AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XII

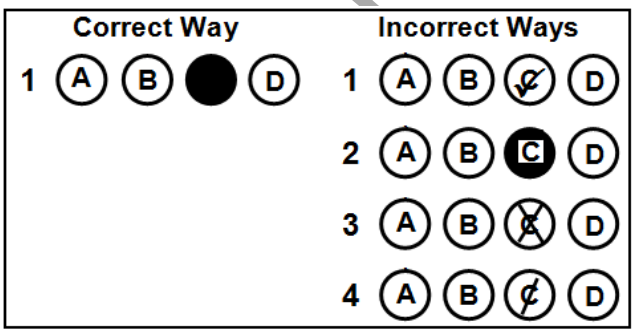
MODEL EXAMINATION PAPER 2020

Mathematics Paper I

Time: 1 hour Marks: 40

INSTRUCTIONS

1. Read each question carefully.
2. Answer the questions on the separate answer sheet provided. DO NOT write your answers on the question paper.
3. There are 100 answer numbers on the answer sheet. Use answer numbers 1 to 40 only.
4. In each question, there are four choices A, B, C, D. Choose ONE. On the answer grid, black out the circle for your choice with a pencil as shown below.



Candidate's Signature

5. If you want to change your answer, ERASE the first answer completely with a rubber, before blacking out a new circle.
6. DO NOT write anything in the answer grid. The computer only records what is in the circles.
7. You may use a scientific calculator if you wish.

1. Among the given functions, the odd function(s) is/ are

   I. $f(x) = -\sqrt{x^2 - 1}$

   II. $f(x) = -x^3$

   III. $f(x) = x^3$

   A. I only.
   B. II only.
   C. I and III.
   D. II and III.

2. If x is measured in radian, then $\lim_{x \to 0}\left(\frac{\sin px}{x}\right)$ is

   A. p
   B. 0
   C. 1
   D. not defined.

3. The value of x which does NOT belong to the domain of the real valued function $f(x) = \sqrt{x^2 - 4}$ is

   (**Note:** $x \in Z$)

   A. 2
   B. -1
   C. -2
   D. -4

4. For the function $f(x) = x^2$ and $g(x) = (x+1)^2$, the value of $f \circ g(-1)$ equals

   A. 0
   B. 2
   C. 4
   D. 16

5. For $y = x^2$, when $x = 2$ and $\delta x = 0.1$, the value of δy is

   A. 0.04
   B. 0.41
   C. 0.44
   D. 8.40

6. $\frac{d}{dx}\left(a^x \times e^2\right)$ is equal to

A. $2e \times a^x$
B. $e^2 \times xa^{x-1}$
C. $e^2 \times a^x \times \ln a$
D. $2e \times xa^{x-1} \times \ln a$

7. The derivative of $\left(\ln \frac{a^2}{x}\right)$, with respect to x, is

A. $\frac{1}{x}$
B. $-\frac{1}{x}$
C. $\left(2a \ln a + \frac{1}{x}\right)$
D. $\left(2a \ln a - \frac{1}{x}\right)$

8. The slope of the tangent to the curve $y = x^2 + 2x + 1$ at the point $(2, 9)$ is

A. 4
B. 6
C. 7
D. 9

9. The derivative of $f(x) = \sin(\ln x)$, with respect to x, is

A. $\frac{\cos(\ln x)}{x}$
B. $-\frac{\cos(\ln x)}{x}$
C. $\cos\left(\frac{\ln x}{x}\right)$
D. $-\cos(\ln x)$

10. If $x = 2t$ and $y = t^2$, where t is the parameter, then $\frac{dy}{dx}$ is equal to

A. $4t$

B. $\frac{1}{4t}$

C. $\frac{1}{t}$

D. t

11. If $\frac{3}{x-1}$ and $-\frac{1}{x-3}$ are the partial fractions of an algebraic expression, then the expression will be

