

$$\therefore -5 - \frac{1}{2} + \frac{k}{4} + \frac{k}{4} = 0 \Rightarrow \frac{k}{2} = \frac{11}{2} \Rightarrow k = 11$$

9. If $A = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 1 & 2 \\ 1 & 2 & 4 \end{bmatrix}$ then $(A^2 - 5A)A^{-1} =$

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

9. (B)

$$\begin{aligned} (A^2 - 5A)A^{-1} &= A^2 A^{-1} - 5AA^{-1} = A \cdot AA^{-1} - 5I \\ &= A - 5I \\ &= \begin{bmatrix} 1 & 2 & 3 \\ -1 & 1 & 2 \\ 1 & 2 & 4 \end{bmatrix} - \begin{bmatrix} 5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{bmatrix} \\ &= \begin{bmatrix} -4 & 2 & 3 \\ -1 & -4 & 2 \\ 1 & 2 & -1 \end{bmatrix} \end{aligned}$$

10. The equation of line passing through $(3, -1, 2)$ and perpendicular to the lines

$$\vec{r} = (\hat{i} + \hat{j} - \hat{k}) + \lambda(2\hat{i} - 2\hat{j} + \hat{k}) \text{ and } \vec{r} = (2\hat{i} + \hat{j} - 3\hat{k}) + \mu(\hat{i} - 2\hat{j} + 2\hat{k}) \text{ is}$$

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

10. (C)

Let a, b, c be d.rs of desired line.

$$\therefore 2a - 2b + c = 0$$

$$a - 2b + 2c = 0$$

$$\therefore \frac{a}{\begin{vmatrix} -2 & 1 \\ -2 & 2 \end{vmatrix}} = \frac{-b}{\begin{vmatrix} 2 & 1 \\ 1 & 2 \end{vmatrix}} = \frac{c}{\begin{vmatrix} 2 & -2 \\ 1 & -2 \end{vmatrix}}$$

$$\therefore \frac{a}{-4+2} = \frac{-b}{4-1} = \frac{c}{-4+2} \Rightarrow a = -2, b = -3, c = -2$$

Hence equation of desired line is

$$\frac{x-3}{-2} = \frac{y+1}{-3} = \frac{z-2}{-2} \text{ i.e. } \frac{x-3}{2} = \frac{y+1}{3} = \frac{z-2}{2}$$

14. (D)

$$\int \frac{\square dx}{\sqrt{16-9x^2}} = \frac{1}{3} \int \frac{dx}{\sqrt{\left(\frac{16}{9}\right) - x^2}} = \frac{1}{3} \int \frac{\square dx}{\sqrt{\left(\frac{4}{3}\right)^2 - x^2}}$$

(Pg. 6)

(7) MHT-CET - 2018 : Mathematics Paper and Solution

$$= \frac{1}{3} \sin^{-1} \left[\frac{x}{3} \right] + c \Rightarrow A = \frac{1}{3} \text{ and } B = \frac{3}{4}$$

$$\therefore A + B = \frac{1}{3} + \frac{3}{4} = \frac{13}{12}$$

15. $\int e^x \left[\frac{2 + \sin 2x}{1 + \cos 2x} \right] dx =$
 (A) $e^x \tan x + c$ (B) $e^x + \tan x + c$ (C) $2e^x \tan x + c$ (D) $e^x \tan 2x + c$

15. (A)

$$\int e^x \left[\frac{2 + \sin 2x}{1 + \cos 2x} \right] dx = \int e^x \left[\frac{2(1 + \sin x \cos x)}{2 \cos^2 x} \right] dx$$

$$= \int e^x \left[\sec^2 x + \tan x \right] dx = e^x \tan x + c$$

16. A coin is tossed three times. If X denotes the absolute difference between the number of heads and the number of tails then $P(X = 1) =$
 (A) $\frac{1}{2}$ (B) $\frac{2}{3}$ (C) $\frac{1}{6}$ (D) $\frac{3}{4}$

16. (D)
 A coin is tossed 3 times.
 \therefore Possibilities are
 HHH $\rightarrow X = 3 - 0 = 3$
 TTT $\rightarrow X = 3 - 0 = 3$
 HHT $\rightarrow X = 2 - 1 = 1$
 HTH $\rightarrow X = 2 - 1 = 1$
 THH $\rightarrow X = 2 - 1 = 1$
 HTT $\rightarrow X = 2 - 1 = 1$
 TTH $\rightarrow X = 2 - 1 = 1$
 THT $\rightarrow X = 2 - 1 = 1$
 $\therefore P(X = 1) = \frac{6}{8} = \frac{3}{4}$

17. If $2 \sin \left(\theta + \frac{\pi}{3} \right) = \cos \left(\theta - \frac{\pi}{6} \right)$, then $\tan \theta =$
 (A) $\sqrt{3}$ (B) $-\frac{1}{\sqrt{3}}$ (C) $\frac{1}{\sqrt{3}}$ (D) $-\sqrt{3}$

17. (D)

$$2 \sin \left(\theta + \frac{\pi}{3} \right) = \cos \left(\theta - \frac{\pi}{6} \right)$$

$$2 \left[\sin \theta \cos \frac{\pi}{3} + \cos \theta \sin \frac{\pi}{3} \right] = \cos \theta \cos \frac{\pi}{6} + \sin \theta \sin \frac{\pi}{6}$$

$$\therefore 2 \left[\frac{\sin \theta}{2} + \cos \theta \left(\frac{\sqrt{3}}{2} \right) \right] = \cos \theta \left(\frac{\sqrt{3}}{2} \right) + \sin \theta \left(\frac{1}{2} \right)$$

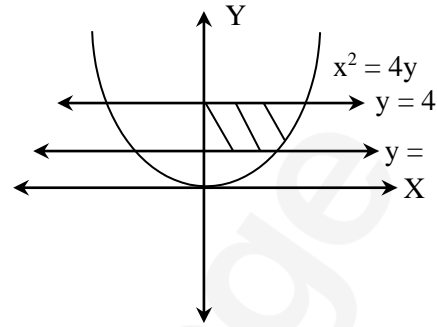
$$\therefore \sin \theta + \sqrt{3} \cos \theta = \frac{\sqrt{3}}{2} \cos \theta + \frac{1}{2} \sin \theta$$

$$\therefore \frac{1}{2} \sin \theta = \frac{-\sqrt{3}}{2} \cos \theta \Rightarrow \tan \theta = -\sqrt{3}$$

18. The area of the region bounded by $x^2 = 4y$, $y = 1$, $y = 4$ and the y -axis lying in the first quadrant is _____ square units.
 (A) $\frac{22}{3}$ (B) $\frac{28}{3}$ (C) 30 (D) $\frac{21}{4}$

18. (B)

We have $x^2 = 4y \Rightarrow x = 2\sqrt{y}$
 $\therefore A = \int_1^4 2\sqrt{y} dy = 2 \left[\frac{y^{3/2}}{3/2} \right]_1^4$
 $= 2 \left(\frac{2}{3} \right) \left[y\sqrt{y} \right]_1^4 = \frac{4}{3} \left[(8-1) \right] = \frac{28}{3}$



19. If $f(x) = \frac{e^{x^2} - \cos x}{x^2}$, for $x \neq 0$ is continuous at $x = 0$, then value of $f(0)$ is

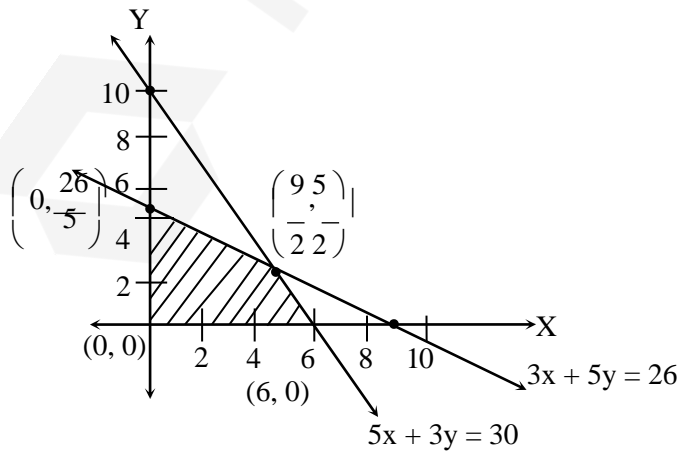
- (A) $\frac{2}{3}$ (B) $\frac{5}{2}$ (C) 1 (D) $\frac{3}{2}$

19. (D)

