

AGA KHAN UNIVERSITY EXAMINATION BOARD
SECONDARY SCHOOL CERTIFICATE
CLASS X
MODEL EXAMINATION PAPER 2023 AND ONWARDS
Mathematics Paper I

Time: 1 hour 20 minutes Marks: 45

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 45 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.

Correct Way	Incorrect Ways
1 (A) (B) <input checked="" type="radio"/> (D)	1 (A) (B) <input checked="" type="radio"/> (D)
	2 (A) (B) <input checked="" type="radio"/> (D)
	3 (A) (B) <input checked="" type="radio"/> (D)
	4 (A) (B) <input checked="" type="radio"/> (D)

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. A formulae list is provided on page 2. You may refer to it during the paper, if you wish.
8. You may use a simple calculator if you wish.

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List of Formulae Mathematics X

Note:

- All symbols used in the formulae have their usual meaning.
- The same formulae will be provided in the annual and re-sit examinations.

Basic Statistics

$$\bar{X} = \frac{\sum x}{n}$$

$$\bar{X} = \frac{\sum fx}{n} \text{ or } \bar{X} = \frac{\sum fx}{\sum f}$$

$$\sigma^2 = \frac{\sum x^2}{n} - \left(\frac{\sum x}{n} \right)^2$$

$$\text{Median} = l + \frac{1}{f} \left(\frac{n}{2} - c \right) \times h$$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$

$$\sigma = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n} \right)^2}$$

Algebraic Manipulation

$$HCF \times LCM = p(x) \times q(x)$$

Linear Graphs and their Applications

$$1 \text{ mile} = \frac{8}{5} \text{ km}$$

$$1 \text{ Hectare} = 2.471 \text{ Acres}$$

$$^{\circ}F = \frac{9}{5} \times ^{\circ}C + 32$$

Quadratic Equations

$$ax^2 + bx + c = 0, a \neq 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\text{Disc} = b^2 - 4ac$$

Introduction to Coordinate Geometry

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Introduction to Trigonometry

$$1^{\circ} = \frac{\pi}{180} \text{ rad}, 1 \text{ rad} = \left(\frac{180}{\pi} \right)^{\circ}$$

$$A = \frac{1}{2} r^2 \theta$$

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$l = r\theta$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

$$1 + \cot^2 \theta = \text{cosec}^2 \theta$$

Algebraic Formulae

$$(a - b)^2 = a^2 - 2ab + b^2$$

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$a^2 - b^2 = (a + b)(a - b)$$

$$(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$$

$$(a + b)^2 - (a - b)^2 = 4ab$$

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

$$(a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$$

$$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

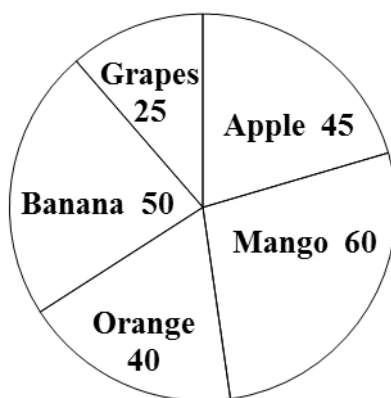
$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

1. The cumulative frequency of the class preceding to the median class will be

Class Interval	Frequency
50 - 59	7
60 - 69	16
70 - 79	24
80 - 89	13
90 - 99	10
Total	70

- A. 16
B. 23
C. 24
D. 47
2. For five observations, if $\sum X = 9$ and $\sum X^2 = 19$, then the variance will be
- A. 0.56
B. 0.20
C. 0.75
D. 2.00
3. The given pie chart shows the number of students together with names of their favourite fruits in a school.



What is the percentage of the students whose favourite fruit is orange?

- A. 11.1
B. 18.2
C. 22.2
D. 40.0

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4. The given data, in ascending order, represents the ages of people who visited a shop in a day.