A. $\frac{2x-8}{x^2-4x+3}$

B. $\frac{2x+8}{x^2-4x+3}$

C. $\frac{2x+8}{x^2+4x-3}$

D. $\frac{2x-8}{x^2+4x-3}$

12. The area bounded by the curve $y = 9 - x^2$ and the x-axis can be found by

A. $\int_0^9 (9-x^2)dx$

B. $\int_{-9}^9 (9-x^2)dx$

C. $\int_{-3}^3 (9-x^2)dx$

D. $\int_0^3 (9-x^2)dx$

13. The integral of $e^{a^2x+b^2}$, with respect to x, is

A. $e^{a^2x+b^2}+C$

B. $e^{2ax+2b}+C$

C. $\frac{1}{a^2}e^{a^2x+b^2}+C$

D. $\frac{1}{a^2+b^2}e^{a^2x+b^2}+C$

14. The integral of $\sqrt{ax-b}$, with respect to x, is

A. $\frac{2a(ax-b)^{\frac{3}{2}}}{3}+C$

B. $\frac{3a(ax-b)^{\frac{3}{2}}}{2}+C$

C. $\frac{2(ax-b)^{\frac{3}{2}}}{3a}+C$

D. $\frac{3(ax-b)^{\frac{3}{2}}}{2a}+C$

15. The integral of $\frac{e}{\sqrt{ax-b}}$, with respect to x, is

A. $\frac{\sqrt{(ax-b)}}{2ae}+C$

B. $\frac{e\sqrt{(ax-b)}}{2a}+C$

C. $\frac{e\sqrt{(ax-b)}}{a}+C$

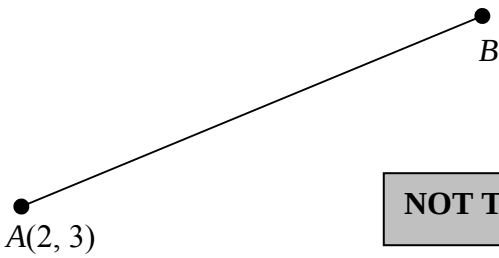
D. $\frac{2e\sqrt{(ax-b)}}{a}+C$

16. The value of $\int_1^e \frac{dx}{x}$ is

A. 1
B. 0
C. -1
D. not defined.

17. In the given diagram, the slope of the line segment AB is $\frac{1}{3}$. The value of x_1 will be

A. -1
B. $\frac{7}{3}$
C. $\frac{5}{3}$
D. 5



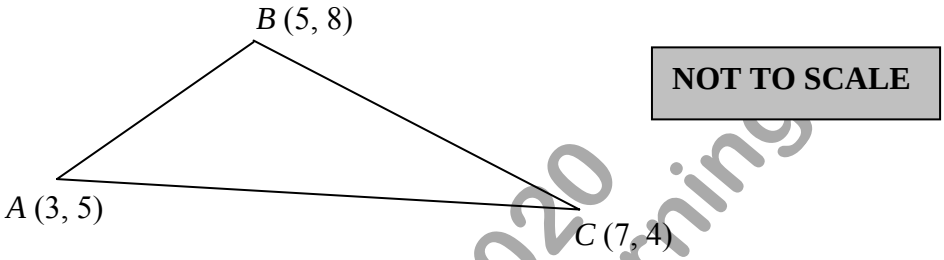
NOT TO SCALE

18. The line $2x + y = 1$ is perpendicular to the line l. If line l is passing through the point (0, 0), then its equation will be

A. $y = 2x$
B. $x = 2y$
C. $y = -2x$
D. $x = -2y$

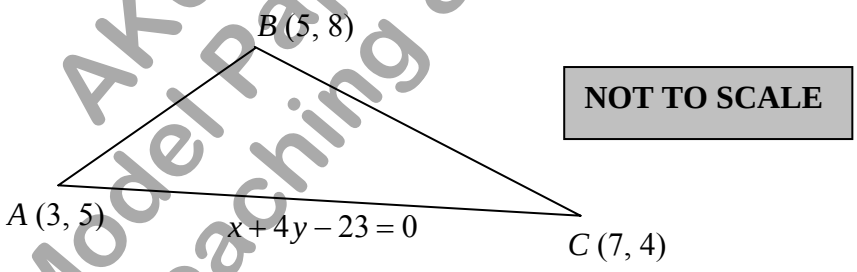
19. In the given triangle *ABC*, the slope of the median intersecting the side *BC* is

A. -2
B. $-\frac{1}{3}$
C. $\frac{1}{3}$
D. 2



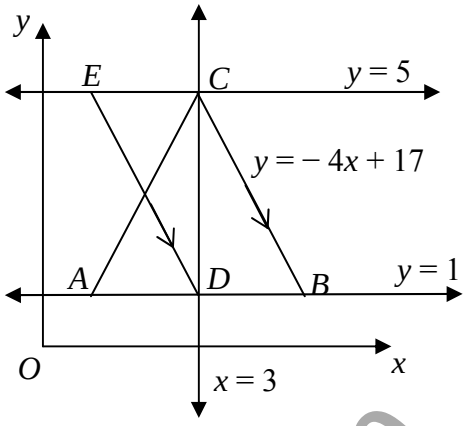
20. In the given triangle *ABC*, the length of altitude from vertex *B* to the side *AC* is

A. $\frac{14}{\sqrt{17}}$
B. $\frac{14}{\sqrt{89}}$
C. $\frac{5}{\sqrt{17}}$
D. $\frac{5}{\sqrt{89}}$



Use the given information to answer Q.21, Q.22 and Q.23.