$f(x) = \frac{e^{x^2} - \cos x}{x^2}$
 $f(0) = \lim_{x \rightarrow 0} \frac{(e^{x^2} - 1) - (\cos x - 1)}{x^2}$
 $= \lim_{x \rightarrow 0} \frac{e^{x^2} - 1}{x^2} - \lim_{x \rightarrow 0} \frac{-2\sin^2 x}{x^2}$
 $= 1 + 2 \lim_{x \rightarrow 0} \left| \frac{\sin x}{x} \right| \times \frac{1}{2} = 1 + \frac{2}{2} = 2$

20. The maximum value of $2x + y$ subject to $3x + 5y \leq 26$ and $5x + 3y \leq 30$, $x \geq 0$, $y \geq 0$ is
 (A) 12 (B) 11.5 (C) 10 (D) 17.33

20. (A)



$$4kh^2 = ab(1 + k)^2$$

$$\text{Here } k = 2$$

$$\therefore 4(2)h^2 = ab(1 + 2)^2$$

$$\therefore 8h^2 = 9ab$$

24. The equation of the line passing through the point $(-3, 1)$ and bisecting the angle between co-ordinate axes is

- (A) $x + y + 2 = 0$ (B) $-x + y + 2 = 0$ (C) $x - y + 4 = 0$ (D) $2x + y + 5 = 0$

24. Question is Wrong.

25. The negation of the statement: "Getting above 95% marks is necessary condition for Hema to get the admission in good college"

- (A) Hema gets above 95% marks but she does not get the admission in good college
 (B) Hema does not get above 95% marks and she gets admission in good college
 (C) If Hema does not get above 95% marks then she will not get the admission in good college.
 (D) Hema does not get above 95% marks or she gets the admission in good college.

25. (B)

p : Hema gets the admission in good college

q : Hema gets 95 % marks

\therefore Given statement can be written in symbolic form as

$$p \rightarrow q$$

\therefore Its negation is $p \wedge \sim q$

26. $\cos 1^\circ \cdot \cos 2^\circ \cdot \cos 3^\circ \dots \dots \cos 179^\circ =$

- (A) 0 (B) 1 (C) $-\frac{1}{2}$ (D) -1

26. (A)

$$\cos 1^\circ \cos 2^\circ \cos 3^\circ \dots \cos 179^\circ = 0$$

(As $\cos 90^\circ = 0 \Rightarrow$ product = 0)

27. If planes $x - cy - bz = 0$, $cx - y + az = 0$ and $bx + ay - z = 0$ pass through a straight line then

$$a^2 + b^2 + c^2 =$$

- (A) $1 - abc$ (B) $abc - 1$ (C) $1 - 2abc$ (D) $2abc - 1$

27. (C)

$$\text{Planes } x - cy - bz = 0$$

$$cx - y + az = 0$$

$$bx + ay - z = 0$$

\therefore Planes are concurrent

$$\begin{vmatrix} 1 & -c & -b \\ c & -1 & a \\ b & a & -1 \end{vmatrix} = 0$$

$$1(1 - a^2) + c(-c - ab) - b(ac + b) = 0$$

$$1 - a^2 - c^2 - abc - abc - b^2 = 0$$

$$a^2 + b^2 + c^2 + 2abc = 1$$

$$a^2 + b^2 + c^2 = 1 - 2abc$$

28. The point of intersection of lines represented by $x^2 - y^2 + 1x + 3y - 2 = 0$ is

- (A) (1, 0) (B) (0, 2) (C) $\begin{pmatrix} -1 & 3 \\ -2 & 2 \end{pmatrix}$ (D) $\begin{pmatrix} 1 & 1 \\ 2 & 2 \end{pmatrix}$

28. (C)

$$x^2 - y^2 + x + 3y - 2 = 0$$

$$a = 1, h = 0, b = -1, g = \frac{1}{2}, f = \frac{3}{2}, c = -2$$

$$\text{Point of intersection } \left(\frac{hf - bg}{ab - h^2}, \frac{gh - af}{ab - h^2} \right)$$

$$\equiv \left(\frac{0 \cdot \frac{1}{2} - (-1) \cdot \frac{3}{2}}{1 \cdot (-1) - 0^2}, \frac{\frac{1}{2} \cdot (-2) - (-1) \cdot 1}{1 \cdot (-1) - 0^2} \right) \equiv \left(-\frac{1}{2}, \frac{3}{2} \right)$$

OR

by partial differentiation w.r.t. x

$$\Rightarrow 2x + 1 = 0 \Rightarrow x = -\frac{1}{2}$$

by partial differentiation w.r.t. y

$$\Rightarrow 2y + 3 = 0 \Rightarrow y = -\frac{3}{2}$$

$$\therefore \text{Point of intersection } \left(-\frac{1}{2}, -\frac{3}{2} \right)$$

29. A die is rolled. If X denotes the number of positive divisors of the outcome then the range of the random variable X is

- (A) {1, 2, 3} (B) {1, 2, 3, 4} (C) {1, 2, 3, 4, 5, 6} (D) {1, 3, 5}

29. (B)

When we get 1, number of positive divisors are 1

When we get 2, number of positive divisors are 2

When we get 3, number of positive divisors are 2

When we get 4, number of positive divisors are 3

When we get 5, number of positive divisors are 2

When we get 6, number of positive divisors are 4

Hence range of r.v. X is {1, 2, 3, 4}

30. A die is thrown four times. The probability of getting perfect square in at least one throw is

- (A) $\frac{16}{81}$ (B) $\frac{65}{81}$ (C) $\frac{23}{81}$ (D) $\frac{58}{81}$

30. (B)
 $P(\text{getting perfect square in atleast one throw}) = 1 - P(\text{not getting perfect square in any throw})$

$$= 1 - \left(\frac{4}{6} \times \frac{4}{6} \times \frac{4}{6} \times \frac{4}{6} \right) = 1 - \left(\frac{2}{3} \right)^4 = 1 - \frac{16}{81} = \frac{65}{81}$$

31. $\int_0^{\pi/4} x \cdot \sec^2 x \, dx = ?$

- (A) $\frac{\pi}{4} + \log \sqrt{2}$ (B) $\frac{\pi}{4} - \log \sqrt{2}$ (C) $1 + \log \sqrt{2}$ (D) $1 - \frac{1}{2} \log 2$

31. (B)

$$\int_0^{\pi/4} x \sec^2 x \, dx = \left[x \int \sec^2 x \, dx \right]_0^{\pi/4} - \int_0^{\pi/4} \left[\frac{d}{dx} x \int \sec^2 x \, dx \right] dx$$

$$\begin{aligned}
 &= \left[x \cdot \tan x \right]_0^{\pi/4} - \int_0^{\pi/4} [\tan x] dx \\
 &= \left[x \cdot \tan x \right]_0^{\pi/4} - \left[\log |\sec x| \right]_0^{\pi/4} \\
 &= \left[\pi - 0 \right] - \left[\log \sec \pi - \log \sec 0 \right] \\
 &= \left[\frac{\pi}{4} - \left[\log \sqrt{2} - \log 1 \right] \right] \\
 &= \frac{\pi}{4} - \log \sqrt{2}
 \end{aligned}$$

32. In ΔABC , with usual notations, if a, b, c are in A.P. then $a \cos^2\left(\frac{C}{2}\right) + c \cos^2\left(\frac{A}{2}\right) = ?$

- (A) $3\frac{a}{2}$ (B) $3\frac{c}{2}$ (C) $3\frac{b}{2}$ (D) $3\frac{abc}{2}$

32. (C)

a, b, c are in A.P.

$$2b = a + c$$

$$\begin{aligned}
 &a \cos^2\left(\frac{C}{2}\right) + c \cos^2\left(\frac{A}{2}\right) \\
 &= a \frac{[1 + \cos C]}{2} + c \frac{[1 + \cos A]}{2} \\
 &= \frac{a + c + a \cos C + c \cos A}{2} \\
 &= \frac{a + c + b}{2} \quad \dots [\square b = a \cos C + c \cos A] \\
 &= \frac{2b + b}{2} = \frac{3b}{2}
 \end{aligned}$$

33. If $x = e^\theta (\sin \theta - \cos \theta)$, $y = e^\theta (\sin \theta + \cos \theta)$ then $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$ is

