Test Booklet Code **A**

ME-2008

746865

This booklet contains 12 pages.
DO NOT open this Test Booklet until you are asked to do so.

Important Instructions :-

1. The MATHEMATICS test is consist of **40** questions. Each question carries **1** mark. For each correct response the candidate will get **1** mark. For each incorrect response, ¼ mark will be deducted. The maximum marks are **40**.
2. The Test is of **1 hour** duration.
3. Use **Black Ball Point Pen only** for writing particulars on OMR Answer Sheet marking ● responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must handover the Answer Sheet to the Invigilator in the Room / Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **A**. Make sure that the CODE printed on the Answer Sheet is the same as that on this booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidate should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet.
8. Do not write your Seat No. anywhere else, except in the specified space in the Test Booklet / Answer Sheet.
9. Use of White fluid for correction is not permissible on the Answer Sheet.
10. Each candidate must show, on demand his / her Admission Card to the Invigilator.
11. No candidate, without special permission of the Superintendent or Invigilator, should leave his / her seat.
12. Use of Manual Calculator is permissible.
13. The candidate should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and must sign the Attendance Sheet (Patrak - 01). Cases where a candidate has **not** signed the Attendance Sheet (Patrak-01) be deemed not to have handed over the Answer Sheet and dealt with as a unfair means case.
14. The candidates are governed by all Rules and Regulations of the Board with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of the Board.
15. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
16. The candidates will write the Correct Test Booklet Code as given in the Test Booklet / Answer Sheet in the Attendance Sheet. (Patrak-01)

Candidate's Name .....

Exam. Seat No. (in figures) ..... (in words) .....

Name of Exam. Centre .....Exam. Centre No. : .....

Test Booklet Code : ..... Test Booklet No. : .....

Candidate's Sign ..... *Block Supt. Sign* .....

MATHEMATICS

1. In which ratio does the line $3x + 4y = 7$ divide the line-segment joining the points (1, 2) and (–2, 1) ?

   (A) 3 : 4 (B) 4 : 3

   (C) 9 : 4 (D) 4 : 9

2. The distance between the points (–115, 105) and (100, 105) is -

   (A) 215 (B) 15

   (C) –15 (D) –215

3. The slope of a line that makes an angle of measure 30° with Y-axis is -

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

   (C) $-\sqrt{3}$ (D) $\sqrt{3}$

4. Find the orthocentre of the triangle formed by the lines $4x - 7y + 10 = 0$, $x + y = 5$ and $7x + 4y = 15$.

   (A) (–1, –2) (B) (–1, 2)

   (C) (1, 2) (D) (1, –2)

5. If $\left(\frac{3}{2}, \frac{5}{2}\right)$ is the mid-point of line-segment intercepted by a line between axes, then the equation of the line is -

   (A) $3x + 5y - 15 = 0$ (B) $5x + 3y - 15 = 0$

   (C) $3x + 5y + 15 = 0$ (D) $5x + 3y + 15 = 0$

(Space for Rough Work)

6. If circle $x^2 + y^2 - Kx - 12y + 4 = 0$ touches X-axis, then K = ...

(A) 16 (B) $\sqrt{16}$

(C) 12 (D) $\sqrt{12}$

7. Let C be the circle with centre (0, 0) and radius 3 units. The equation of the locus of the mid-points of the chords of the circle C that subtend an angle of $\frac{2\pi}{3}$ at its centre is ....

(A) $x^2 + y^2 = \frac{32}{7}$ (B) $x^2 + y^2 = 7$

(C) $x^2 + y^2 + 30x + 7 = 0$ (D) $x^2 + y^2 = \frac{9}{4}$

8. Find the equation of the tangent drawn from (5, 5) to the parabola $y^2 = 5x$.

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

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

9. The equation of tangent with slope $\frac{1}{2}$ to Parabola $2x^2 = 7y$ is .....

(A) $2x + 4y = 7$ (B) $3x + 6y = 7$

(C) $2x - 4y = -7$ (D) $3x - 6y = 7$

10. Find the equation of the auxiliary circle of $\frac{x^2}{9} + \frac{y^2}{16} = 1$.

(A) $x^2 + y^2 = 16$ (B) $x^2 + y^2 = 9$

(C) $x^2 + y^2 = 25$ (D) $x^2 + y^2 = 7$

(Space for Rough Work)