9, 9, 10, 15, 17, 19, 23, 27, p , p , 32, 35, 35, 35, 37, 40, 40

The mode of the data

- A. is 28
B. is 35
C. is 40
D. cannot be determined
5. If $\frac{X}{Y} = \frac{a}{2}$ and $\bar{X} = \frac{a}{2}$, then the value of \bar{Y} is equal to
- A. a
B. $\frac{a}{4}$
C. 0
D. 1
6. If $\frac{1}{a^2} \times (\text{variance of } x)$ is b , then the standard deviation of x will be
- A. $a\sqrt{b}$
B. \sqrt{ab}
C. a^2b^2
D. a^4b^2
7. $\sqrt{(x-4)(x+4)(x^2-16)}$ is equal to
- A. $x-4$
B. $x+4$
C. x^2-16
D. x^2+16
8. The least common multiple (LCM) of $x^4 - a^4$, $x^2 - a^2$ and $x^2 + a^2$ is equal to
- A. 1
B. $x^2 + a^2$
C. $x^2 - a^2$
D. $x^4 - a^4$

9. The highest common factor (HCF) of $(y-1)^2$, $(y+1)^2$ and y^2-1 is equal to
- 1
 - $y-1$
 - $y+1$
 - $(y-1)^2(y+1)^2$
10. On simplification of $\left(1 - \frac{1}{x}\right) \div \frac{1}{x}$, we get
- 1
 - $x-1$
 - $\frac{x-1}{x^2}$
 - $\frac{1-x}{x^2}$
11. To convert $\frac{5x^2+6}{(x-1)^2(x+1)}$ into its partial fractions, the appropriate form will be
- $\frac{A}{(x-1)} + \frac{B}{x+1}$
 - $\frac{A}{(x-1)^2} + \frac{B}{x+1}$
 - $\frac{Ax^2+B}{(x-1)^2} + \frac{C}{x+1}$
 - $\frac{A}{(x-1)} + \frac{B}{(x-1)^2} + \frac{C}{x+1}$
12. On simplification, $\frac{1}{1-x} \div \frac{2}{x-1}$ is equal to
- $-\frac{1}{2}$
 - -2
 - 2
 - $\frac{1}{2}$

13. On simplification of $2 - \frac{(a+b)^2}{(a-b)(a+b)}$, we get

- A. 1
- B. $\frac{a+b}{a-b}$
- C. $\frac{a+3b}{a-b}$
- D. $\frac{a-3b}{a-b}$

14. On solving the equation $3 = -\frac{3}{2}x$, the value of x will be

- A. -2
- B. 2
- C. $\frac{9}{2}$
- D. $-\frac{1}{2}$

15. The solution of $7x - 7 > -7$ will be

- A. $x < 2$
- B. $x > -2$
- C. $x < 0$
- D. $x > 0$

16. The solution set of $|1 - x| = 0$ will be

- A. $\{1\}$.
- B. $\{-1\}$.
- C. $\{0, 1\}$.
- D. $\{-1, 1\}$.

17. The solution set of $\sqrt{x - \frac{1}{4}} = \frac{1}{2}$ will be

- A. $\left\{\frac{1}{4}\right\}$.
- B. $\left\{\frac{1}{2}\right\}$.
- C. $\left\{0, \frac{1}{4}\right\}$.
- D. $\left\{0, \frac{1}{2}\right\}$.

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18. Which of the following inequalities satisfies the solution set $x < 1$ or $x > -1$?