- (A) 1 (B) 0 (C) $\frac{1}{\sqrt{2}}$ (D) $\sqrt{2}$

33. (A)

$$x = e^\theta (\sin \theta - \cos \theta), y = e^\theta (\sin \theta + \cos \theta)$$

$$\frac{dx}{d\theta} = e^\theta (\cos \theta + \sin \theta) + (\sin \theta - \cos \theta)e^\theta$$

$$\frac{dy}{d\theta} = e^\theta (\cos \theta - \sin \theta) + (\sin \theta + \cos \theta)e^\theta$$

$$\frac{dy}{dx} = \frac{dy/d\theta}{dx/d\theta} = \frac{e^\theta [2\cos \theta]}{e^\theta [2\sin \theta]}$$

$$\therefore \frac{dy}{dx} = \cot \theta$$

$$\left. \frac{dy}{dx} \right|_{\theta = \frac{\pi}{4}} = \cot \frac{\pi}{4} = 1$$

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34. The number of solutions of $\sin x + \sin 3x + \sin 5x = 0$ in the interval $\left[\frac{\pi}{2}, \frac{3\pi}{2} \right]$ is

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

34. (B)

$$\sin x + \sin 3x + \sin 5x = 0$$

$$\sin 5x + \sin x + \sin 3x = 0$$

$$2 \sin 3x \cdot \cos 2x + \sin 3x = 0$$

$$\therefore \sin 3x [2 \cos 2x + 1] = 0$$

$$\therefore \sin 3x = 0 \quad \text{or} \quad 2 \cos 2x + 1 = 0$$

$$\sin 3x = \sin n\pi \quad \text{or} \quad 2 \cos 2x = -1$$

$$3x = n\pi \quad \text{or} \quad \cos 2x = -1/2$$

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

$$\cos 2x = -\cos \pi/3$$

$$\cos 2x = \cos(\pi - \pi/3)$$

$$\cos 2x = \cos \frac{2\pi}{3}$$

$$2x = 2n\pi \pm \frac{2\pi}{3}$$

$$x = \frac{n\pi}{3}, \quad x = n\pi \pm \frac{\pi}{3}$$

$$x \in \left[\frac{\pi}{2}, \frac{3\pi}{2} \right] \text{ gives}$$

$$x = 180, x = 120, x = 240$$

$$x = \pi, x = \frac{2\pi}{3}, x = \frac{4\pi}{3}$$

35. If $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$, then $x =$

(A) -1

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

(C) $\frac{1}{6}$

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

35. (C)

$$\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$$

$$\tan^{-1} \left(\frac{2x + 3x}{1 - 6x^2} \right) = \frac{\pi}{4}$$

$$\frac{5x}{1 - 6x^2} = \tan \frac{\pi}{4}$$

$$\frac{5x}{1 - 6x^2} = 1$$

$$5x = 1 - 6x^2$$

$$6x^2 + 5x - 1 = 0$$

$$6x^2 + 6x - x - 1 = 0$$

$$6x(x + 1) - 1(x + 1) = 0$$

$$(x + 1)(6x - 1) = 0$$

$$\therefore x = -1, x = \frac{1}{6}$$

When $x = \frac{1}{6}$, given equation is satisfied.

When $x = -1$, we get sum of two negative angles which cannot be equal to positive angle.

$$\therefore x = \frac{1}{6}$$

36. Matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 5 \\ 2 & 4 & 7 \end{bmatrix}$ then the value of $a_{31} A_{31} + a_{32} A_{32} + a_{33} A_{33}$ is

- (A) 1 (B) 13 (C) -1 (D) -13

36. (C)

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 5 \\ 2 & 4 & 7 \end{bmatrix}$$

$$\begin{aligned} a_{31} A_{31} + a_{32} A_{32} + a_{33} A_{33} &= |A| \\ &= +1(7 - 20) - 2(7 - 10) + 3(4 - 2) \\ &= -13 + 6 + 6 \\ &= -1 \end{aligned}$$

37. The contrapositive of the statement: “If the weather is fine then my friends will come and we go for a picnic.”

- (A) The weather is fine but my friends will not come or we do not go for a picnic
 (B) If my friends do not come or we do not go for picnic then weather will not be fine
 (C) If the weather is not fine then my friends will not come or we do not go for a picnic
 (D) The weather is not fine byt my friends will come and we go for a picnic

37. (B)

p = The weather is fine

q = My friends will come and we go for a picnic.

Given statement $p \rightarrow q$

Contrapositive $\sim q \rightarrow \sim p$

i.e. If my friends do not come or we do not go for picnic then weather will not be fine.

38. If $f(x) = \frac{x}{x^2 + 1}$ is increasing function then the value of x lies in

- (A) R (B) $(-\infty, -1)$ (C) $(1, \infty)$ (D) $(-1, 1)$

38. (D)

$$f(x) = \frac{x}{x^2 + 1}$$

$$f'(x) = \frac{(x^2 + 1)(1) - (x)(2x)}{(x^2 + 1)^2} > 0$$

$$1 - x^2$$

$$f(x) = \frac{1}{(x^2 + 1)^2} > 0$$

Here $\frac{1}{x^2 + 1} \neq 0, \quad x^2 \neq -1$

$$1 - x^2 > 0, \quad x^2 < 1$$

$$x \in (-1, 1)$$

39. If $X = \{4^n - 3n - 1 : n \in \mathbb{N}\}$ and $Y = \{9(n - 1) : n \in \mathbb{N}\}$, then $X \cap Y =$

- (A) X (B) Y (C) ϕ (D) $\{0\}$

39. (A)

$$X = 4^n - 3n - 1 \quad n \in \mathbb{N}$$

$$Y = 9(n - 1) \quad n \in \mathbb{N}$$

$$X = \{0, 9, 54, 243, \dots\}$$

$$Y = \{0, 9, 18, 27, 36, 45, 54, \dots\}$$

$$\therefore X \cap Y = X$$

40. The statement pattern $p \wedge (\sim p \wedge q)$ is
 (A) a tautology (B) a contradiction
 (C) equivalent to $p \wedge q$ (D) equivalent to $p \vee q$

40. (B)
 $p \wedge (\sim p \wedge q)$
 $= (p \wedge \sim p) \wedge q$ (Associative law)
 $= F \wedge q$ (Compliment law)
 $= F$ (Identity law)

41. If the line $y = 4x - 5$ touches to the curve $y^2 = ax^3 + b$ at the point $(2, 3)$ then $7a + 2b =$
 (A) 0 (B) 1 (C) -1 (D) 2

41. (A)
 line $y = 4x - 5 \rightarrow$ slope of line $m = 4$... (i)
 curve $y^2 = ax^3 + b$
 \therefore Differentiating w.r.t. 'x'

$$2y \frac{dy}{dx} = 3ax^2$$

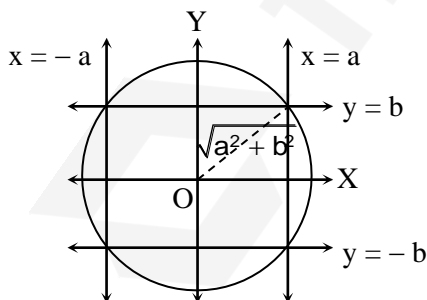
$$\frac{dy}{dx} = \frac{3ax^2}{2y} = \text{slope of tangent}$$

$$\therefore \left. \frac{dy}{dx} \right|_{(2,3)} = \frac{3a \times 4}{2 \times 3} = 2a \quad \dots \text{(ii)}$$

\therefore from (i) and (ii)
 $4 = 2a \rightarrow \boxed{a = 2}$
 $\therefore y^2 = ax^3 + b$ at $(2, 3)$
 $9 = 2 \times 8 + b \rightarrow b = 9 - 16 = -7$
 $\boxed{b = -7}$
 $\therefore 7a + 2b = 7 \times 2 + 2(-7) = 0$

42. The sides of a rectangle are given by $x = \pm a$ and $y = \pm b$. The equation of the circle passing through the vertices of the rectangle is
 (A) $x^2 + y^2 = a^2$ (B) $x^2 + y^2 = a^2 + b^2$
 (C) $x^2 + y^2 = a^2 - b^2$ (D) $(x - a)^2 + (y - b)^2 = a^2 + b^2$

42. (B)



Centre = $(0, 0)$ $r = \sqrt{a^2 + b^2}$
 \therefore equation of circle
 $x^2 + y^2 = a^2 + b^2$