11. Length of latus-rectum of Hyperbola $y^2 - 16x^2 = 16$ is -

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

(C) 2 (D) -2

12. Length of transverse axis of Hyperbola $y^2 = 64x^2 + 64$ is ....

(A) 4 (B) 8

(C) 16 (D) 32

13. If $\bar{x} = (1, 1, 2)$, $\bar{y} = (1, 2, 1)$ and $\bar{z} = (2, 1, 1)$, then find $\bar{x} \times (\bar{y} \times \bar{z})$.

(A) $(-5, 5, 0)$ (B) $(5, 5, 5)$

(C) $(5, 0, -5)$ (D) $(-5, -5, -5)$

14. Which of the following is not a unit vector ?

(A) $\left(\frac{1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$ (B) $(\cos\alpha, 0, \sin\alpha)$

(C) $(1, 0, 0)$ (D) $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$

15. The position vectors of three vertices in order of a parallelogram are respectively $\bar{i} + \bar{j} + \bar{k}$, $\bar{i} + 3\bar{j} + 5\bar{k}$ and $7\bar{i} + 9\bar{j} + 11\bar{k}$, then find out the position vector of its fourth vertex.

(A) $6(\bar{i} + \bar{j} + \bar{k})$ (B) $7(\bar{i} + \bar{j} + \bar{k})$

(C) $2\bar{i} - 4\bar{k}$ (D) $6\bar{i} + 8\bar{j} + 10\bar{k}$

(Space for Rough Work)

16. If one of the vertices of a parallelopiped is origin and its edges are $\overline{OA}$, $\overline{OB}$ and $\overline{OC}$ where A(4, 3, 1), B(3, 1, 2) and C(5, 2, 1), then find the volume of this parallelopiped.

(A) 8 units
(B) 9 units
(C) 10 units
(D) None of these

17. Find the co-ordinates of the foot of the perpendicular drawn from the point (2, 4, –1) to the line $\bar{r} = (-5, -3, 6) + K(1, 4, -9),\ K \in R$

(A) (– 4, 1, 3)
(B) (– 4, 1, – 3)
(C) (1, 3, 4)
(D) (4, 3, 1)

18. Find the intercepts on the axes cut by plane $\bar{r}.(2, -3, 4) = 12$.

(A) 2, – 3, 4
(B) 6, – 4, 3
(C) 6, 4, 3
(D) None of these

19. Find the measure of the angle between the planes
$2x - y + z = 2$ and $x + y + 2z = 3$

(A) $\pi/2$
(B) $\pi/3$
(C) $\pi/4$
(D) $\pi/6$

20. Find out the equation of a sphere that passes through the points (0, 0, 0), (a, 0, 0), (0, b, 0) and (0, 0, c).

(A) $x^2 + y^2 + z^2 + 2ax + 2by + 2cz = 0$
(B) $x^2 + y^2 + z^2 - 2ax - 2by - 2cz = 0$
(C) $x^2 + y^2 + z^2 - ax - by - cz = 0$
(D) $x^2 + y^2 + z^2 + ax + by + cz = 0$

(Space for Rough Work)

21. $\lim_{x\to\infty} x\left(\sqrt[x]{3}-1\right) =$ .....

(A) $\log 3$
(B) $-\log 3$
(C) $\log x$
(D) limit does not exist.

22. $\lim_{n\to\infty} \frac{1+2+3+.....+n}{n^2} =$ .....

(A) $\frac{1}{2}$
(B) 0
(C) 2
(D) ∞

23. $\lim_{x\to\infty} \frac{2x+3}{x} =$ .....

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

24. $\lim_{x\to\infty} \frac{5^x-3^x}{2^x-5^x} =$ .....