- A. $|8x| < 8$
- B. $8|x| > 8$
- C. $|x| + 1 > 1$
- D. $|x| + 1 < 1$

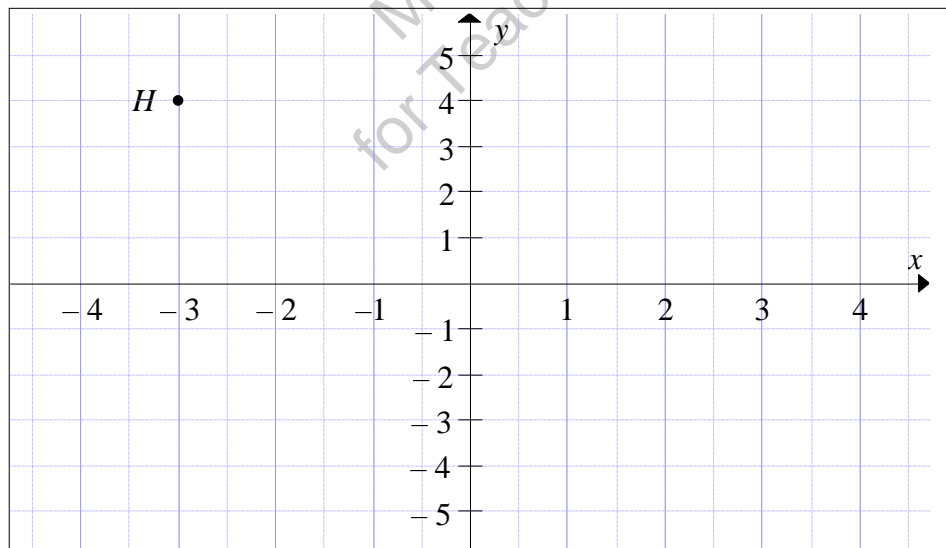
19. If $\sqrt{x} - 1 = 1$, then the value of x is equal to

- A. 0
- B. 2
- C. ± 2
- D. 4

20. For the given equations $x - 3y = 9$ and $x + 3y = 15$, the value of x will be

- A. -6
- B. -3
- C. 12
- D. 24

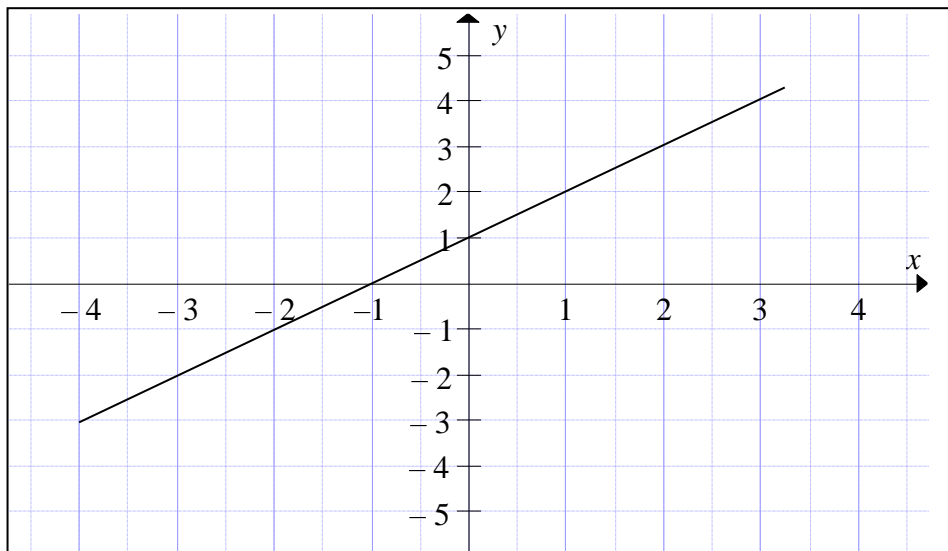
21. The coordinates of point H in the given graph is



- A. $(-3, 4)$.
- B. $(4, -3)$.
- C. $(3, -4)$.
- D. $(-3, -4)$.

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22. One of the points that lies on the given line is



- A. $(3, 2)$.
 B. $(4, 4)$.
 C. $(0, -1)$.
 D. $(-1, 0)$.
23. The standard form of the quadratic equation $\frac{3}{2} + x^2 = 2x$ is
- A. $x^2 + 4x + 3 = 0$
 B. $x^2 - 2x + 3 = 0$
 C. $2x^2 + 4x + 3 = 0$
 D. $2x^2 - 4x + 3 = 0$
24. Four times of a number is squared. The result will be half of one less than that number. The given statement can be written mathematically as

(Note: Let x be the number.)