43. The minimum value of the function $f(x) = x \log x$ is

- (A) $-\frac{1}{e}$ (B) $-e$ (C) $\frac{1}{e}$ (D) e

43. (A)

$$\begin{aligned}
 f(x) &= x \log x \\
 \therefore f'(x) &= 1 + \log x \\
 f'(x) = 0 &\Rightarrow 1 + \log x = 0 \\
 \log x &= -1 \\
 x &= \frac{1}{e} \\
 \text{min value} &= f\left(\frac{1}{e}\right) = \frac{1}{e} \cdot \log\left(\frac{1}{e}\right) \\
 &= \frac{1}{e} (\log 1 - \log e) \\
 &= \frac{1}{e} (0 - 1) \\
 &= -\frac{1}{e}
 \end{aligned}$$

44. If $X \sim B(n, p)$ with $n = 10, p = 0.4$ the $E(X^2) = ?$

- (A) 4 (B) 2.4 (C) 3.6 (D) 18.4

44. (D)

$$\begin{aligned}
 n &= 10, p = 0.4, q = 0.6 \\
 E(x) &= np = 4 \\
 V(x) &= npq = 10(0.4)(0.6) \\
 &= 2.4 \\
 V(x) &= E(x^2) - [E(x)]^2 \\
 2.4 &= E(x^2) - (4)^2 \\
 E(x^2) &= 18.4
 \end{aligned}$$

45. The general solution of differential equation $\frac{dx}{dy} = \cos(x + y)$ is

- (A) $\tan\left(\frac{x+y}{2}\right) = y + c$ (B) $\tan\left(\frac{x+y}{2}\right) = x + c$
 (C) $\cot\left(\frac{x+y}{2}\right) = y + c$ (D) $\cot\left(\frac{x+y}{2}\right) = x + c$

45. (A)

$$\begin{aligned}
 \frac{dx}{dy} &= \cos(x + y) \\
 \therefore \frac{dy}{dx} &= \frac{1}{\cos(x + y)} \\
 \text{Put } x + y &= V \\
 \therefore \text{Differentiating w.r.t. 'x'} \\
 1 + \frac{dy}{dx} &= \frac{dV}{dx} \\
 \therefore \frac{dy}{dx} &= \frac{dV}{dx} - 1 \\
 \therefore \frac{dV}{dx} - 1 &= \frac{1}{\cos V}
 \end{aligned}$$

$$\frac{dV}{dx} = \frac{1}{\cos V} + 1$$

$$\frac{dV}{dx} = \frac{1 + \cos V}{\cos V}$$

$$\therefore \frac{\cos V}{(1 + \cos V)} dV = dx$$

$$\int \frac{(1 + \cos V) - 1}{1 + \cos V} dV = \int dx$$

$$\int \left[1 - \frac{1}{2 \cos^2 \frac{V}{2}} \right] dV = \int dx$$

$$V - \frac{1}{2} \frac{\tan \frac{V}{2}}{\frac{1}{2}} = x + C_1$$

$$x + y - \tan \left(\frac{x+y}{2} \right) = x + C_1$$

$$\tan \left(\frac{x+y}{2} \right) = y + C \dots\dots\dots [\square C = -C_1]$$

46. If planes $\vec{r} \cdot (p\hat{i} - \hat{j} + 2\hat{k}) + 3 = 0$ and $\vec{r} \cdot (2\hat{i} - p\hat{j} - \hat{k}) - 5 = 0$ include angle $\frac{\pi}{3}$ then the value of p is
 (A) 1, -3 (B) -1, 3 (C) -3 (D) 3

46. (D)

We have $\vec{r} \cdot (p\hat{i} - \hat{j} + 2\hat{k}) + 3 = 0$ and $\vec{r} \cdot (2\hat{i} - p\hat{j} - \hat{k}) - 5 = 0$ include angle $\frac{\pi}{3}$

$$\cos \theta = \frac{|\vec{n}_1 \cdot \vec{n}_2|}{|\vec{n}_1| |\vec{n}_2|}$$

$$\cos \frac{\pi}{3} = \frac{(p\hat{i} - \hat{j} + 2\hat{k}) \cdot (2\hat{i} - p\hat{j} - \hat{k})}{\sqrt{(p)^2 + (-1)^2 + (2)^2} \sqrt{(2)^2 + (-p)^2 + (-1)^2}}$$

$$\frac{1}{2} = \frac{2p + p - 2}{(\sqrt{p^2 + 5})(\sqrt{p^2 + 5})} \Rightarrow \frac{1}{2} = \frac{3p - 2}{p^2 + 5}$$

$$\therefore p^2 + 5 = 6p - 4 \Rightarrow p^2 - 6p + 9 = 0$$

$$\therefore (p - 3)^2 = 0 \Rightarrow p = 3$$

47. The order of the differential equation of all parabolas, whose latus rectum is 4a and axis parallel to the x-axis, is
 (A) one (B) four (C) three (D) two

47. (D)

Equation of parabola whose axis is parallel to X axis and latus rectum is 4a
 $(y - k)^2 = 4a(x - h)$
 h & k are arbitrary constants \Rightarrow order 2.

48. If lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $x - 3 = \frac{y-k}{2} = z$ intersect then the value of k is
 (A) $\frac{9}{2}$ (B) $\frac{1}{2}$ (C) $\frac{5}{2}$ (D) $\frac{7}{2}$

48. (A)

Points on the line are $(1, -1, 1)$ and $(3, k, 0)$ and direction ratios of lines are 2, 3, 4 and 1, 2, 1
 Since lines intersect, then lines are coplanar

$$\therefore \begin{vmatrix} x_2 - x_1 & y_2 - y_1 & z_2 - z_1 \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix} = 0$$

$$\therefore \begin{vmatrix} 2 & k+1 & -1 \\ 2 & 3 & 4 \\ 1 & 2 & 1 \end{vmatrix} = 0$$

$$\therefore 2(-5) - (k+1)(-2) - 1(1) = 0$$

$$-11 + 2k + 2 = 0$$

$$k = \frac{9}{2}$$

49. If a line makes angles 120° and 60° with the positive directions of X and Z axes respectively then the angle made by the line with positive Y-axis is

- (A) 150° (B) 60° (C) 135° (D) 120°

49. (C)

$$\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 1$$

$$\therefore (\cos 120^\circ)^2 + \cos^2 \beta + (\cos 60^\circ)^2 = 1$$

$$\therefore \left(\frac{-1}{2}\right)^2 + \cos^2 \beta + \left(\frac{1}{2}\right)^2 = 1$$

$$\therefore \cos^2 \beta = 1 - \frac{1}{2} - \frac{1}{2} \Rightarrow \cos \beta = \pm \frac{1}{\sqrt{2}}$$

$$\therefore \beta = 135^\circ$$

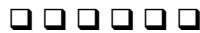
50. L and M are two points with position vectors $2\vec{a} - \vec{b}$ and $\vec{a} + 2\vec{b}$ respectively. The position vector of the point N which divides the line segment LM in the ratio 2 : 1 externally is

- (A) $3\vec{b}$ (B) $4\vec{b}$ (C) $5\vec{b}$ (D) $3\vec{a} + 4\vec{b}$

50. (C)

We have $L \equiv (2, -1)$ and $M \equiv (1, 2)$
 and is divided by N in ratio 2 : 1 externally.

$$\therefore N \equiv \frac{(2)(1) - (2)(1) \quad (2)(2) - (1)(-1)}{\begin{pmatrix} 2-1 \\ 0 \\ 1 \end{pmatrix}}, \text{ i.e. } N \equiv \begin{pmatrix} 2-1 \\ 0 \\ 1 \end{pmatrix} \text{ i.e. } N = (0, 5) \text{ i.e. } 5\vec{b}$$