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

25. If $f'(x) = g'(x)$, then .....

(A) $f(x) = g(x) + c$
(B) $f(x)\cdot g(x) = c$
(C) $f(x) = g(x)$
(D) $f(x) = c\cdot g(x)$

(Space for Rough Work)

26. $\frac{d}{dx}\left(\frac{1}{x}\right) =$ ..... ; $x \neq 0$

(A) 1

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

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

(D) not possible.

27. $\frac{d}{dx}\left[\tan^{-1}\left(\frac{a+x}{1-ax}\right)\right] =$ ..... ; a is constant, $a, x \in R^+$; $ax < 1$.

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

(B) $-\frac{1}{1+x^2}$

(C) $\frac{a}{1+x^2}$

(D) $\frac{-a}{1+x^2}$

28. $y = a^x$, then $y_n =$ ..... ; $a > 0$, $x \in R$.

(A) $a^x (\log a)^n$

(B) $(a^x)^n \cdot \log a$

(C) $n a^x \cdot \log a$

(D) $a^{nx} \cdot (\log a)^n$

29. If $f(x) = x^2 + ax + 5$ is increasing function in (2, 3), then the minimum value of a is ..... ; $a \in R$.

(A) 4

(B) –2

(C) – 4

(D) 2

30. If $\log_e 5 = 1.609$, then the approximate value of $\log 5.1$ is ...

(A) 1.629

(B) 1.809

(C) 1.701

(D) 1.611

(Space for Rough Work)

31. The set of extreme values of function $f(x) = \tan x$,

is ..... ; $x \in R - \left\{(2k+1)\frac{\pi}{2},\ k \in Z\right\}$.

(A) R
(B) $R^+ \cup \{0\}$
(C) $R - (-1, 1)$
(D) ϕ

32. $\int \log x \ dx = \ldots\ldots\ldots + c$; $x > 0$.

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

33. $\int \frac{x \sin x}{x\cos x - \sin x - 1}\ dx = \ldots\ldots\ldots + c$.

(A) $\log|x\cos x - \sin x - 1|$
(B) $-\log|x\cos x - \sin x - 1|$
(C) $\log|x\sin x - \cos x - 1|$
(D) $-\log|x\sin x - \cos x - 1|$

34. $\int f(x)dx = \ldots\ldots\ldots + c$; $f(x) = \begin{vmatrix} 2007 & 2008 \\ 2007x & 2008x \end{vmatrix}$

(A) x
(B) 0
(C) constant
(D) not possible

35. $\int \frac{1}{\sqrt{\left(\log \frac{1}{2}\right)^2 - x^2}}\ dx = \ldots\ldots\ldots + c$.

(A) $2\sin^{-1}\left(\frac{\log 2}{x}\right)$
(B) $-2\sin^{-1}\left(\frac{\log 2}{x}\right)$
(C) $-\sin^{-1}\left(\frac{x}{\log 2}\right)$
(D) $\sin^{-1}\left(\frac{x}{\log 2}\right)$

(Space for Rough Work)

36. $\int_{-4}^{4} \frac{|x+5|}{x+5}\, dx =$ .....

(A) 0 (B) 8

(C) -8 (D) none of these

37. $\int_{0}^{\pi/2} \frac{2008^{\sin x}}{2008^{\sin x} + 2008^{\cos x}}\, dx =$ .....

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{4}$

(C) π (D) 0

38. $\int_{-1}^{1} \frac{e^x + 1}{e^x - 1}\, dx =$ .....

(A) $\log(e^2 + 1)$ (B) $\log(e^2 - 1)$

(C) $\log e$ (D) $\log 1$

39. The integrating factor of the equation $(1+x)\frac{dy}{dx} - xy = 1 - x$ is ..... .

(A) $x \cdot e^x$ (B) $1 + x$

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

40. The equation of a particle is $x = t^3 - 9t^2 + 3t + 1$ and $v = -24$, then $a =$ .....

(A) 0 (B) 1

(C) 2 (D) 3

(Space for Rough Work)