In the given diagram, triangle *ABC* is an isosceles triangle. Equation of the line *AB* is $y = 1$, *EC* is $y = 5$, and *CB* is $y = -4x + 17$. Line *CB* is parallel to line *ED*.



NOT TO SCALE

21. The altitude of triangle *ABC* is

A. 3 units.
B. 4 units.
C. 5 units.
D. 6 units.

22. The equation of the line *ED* is $y = mx + 13$. The value of *m* is

A. – 4
B. – 1
C. 1
D. 4

23. The distance of line *CD* from *y*-axis is

A. 1 unit.
B. 3 units.
C. 4 units.
D. 5 units.

24. The given table shows the information of a factory that produces jackets.

	Small Jacket	**Medium Jacket**
Quantity	x	y
Time Required (min)	50	60
Cost per Jacket (Rs)	400	500

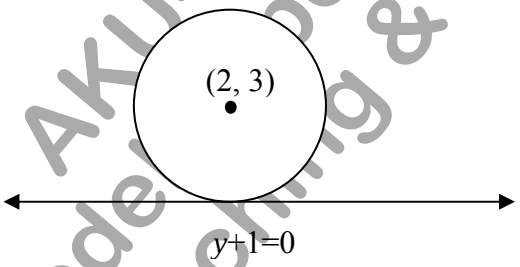
The total labour hours available per day are at most 200 hours.

The condition for the time constraint is

A. $60x + 50y \leq 12{,}000$
B. $50x + 60y \leq 12{,}000$
C. $60x + 50y \geq 12{,}000$
D. $50x + 60y \geq 12{,}000$

25. In the given diagram, a circle has the centre at point (2, 3) and touches the line $y + 1 = 0$. Its radius will be

A. $\frac{3}{\sqrt{13}}$ units.
B. $\frac{4}{\sqrt{13}}$ units.
C. 3 units.
D. 4 units.



NOT TO SCALE

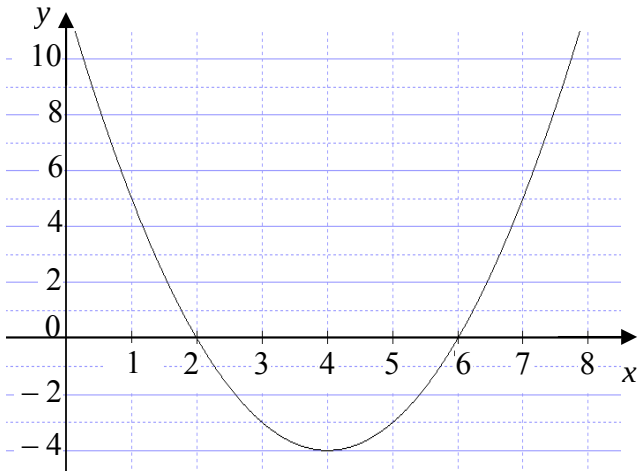
26. The centre of the circle represented by equation $(2x+3)^2 + (2y-4)^2 = 16$, is

A. $\left(-\frac{3}{4}, 1\right)$
B. $\left(\frac{3}{4}, -1\right)$
C. $\left(-\frac{3}{2}, 2\right)$
D. $\left(\frac{3}{2}, -2\right)$

27. The centre of the circle $x^2 + y^2 + 8x + 18y + 5 = 0$ is

A. (4, 9)
B. (8, 18)
C. (– 4, – 9)
D. (– 8, –18)

Use the given diagram to answer Q.28, Q.29 and Q.30.



28. The equation of parabola is

A. $y+4=(x-4)^2$
B. $x-4=(y-4)^2$
C. $y-4=(x+4)^2$
D. $x+4=(y+4)^2$

29. The coordinates of the focus of the parabola is

A. $\left(-\frac{17}{4},-4\right)$
B. $\left(-\frac{15}{4},-4\right)$
C. $\left(4,-\frac{17}{4}\right)$
D. $\left(4,-\frac{15}{4}\right)$

30. The equation of directrix of the parabola is

A. $x=-\frac{17}{4}$
B. $x=-\frac{15}{4}$
C. $y=-\frac{17}{4}$
D. $y=-\frac{15}{4}$

31. The major axis of the ellipse $2x^2 + 8y^2 - 4 = 0$ is along

A. x - axis and has a length of 2 units.
B. y - axis and has a length of 2 units.
C. x - axis and has a length of $2\sqrt{2}$ units.
D. y - axis and has a length of $2\sqrt{2}$ units.