LOGARITHMS

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----|------|------|------|------|------|------|------|------|------|------|---|---|----|----|----|----|----|----|----|
| 10 | 0000 | 0043 | 0086 | 0128 | 0170 | | | | | | 5 | 9 | 13 | 17 | 21 | 26 | 30 | 34 | 38 |
| | | | | | | 0212 | 0253 | 0294 | 0334 | 0374 | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 |
| 11 | 0414 | 0453 | 0492 | 0531 | 0569 | | | | | | 4 | 8 | 12 | 16 | 20 | 23 | 27 | 31 | 35 |
| | | | | | | 0607 | 0645 | 0682 | 0719 | 0755 | 4 | 7 | 11 | 15 | 18 | 22 | 26 | 29 | 33 |
| 12 | 0792 | 0828 | 0864 | 0899 | 0934 | | | | | | 3 | 7 | 11 | 14 | 18 | 21 | 25 | 28 | 32 |
| | | | | | | 0969 | 1004 | 1038 | 1072 | 1106 | 3 | 7 | 10 | 14 | 17 | 20 | 24 | 27 | 31 |
| 13 | 1139 | 1173 | 1206 | 1239 | 1271 | | | | | | 3 | 6 | 10 | 13 | 16 | 19 | 23 | 26 | 29 |
| | | | | | | 1303 | 1335 | 1367 | 1399 | 1430 | 3 | 6 | 10 | 13 | 16 | 19 | 22 | 25 | 29 |
| 14 | 1461 | 1492 | 1523 | 1553 | 1584 | | | | | | 3 | 6 | 9 | 12 | 15 | 19 | 22 | 25 | 28 |
| | | | | | | 1614 | 1644 | 1673 | 1703 | 1732 | 3 | 6 | 9 | 12 | 14 | 17 | 20 | 23 | 26 |
| 15 | 1761 | 1790 | 1818 | 1847 | 1875 | | | | | | 3 | 6 | 9 | 11 | 14 | 17 | 20 | 23 | 26 |
| | | | | | | 1903 | 1931 | 1959 | 1987 | 2014 | 3 | 6 | 8 | 11 | 14 | 17 | 19 | 22 | 25 |
| 16 | 2041 | 2068 | 2095 | 2122 | 2148 | | | | | | 3 | 6 | 8 | 11 | 14 | 16 | 19 | 22 | 24 |
| | | | | | | 2175 | 2201 | 2227 | 2253 | 2279 | 3 | 5 | 8 | 10 | 13 | 16 | 18 | 21 | 23 |
| 17 | 2304 | 2330 | 2355 | 2380 | 2405 | | | | | | 3 | 5 | 8 | 10 | 13 | 15 | 18 | 20 | 23 |
| | | | | | | 2430 | 2455 | 2480 | 2504 | 2529 | 3 | 5 | 8 | 10 | 12 | 15 | 17 | 20 | 22 |
| 18 | 2553 | 2577 | 2601 | 2625 | 2648 | | | | | | 2 | 5 | 7 | 9 | 12 | 14 | 17 | 19 | 21 |
| | | | | | | 2672 | 2695 | 2718 | 2742 | 2765 | 2 | 4 | 7 | 9 | 11 | 14 | 16 | 18 | 21 |
| 19 | 2788 | 2810 | 2833 | 2856 | 2878 | | | | | | 2 | 4 | 7 | 9 | 11 | 13 | 16 | 18 | 20 |
| | | | | | | 2900 | 2923 | 2945 | 2967 | 2989 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 17 | 19 |
| 20 | 3010 | 3032 | 3054 | 3075 | 3096 | 3118 | 3139 | 3160 | 3181 | 3201 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 17 | 19 |
| 21 | 3222 | 3243 | 3263 | 3284 | 3304 | 3324 | 3345 | 3365 | 3385 | 3404 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 22 | 3424 | 3444 | 3464 | 3483 | 3502 | 3522 | 3541 | 3560 | 3579 | 3598 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 15 | 17 |
| 23 | 3617 | 3636 | 3655 | 3674 | 3692 | 3711 | 3729 | 3747 | 3766 | 3784 | 2 | 4 | 6 | 7 | 9 | 11 | 13 | 15 | 17 |
| 24 | 3802 | 3820 | 3838 | 3856 | 3874 | 3892 | 3909 | 3927 | 3945 | 3962 | 2 | 4 | 5 | 7 | 9 | 11 | 12 | 14 | 16 |
| 25 | 3979 | 3997 | 4014 | 4031 | 4048 | 4065 | 4082 | 4099 | 4116 | 4133 | 2 | 3 | 5 | 7 | 9 | 10 | 12 | 14 | 15 |
| 26 | 4150 | 4166 | 4183 | 4200 | 4216 | 4232 | 4249 | 4265 | 4281 | 4298 | 2 | 3 | 5 | 7 | 8 | 10 | 11 | 14 | 15 |
| 27 | 4314 | 4330 | 4346 | 4362 | 4378 | 4393 | 4409 | 4425 | 4440 | 4456 | 2 | 3 | 5 | 6 | 8 | 9 | 11 | 13 | 14 |
| 28 | 4472 | 4487 | 4502 | 4518 | 4533 | 4548 | 4564 | 4579 | 4594 | 4609 | 2 | 3 | 5 | 6 | 8 | 9 | 11 | 12 | 14 |
| 29 | 4624 | 4639 | 4654 | 4669 | 4683 | 4698 | 4713 | 4728 | 4742 | 4757 | 1 | 3 | 4 | 6 | 7 | 9 | 10 | 12 | 13 |
| 30 | 4771 | 4786 | 4800 | 4814 | 4829 | 4843 | 4857 | 4871 | 4886 | 4900 | 1 | 3 | 4 | 6 | 7 | 9 | 10 | 11 | 13 |
| 31 | 4914 | 4928 | 4942 | 4955 | 4969 | 4983 | 4997 | 5011 | 5024 | 5038 | 1 | 3 | 4 | 6 | 7 | 8 | 10 | 11 | 12 |
| 32 | 5051 | 5065 | 5079 | 5092 | 5105 | 5119 | 5132 | 5145 | 5159 | 5172 | 1 | 3 | 4 | 5 | 7 | 8 | 9 | 11 | 12 |
| 33 | 5185 | 5198 | 5211 | 5224 | 5237 | 5250 | 5263 | 5276 | 5289 | 5302 | 1 | 3 | 4 | 5 | 6 | 8 | 9 | 10 | 12 |
| 34 | 5315 | 5328 | 5340 | 5353 | 5366 | 5378 | 5391 | 5403 | 5416 | 5428 | 1 | 3 | 4 | 5 | 6 | 8 | 9 | 10 | 11 |
| 35 | 5441 | 5453 | 5465 | 5478 | 5490 | 5502 | 5514 | 5527 | 5539 | 5551 | 1 | 2 | 4 | 5 | 6 | 7 | 9 | 10 | 11 |
| 36 | 5583 | 5595 | 5607 | 5619 | 5631 | 5643 | 5655 | 5667 | 5679 | 5691 | 1 | 2 | 4 | 5 | 6 | 7 | 8 | 10 | 11 |
| 37 | 5682 | 5694 | 5705 | 5717 | 5729 | 5740 | 5752 | 5763 | 5775 | 5786 | 1 | 2 | 3 | 5 | 6 | 7 | 8 | 9 | 10 |
| 38 | 5798 | 5809 | 5821 | 5832 | 5843 | 5855 | 5866 | 5877 | 5888 | 5899 | 1 | 2 | 3 | 5 | 6 | 7 | 8 | 9 | 10 |
| 39 | 5911 | 5922 | 5933 | 5944 | 5955 | 5966 | 5977 | 5988 | 5999 | 6010 | 1 | 2 | 3 | 4 | 5 | 7 | 8 | 9 | 10 |
| 40 | 6021 | 6031 | 6042 | 6053 | 6064 | 6075 | 6086 | 6096 | 6107 | 6117 | 1 | 2 | 3 | 4 | 5 | 6 | 8 | 9 | 10 |
| 41 | 6128 | 6138 | 6149 | 6160 | 6170 | 6180 | 6191 | 6201 | 6212 | 6222 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 42 | 6232 | 6243 | 6253 | 6263 | 6274 | 6284 | 6294 | 6304 | 6314 | 6325 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 43 | 6335 | 6345 | 6355 | 6365 | 6375 | 6385 | 6395 | 6405 | 6415 | 6425 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 44 | 6435 | 6444 | 6454 | 6464 | 6474 | 6484 | 6493 | 6503 | 6513 | 6522 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 45 | 6532 | 6542 | 6551 | 6561 | 6571 | 6580 | 6590 | 6599 | 6609 | 6618 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 46 | 6628 | 6637 | 6646 | 6655 | 6665 | 6675 | 6684 | 6693 | 6702 | 6712 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 7 | 8 |
| 47 | 6721 | 6730 | 6739 | 6749 | 6758 | 6767 | 6776 | 6785 | 6794 | 6803 | 1 | 2 | 3 | 4 | 5 | 5 | 6 | 7 | 8 |
| 48 | 6812 | 6821 | 6830 | 6839 | 6848 | 6857 | 6866 | 6875 | 6884 | 6893 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 7 | 8 |
| 49 | 6902 | 6911 | 6920 | 6928 | 6937 | 6946 | 6955 | 6964 | 6972 | 6981 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 7 | 8 |

LOGARITHMS

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----|------|------|------|------|------|------|------|------|------|------|---|---|---|---|---|---|---|---|---|
| 50 | 6990 | 6998 | 7007 | 7016 | 7024 | 7033 | 7042 | 7050 | 7059 | 7067 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 7 | 8 |
| 51 | 7076 | 7084 | 7093 | 7101 | 7110 | 7118 | 7126 | 7135 | 7143 | 7152 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 7 | 8 |
| 52 | 7160 | 7168 | 7177 | 7185 | 7193 | 7202 | 7210 | 7218 | 7226 | 7235 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 7 |
| 53 | 7243 | 7251 | 7259 | 7267 | 7275 | 7284 | 7292 | 7300 | 7308 | 7316 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 6 | 7 |
| 54 | 7324 | 7332 | 7340 | 7348 | 7356 | 7364 | 7372 | 7380 | 7388 | 7396 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 6 | 7 |
| 55 | 7404 | 7412 | 7419 | 7427 | 7435 | 7443 | 7451 | 7459 | 7466 | 7474 | 1 | 2 | 2 | 3 | 4 | 5 | 5 | 6 | 7 |
| 56 | 7482 | 7490 | 7497 | 7505 | 7513 | 7520 | 7528 | 7536 | 7543 | 7551 | 1 | 2 | 2 | 3 | 4 | 5 | 5 | 6 | 7 |
| 57 | 7559 | 7566 | 7574 | 7582 | 7589 | 7597 | 7604 | 7612 | 7619 | 7627 | 1 | 2 | 2 | 3 | 4 | 5 | 5 | 6 | 7 |
| 58 | 7634 | 7642 | 7649 | 7657 | 7664 | 7672 | 7679 | 7686 | 7694 | 7701 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 7 |
| 59 | 7709 | 7716 | 7723 | 7731 | 7738 | 7745 | 7752 | 7760 | 7767 | 7774 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 7 |
| 60 | 7782 | 7789 | 7796 | 7803 | 7810 | 7818 | 7825 | 7832 | 7839 | 7846 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 6 |
| 61 | 7853 | 7860 | 7868 | 7875 | 7882 | 7889 | 7896 | 7903 | 7910 | 7917 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 6 |
| 62 | 7924 | 7931 | 7938 | 7945 | 7952 | 7959 | 7966 | 7973 | 7980 | 7987 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 6 |
| 63 | 7993 | 8000 | 8007 | 8014 | 8021 | 8028 | 8035 | 8041 | 8048 | 8055 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 |
| 64 | 8062 | 8069 | 8075 | 8082 | 8089 | 8096 | 8102 | 8109 | 8116 | 8122 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 |
| 65 | 8129 | 8136 | 8142 | 8149 | 8156 | 8162 | 8169 | 8176 | 8182 | 8189 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 |
| 66 | 8195 | 8202 | 8209 | 8215 | 8222 | 8228 | 8235 | 8241 | 8248 | 8254 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 |
| 67 | 8261 | 8267 | 8274 | 8280 | 8287 | 8293 | 8299 | 8306 | 8312 | 8319 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 |
| 68 | 8325 | 8331 | 8338 | 8344 | 8351 | 8357 | 8363 | 8370 | 8376 | 8382 | 1 | 1 | 2 | 3 | 3 | 4 | 4 | 5 | 6 |
| 69 | 8388 | 8395 | 8401 | 8407 | 8414 | 8420 | 8426 | 8432 | 8439 | 8445 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 6 |
| 70 | 8451 | 8457 | 8463 | 8470 | 8476 | 8482 | 8488 | 8494 | 8500 | 8506 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 6 |
| 71 | 8513 | 8519 | 8525 | 8531 | 8537 | 8543 | 8549 | 8555 | 8561 | 8567 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 5 |
| 72 | 8573 | 8579 | 8585 | 8591 | 8597 | 8603 | 8609 | 8615 | 8621 | 8627 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 5 |
| 73 | 8633 | 8639 | 8645 | 8651 | 8657 | 8663 | 8669 | 8675 | 8681 | 8686 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 5 |
| 74 | 8692 | 8698 | 8704 | 8710 | 8716 | 8722 | 8727 | 8733 | 8739 | 8745 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 5 |
| 75 | 8751 | 8756 | 8762 | 8768 | 8774 | 8779 | 8785 | 8791 | 8797 | 8802 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 5 | 5 |
| 76 | 8808 | 8814 | 8820 | 8825 | 8831 | 8837 | 8842 | 8848 | 8854 | 8859 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 5 | 5 |
| 77 | 8865 | 8871 | 8876 | 8882 | 8887 | 8893 | 8899 | 8904 | 8910 | 8915 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 78 | 8921 | 8927 | 8932 | 8938 | 8943 | 8949 | 8954 | 8960 | 8965 | 8971 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 79 | 8976 | 8982 | 8987 | 8993 | 8998 | 9004 | 9009 | 9015 | 9020 | 9025 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 80 | 9031 | 9036 | 9042 | 9047 | 9053 | 9058 | 9063 | 9069 | 9074 | 9079 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 81 | 9085 | 9090 | 9096 | 9101 | 9106 | 9112 | 9117 | 9122 | 9128 | 9133 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 82 | 9138 | 9143 | 9149 | 9154 | 9159 | 9165 | 9170 | 9175 | 9180 | 9186 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 83 | 9191 | 9196 | 9201 | 9206 | 9212 | 9217 | 9222 | 9227 | 9232 | 9238 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 84 | 9243 | 9248 | 9253 | 9258 | 9263 | 9269 | 9274 | 9279 | 9284 | 9289 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 85 | 9294 | 9299 | 9304 | 9309 | 9315 | 9320 | 9325 | 9330 | 9335 | 9340 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 86 | 9345 | 9350 | 9355 | 9360 | 9365 | 9370 | 9375 | 9380 | 9385 | 9390 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 87 | 9395 | 9400 | 9405 | 9410 | 9415 | 9420 | 9425 | 9430 | 9435 | 9440 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 88 | 9445 | 9450 | 9455 | 9460 | 9465 | 9469 | 9474 | 9479 | 9484 | 9489 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 89 | 9494 | 9499 | 9504 | 9509 | 9513 | 9518 | 9523 | 9528 | 9533 | 9538 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 90 | 9542 | 9547 | 9552 | 9557 | 9562 | 9566 | 9571 | 9576 | 9581 | 9586 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 91 | 9590 | 9595 | 9600 | 9605 | 9609 | 9614 | 9619 | 9624 | 9628 | 9633 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 92 | 9638 | 9643 | 9647 | 9652 | 9657 | 9661 | 9666 | 9671 | 9675 | 9680 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 93 | 9685 | 9689 | 9694 | 9699 | 9703 | 9708 | 9713 | 9717 | 9722 | 9727 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 94 | 9731 | 9736 | 9741 | 9745 | 9750 | 9754 | 9759 | 9763 | 9768 | 9773 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 95 | 9777 | 9782 | 9786 | 9791 | 9795 | 9800 | 9805 | 9809 | 9814 | 9818 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 96 | 9823 | 9827 | 9832 | 9836 | 9841 | 9845 | 9850 | 9854 | 9859 | 9863 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 97 | 9868 | 9872 | 9877 | 9881 | 9886 | 9890 | 9894 | 9899 | 9903 | 9908 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 98 | 9912 | 9917 | 9921 | 9926 | 9930 | 9934 | 9939 | 9943 | 9948 | 9952 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 99 | 9956 | 9961 | 9965 | 9969 | 9974 | 9978 | 9983 | 9987 | 9991 | 9996 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 |