32. The vertices and co-vertices of an ellipse are $(\pm 5, 0)$ and $(0, \pm 3)$ respectively. The equation of the ellipse is

A. $\frac{x^2}{3} + \frac{y^2}{5} = 1$
B. $\frac{x^2}{5} + \frac{y^2}{3} = 1$
C. $\frac{x^2}{9} + \frac{y^2}{25} = 1$
D. $\frac{x^2}{25} + \frac{y^2}{9} = 1$

33. The distance between foci of a hyperbola is $8\sqrt{2}$ and length of its semi transverse axis is 4. The eccentricity of the hyperbola will be

A. $\frac{\sqrt{2}}{2}$
B. $\frac{\sqrt{2}}{4}$
C. $\sqrt{2}$
D. $2\sqrt{2}$

34. When origin is shifted to $(-1, 7)$, the coordinates of a point (x, y) becomes $(-5, 6)$. With respect to origin initially the point (x, y) was equal to

A. (4, 1)
B. (4, −1)
C. (−6, 13)
D. (6, −13)

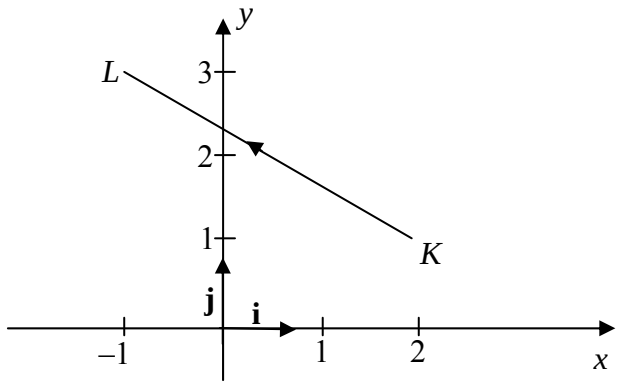
35. If x - axis and y - axis are rotated through an angle of 25^o, then x - coordinate of the point (6, 8) will become

(**Note**: The answer is given in TWO decimal places.)

A. 8.82
B. 9.79
C. 2.06
D. 4.71

36. The geometrical representation of vector *KL* is shown in the given diagram.
The vector *KL* will be

A. $-\mathbf{i}+2\mathbf{j}$
B. $\mathbf{i}+3\mathbf{j}$
C. $-3\mathbf{i}+2\mathbf{j}$
D. $2\mathbf{i}-3\mathbf{j}$



37. If $\vec{MP} = -(-3\mathbf{i})$ and $\vec{MO} = 3\mathbf{j}+3\mathbf{i}$, then the position vector of *P* will be

A. $3\mathbf{j}$
B. $-3\mathbf{j}$
C. $-6\mathbf{i}+3\mathbf{j}$
D. $6\mathbf{i}-3\mathbf{j}$

38. Which of the following two vectors give the dot product 48?

A. $6\mathbf{i}$ and $8\mathbf{j}$
B. $-12\mathbf{i}$ and $-4\mathbf{j}$
C. $6\mathbf{i}+3\mathbf{j}$ and $14\mathbf{j}$
D. $5\mathbf{i}+\mathbf{j}$ and $9\mathbf{i}+3\mathbf{j}$

39. Which of the following statements is CORRECT for $\mathbf{a}-2\mathbf{b}=\mathbf{0}$ and $\mathbf{c}+3\mathbf{a}=\mathbf{0}$?

(**Note:** **a**, **b**, and **c** are non-zero vectors and **0** is a zero vector.)

I. Vectors **a** and **b** are parallel and have opposite direction.
II. Vectors **a** and **c** are parallel and have same direction.
III. Vectors **a**, **b** and **c** are parallel to each other.

A. I only
B. III only
C. I and II
D. II and III

40. If a vector **w** is perpendicular to each of the vectors **u** and **v**, then **w** will be determined by the

A. dot product of **u** and **v**.
B. unit vectors of **u** and **v**.
C. projection of **u** along **v**.
D. cross product of **u** and **v**.

END OF PAPER

Please use this page for rough work