ANTILOGARITHMS

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|------|------|------|------|------|------|------|------|------|------|------|---|---|---|---|---|---|---|---|---|
| 0.00 | 1000 | 1002 | 1005 | 1007 | 1009 | 1012 | 1014 | 1016 | 1019 | 1021 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| 0.01 | 1023 | 1026 | 1028 | 1030 | 1033 | 1035 | 1038 | 1040 | 1042 | 1045 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| 0.02 | 1047 | 1050 | 1052 | 1054 | 1057 | 1059 | 1062 | 1064 | 1067 | 1069 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| 0.03 | 1072 | 1074 | 1076 | 1079 | 1081 | 1084 | 1086 | 1089 | 1091 | 1094 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| 0.04 | 1096 | 1099 | 1102 | 1104 | 1107 | 1109 | 1112 | 1114 | 1117 | 1119 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| 0.05 | 1122 | 1125 | 1127 | 1130 | 1132 | 1135 | 1138 | 1140 | 1143 | 1146 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| 0.06 | 1148 | 1151 | 1153 | 1156 | 1159 | 1161 | 1164 | 1167 | 1169 | 1172 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| 0.07 | 1175 | 1178 | 1180 | 1183 | 1186 | 1189 | 1191 | 1194 | 1197 | 1199 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| 0.08 | 1202 | 1205 | 1208 | 1211 | 1213 | 1216 | 1219 | 1222 | 1225 | 1227 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| 0.09 | 1230 | 1233 | 1236 | 1239 | 1242 | 1245 | 1247 | 1250 | 1253 | 1256 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| 0.10 | 1259 | 1262 | 1265 | 1268 | 1271 | 1274 | 1276 | 1279 | 1282 | 1285 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| 0.11 | 1288 | 1291 | 1294 | 1297 | 1300 | 1303 | 1306 | 1309 | 1312 | 1315 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 |
| 0.12 | 1318 | 1321 | 1324 | 1327 | 1330 | 1334 | 1337 | 1340 | 1343 | 1346 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 |
| 0.13 | 1349 | 1352 | 1355 | 1358 | 1361 | 1365 | 1368 | 1371 | 1374 | 1377 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 |
| 0.14 | 1380 | 1384 | 1387 | 1390 | 1393 | 1396 | 1400 | 1403 | 1406 | 1409 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 |
| 0.15 | 1413 | 1416 | 1419 | 1422 | 1426 | 1429 | 1432 | 1435 | 1439 | 1442 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 |
| 0.16 | 1445 | 1449 | 1452 | 1455 | 1459 | 1462 | 1466 | 1469 | 1472 | 1476 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 |
| 0.17 | 1479 | 1483 | 1486 | 1489 | 1493 | 1496 | 1500 | 1503 | 1507 | 1510 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 |
| 0.18 | 1514 | 1517 | 1521 | 1524 | 1528 | 1531 | 1535 | 1538 | 1542 | 1545 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 |
| 0.19 | 1549 | 1552 | 1556 | 1560 | 1563 | 1567 | 1570 | 1574 | 1578 | 1581 | 0 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 |
| 0.20 | 1585 | 1589 | 1592 | 1596 | 1600 | 1603 | 1607 | 1611 | 1614 | 1618 | 0 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 |
| 0.21 | 1622 | 1626 | 1629 | 1633 | 1637 | 1641 | 1644 | 1648 | 1652 | 1656 | 0 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 |
| 0.22 | 1660 | 1663 | 1667 | 1671 | 1675 | 1679 | 1683 | 1687 | 1690 | 1694 | 0 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 |
| 0.23 | 1698 | 1702 | 1706 | 1710 | 1714 | 1718 | 1722 | 1726 | 1730 | 1734 | 0 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 |
| 0.24 | 1738 | 1742 | 1746 | 1750 | 1754 | 1758 | 1762 | 1766 | 1770 | 1774 | 0 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 |
| 0.25 | 1778 | 1782 | 1786 | 1791 | 1795 | 1799 | 1803 | 1807 | 1811 | 1816 | 0 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 |
| 0.26 | 1820 | 1824 | 1828 | 1832 | 1837 | 1841 | 1845 | 1849 | 1854 | 1858 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 |
| 0.27 | 1862 | 1866 | 1871 | 1875 | 1879 | 1884 | 1888 | 1892 | 1897 | 1901 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 |
| 0.28 | 1905 | 1910 | 1914 | 1919 | 1923 | 1928 | 1932 | 1936 | 1941 | 1945 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 0.29 | 1950 | 1954 | 1959 | 1963 | 1968 | 1972 | 1977 | 1982 | 1986 | 1991 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 0.30 | 1995 | 2000 | 2004 | 2009 | 2014 | 2018 | 2023 | 2028 | 2032 | 2037 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 0.31 | 2042 | 2046 | 2051 | 2056 | 2061 | 2065 | 2070 | 2075 | 2080 | 2084 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 0.32 | 2089 | 2094 | 2099 | 2104 | 2109 | 2113 | 2118 | 2123 | 2128 | 2133 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 0.33 | 2138 | 2143 | 2148 | 2153 | 2158 | 2163 | 2168 | 2173 | 2178 | 2183 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 0.34 | 2188 | 2193 | 2198 | 2203 | 2208 | 2213 | 2218 | 2223 | 2228 | 2234 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 0.35 | 2239 | 2244 | 2249 | 2254 | 2259 | 2265 | 2270 | 2275 | 2280 | 2286 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 0.36 | 2291 | 2296 | 2301 | 2307 | 2312 | 2317 | 2323 | 2328 | 2333 | 2339 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 0.37 | 2344 | 2350 | 2355 | 2360 | 2366 | 2371 | 2377 | 2382 | 2388 | 2393 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 0.38 | 2399 | 2404 | 2410 | 2415 | 2421 | 2427 | 2432 | 2438 | 2443 | 2449 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 0.39 | 2455 | 2460 | 2466 | 2472 | 2477 | 2483 | 2489 | 2495 | 2500 | 2506 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 5 | 5 |
| 0.40 | 2512 | 2518 | 2523 | 2529 | 2535 | 2541 | 2547 | 2553 | 2559 | 2564 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 5 |
| 0.41 | 2570 | 2576 | 2582 | 2588 | 2594 | 2600 | 2606 | 2612 | 2618 | 2624 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 5 |
| 0.42 | 2630 | 2636 | 2642 | 2649 | 2655 | 2661 | 2667 | 2673 | 2679 | 2685 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 6 |
| 0.43 | 2692 | 2698 | 2704 | 2710 | 2716 | 2723 | 2729 | 2735 | 2742 | 2748 | 1 | 1 | 2 | 3 | 3 | 4 | 4 | 5 | 6 |
| 0.44 | 2754 | 2761 | 2767 | 2773 | 2780 | 2786 | 2793 | 2799 | 2805 | 2812 | 1 | 1 | 2 | 3 | 3 | 4 | 4 | 5 | 6 |
| 0.45 | 2818 | 2825 | 2831 | 2838 | 2844 | 2851 | 2858 | 2864 | 2871 | 2877 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 |
| 0.46 | 2884 | 2891 | 2897 | 2904 | 2911 | 2917 | 2924 | 2931 | 2938 | 2944 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 |
| 0.47 | 2951 | 2958 | 2965 | 2972 | 2979 | 2985 | 2992 | 2999 | 3006 | 3013 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 |
| 0.48 | 3020 | 3027 | 3034 | 3041 | 3048 | 3055 | 3062 | 3069 | 3076 | 3083 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 6 |
| 0.49 | 3090 | 3097 | 3105 | 3112 | 3119 | 3126 | 3133 | 3141 | 3148 | 3155 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 6 |

ANTILOGARITHMS

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|------|------|------|------|------|------|------|------|------|------|------|---|---|---|---|----|----|----|----|----|
| 0.50 | 3162 | 3170 | 3177 | 3184 | 3192 | 3199 | 3206 | 3214 | 3221 | 3228 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 7 |
| 0.51 | 3236 | 3243 | 3251 | 3259 | 3266 | 3273 | 3281 | 3289 | 3296 | 3304 | 1 | 2 | 2 | 3 | 4 | 5 | 5 | 6 | 7 |
| 0.52 | 3311 | 3319 | 3327 | 3334 | 3342 | 3350 | 3357 | 3365 | 3373 | 3381 | 1 | 2 | 2 | 3 | 4 | 5 | 5 | 6 | 7 |
| 0.53 | 3388 | 3396 | 3404 | 3412 | 3420 | 3428 | 3436 | 3443 | 3451 | 3459 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 6 | 7 |
| 0.54 | 3467 | 3475 | 3483 | 3491 | 3499 | 3508 | 3516 | 3524 | 3532 | 3540 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 6 | 7 |
| 0.55 | 3548 | 3556 | 3565 | 3573 | 3581 | 3589 | 3597 | 3606 | 3614 | 3622 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 7 |
| 0.56 | 3631 | 3639 | 3648 | 3656 | 3664 | 3673 | 3681 | 3690 | 3698 | 3707 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 7 | 8 |
| 0.57 | 3715 | 3724 | 3733 | 3741 | 3750 | 3758 | 3767 | 3776 | 3784 | 3793 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 7 | 8 |
| 0.58 | 3802 | 3811 | 3819 | 3828 | 3837 | 3846 | 3855 | 3864 | 3873 | 3882 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 7 | 8 |
| 0.59 | 3890 | 3899 | 3908 | 3917 | 3926 | 3936 | 3945 | 3954 | 3963 | 3972 | 1 | 2 | 3 | 4 | 5 | 5 | 6 | 7 | 8 |
| 0.60 | 3981 | 3990 | 3999 | 4009 | 4018 | 4027 | 4036 | 4046 | 4055 | 4064 | 1 | 2 | 3 | 4 | 5 | 6 | 6 | 7 | 8 |
| 0.61 | 4074 | 4083 | 4093 | 4102 | 4111 | 4121 | 4130 | 4140 | 4150 | 4159 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0.62 | 4169 | 4178 | 4188 | 4198 | 4207 | 4217 | 4227 | 4238 | 4246 | 4256 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0.63 | 4266 | 4276 | 4286 | 4295 | 4305 | 4315 | 4326 | 4335 | 4345 | 4355 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0.64 | 4365 | 4375 | 4385 | 4396 | 4406 | 4416 | 4426 | 4436 | 4446 | 4457 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0.65 | 4467 | 4477 | 4487 | 4498 | 4508 | 4519 | 4529 | 4539 | 4550 | 4560 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0.66 | 4571 | 4581 | 4592 | 4603 | 4613 | 4624 | 4634 | 4645 | 4656 | 4667 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 9 | 10 |
| 0.67 | 4677 | 4688 | 4699 | 4710 | 4721 | 4732 | 4742 | 4753 | 4764 | 4775 | 1 | 2 | 3 | 4 | 5 | 7 | 8 | 9 | 10 |
| 0.68 | 4786 | 4797 | 4808 | 4819 | 4831 | 4842 | 4853 | 4864 | 4875 | 4887 | 1 | 2 | 3 | 4 | 6 | 7 | 8 | 9 | 10 |
| 0.69 | 4898 | 4909 | 4920 | 4932 | 4943 | 4955 | 4966 | 4977 | 4989 | 5000 | 1 | 2 | 3 | 5 | 6 | 7 | 8 | 9 | 10 |
| 0.70 | 5012 | 5023 | 5035 | 5047 | 5058 | 5070 | 5082 | 5093 | 5105 | 5117 | 1 | 2 | 4 | 5 | 6 | 7 | 8 | 9 | 11 |
| 0.71 | 5129 | 5140 | 5152 | 5164 | 5176 | 5188 | 5200 | 5212 | 5224 | 5236 | 1 | 2 | 4 | 5 | 6 | 7 | 8 | 10 | 11 |
| 0.72 | 5248 | 5260 | 5272 | 5284 | 5297 | 5309 | 5321 | 5333 | 5346 | 5348 | 1 | 2 | 4 | 5 | 6 | 7 | 9 | 10 | 11 |
| 0.73 | 5370 | 5383 | 5395 | 5408 | 5420 | 5433 | 5445 | 5458 | 5470 | 5483 | 1 | 3 | 4 | 5 | 6 | 8 | 9 | 10 | 11 |
| 0.74 | 5495 | 5508 | 5521 | 5534 | 5546 | 5559 | 5572 | 5585 | 5598 | 5610 | 1 | 3 | 4 | 5 | 6 | 8 | 9 | 10 | 12 |
| 0.75 | 5623 | 5636 | 5649 | 5662 | 5675 | 5689 | 5702 | 5715 | 5728 | 5741 | 1 | 3 | 4 | 5 | 7 | 8 | 9 | 10 | 12 |
| 0.76 | 5754 | 5768 | 5781 | 5794 | 5808 | 5821 | 5834 | 5848 | 5861 | 5875 | 1 | 3 | 4 | 5 | 7 | 8 | 9 | 11 | 12 |
| 0.77 | 5888 | 5902 | 5916 | 5929 | 5943 | 5957 | 5970 | 5984 | 5998 | 6012 | 1 | 3 | 4 | 5 | 7 | 8 | 10 | 11 | 12 |
| 0.78 | 6026 | 6039 | 6053 | 6067 | 6081 | 6095 | 6109 | 6124 | 6138 | 6152 | 1 | 3 | 4 | 6 | 7 | 8 | 10 | 11 | 13 |
| 0.79 | 6166 | 6180 | 6194 | 6209 | 6223 | 6237 | 6252 | 6266 | 6281 | 6295 | 1 | 3 | 4 | 6 | 7 | 8 | 10 | 11 | 13 |
| 0.80 | 6310 | 6324 | 6339 | 6353 | 6368 | 6383 | 6397 | 6412 | 6427 | 6442 | 1 | 3 | 4 | 6 | 7 | 9 | 10 | 12 | 13 |
| 0.81 | 6457 | 6471 | 6486 | 6501 | 6516 | 6531 | 6546 | 6561 | 6577 | 6592 | 2 | 3 | 5 | 6 | 8 | 9 | 11 | 12 | 14 |
| 0.82 | 6607 | 6622 | 6637 | 6653 | 6668 | 6683 | 6699 | 6714 | 6730 | 6745 | 2 | 3 | 5 | 6 | 8 | 9 | 11 | 12 | 14 |
| 0.83 | 6761 | 6776 | 6792 | 6808 | 6823 | 6839 | 6855 | 6871 | 6887 | 6902 | 2 | 3 | 5 | 6 | 8 | 9 | 11 | 13 | 14 |
| 0.84 | 6918 | 6934 | 6950 | 6966 | 6982 | 6998 | 7015 | 7031 | 7047 | 7063 | 2 | 3 | 5 | 6 | 8 | 10 | 11 | 13 | 15 |
| 0.85 | 7079 | 7096 | 7112 | 7129 | 7145 | 7161 | 7178 | 7194 | 7211 | 7228 | 2 | 3 | 5 | 7 | 8 | 10 | 12 | 13 | 15 |
| 0.86 | 7244 | 7261 | 7278 | 7295 | 7311 | 7328 | 7345 | 7362 | 7379 | 7396 | 2 | 3 | 5 | 7 | 8 | 10 | 12 | 13 | 15 |
| 0.87 | 7413 | 7430 | 7447 | 7464 | 7482 | 7499 | 7516 | 7534 | 7551 | 7568 | 2 | 3 | 5 | 7 | 9 | 10 | 12 | 14 | 16 |
| 0.88 | 7586 | 7603 | 7621 | 7638 | 7656 | 7674 | 7691 | 7709 | 7727 | 7745 | 2 | 4 | 5 | 7 | 8 | 11 | 12 | 14 | 16 |
| 0.89 | 7762 | 7780 | 7798 | 7816 | 7834 | 7852 | 7870 | 7889 | 7907 | 7925 | 2 | 4 | 5 | 7 | 9 | 11 | 13 | 14 | 16 |
| 0.90 | 7943 | 7962 | 7980 | 7998 | 8017 | 8036 | 8054 | 8072 | 8091 | 8110 | 2 | 4 | 6 | 7 | 9 | 11 | 13 | 15 | 17 |
| 0.91 | 8128 | 8147 | 8166 | 8185 | 8204 | 8222 | 8241 | 8260 | 8279 | 8299 | 2 | 4 | 6 | 8 | 9 | 11 | 13 | 15 | 17 |
| 0.92 | 8318 | 8337 | 8356 | 8375 | 8395 | 8414 | 8433 | 8453 | 8472 | 8492 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 15 | 17 |
| 0.93 | 8511 | 8531 | 8551 | 8570 | 8590 | 8610 | 8630 | 8650 | 8670 | 8690 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 0.94 | 8710 | 8730 | 8750 | 8770 | 8790 | 8810 | 8831 | 8851 | 8872 | 8892 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 0.95 | 8913 | 8933 | 8954 | 8974 | 8995 | 9016 | 9036 | 9057 | 9078 | 9099 | 2 | 4 | 6 | 8 | 10 | 12 | 15 | 17 | 19 |
| 0.96 | 9120 | 9141 | 9162 | 9183 | 9204 | 9220 | 9247 | 9268 | 9290 | 9311 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 17 | 19 |
| 0.97 | 9333 | 9354 | 9376 | 9397 | 9419 | 9441 | 9462 | 9484 | 9506 | 9528 | 2 | 4 | 7 | 9 | 11 | 13 | 15 | 17 | 20 |
| 0.98 | 9550 | 9572 | 9594 | 9616 | 9638 | 9661 | 9683 | 9705 | 9727 | 9750 | 2 | 4 | 7 | 9 | 11 | 13 | 16 | 18 | 20 |
| 0.99 | 9772 | 9795 | 9817 | 9840 | 9863 | 9886 | 9908 | 9931 | 9954 | 9977 | 2 | 5 | 7 | 9 | 11 | 14 | 16 | 18 | 20 |

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