- A. $4x^2 = \frac{1}{2}x - 1$
 B. $16x^2 = \frac{1}{2}x - 1$
 C. $4x^2 = \frac{1}{2}(x - 1)$
 D. $16x^2 = \frac{1}{2}(x - 1)$

25. The solution set of $a^2x^2 - a^2 = 0$ is

- A. $\{1\}$.
- B. $\{\pm 1\}$.
- C. $\{a\}$.
- D. $\{\pm a\}$.

26. What should be added to $x^2 + 3x$ to make it a perfect square?

- A. $\frac{1}{9}$
- B. $\frac{3}{2}$
- C. $\frac{9}{4}$
- D. 9

27. The midpoint of the line segment joining the two points $(2, -2)$ and $(-2, -2)$ is (m, n) . The value of n^2 is equal to

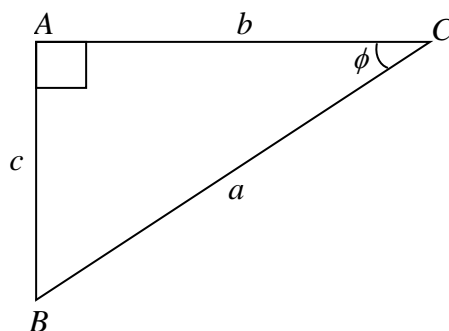
- A. -2
- B. -4
- C. 4
- D. 0

28. The distance between $(0, b)$ and $(-b, 0)$ is

- A. 0
- B. $2b$
- C. $\sqrt{2}b$
- D. $2b^2$

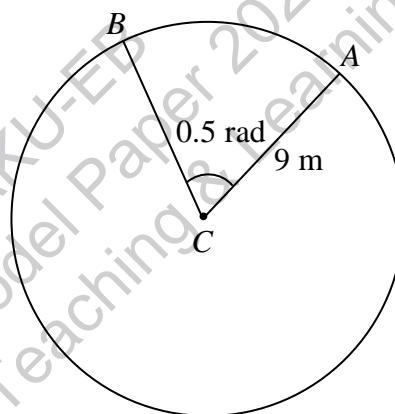
29. In the given triangle ABC , $\tan \phi$ is

- A. $\frac{a}{b}$.
- B. $\frac{b}{a}$.
- C. $\frac{b}{c}$.
- D. $\frac{c}{b}$.



30. In the given diagram, the length of the minor arc AB is

- A. 0.025 m.
- B. 4.5 m.
- C. 18 m.
- D. 20.25 m.



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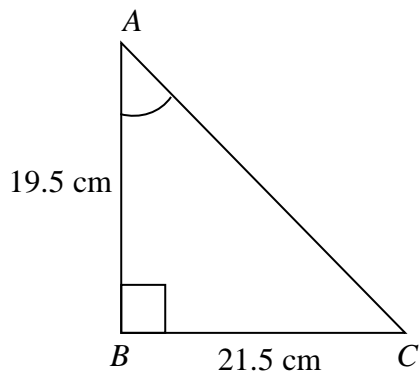
31. On simplification of $(\sec^2 \theta - 1) \cot \theta$, we get

- A. 1
- B. $\tan \theta$
- C. $\cot^3 \theta$
- D. $\sin \theta \cos \theta$

32. The value of $\operatorname{cosec}^2 45^\circ$ is

- A. 2
- B. $\frac{1}{2}$
- C. $\frac{3}{4}$
- D. $\frac{4}{3}$

33. In the given triangle ABC , the length of AC is



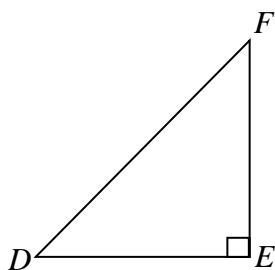
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- A. 2 cm.
 B. 3.009 cm.
 C. 29.026 cm.
 D. 41 cm.
34. In a sector, if the ratio of arc length to the radius is $3:5$, then its central angle
- A. is 2 radians.
 B. is 0.6 radians.
 C. is 1.67 radians.
 D. cannot be determined.
35. For $A = 45^\circ$, the value of $(\sin A + \cos A)^2$ is equal to
- A. 1
 B. 2
 C. $\frac{1}{2}$
 D. $\frac{1}{4}$
36. The tangent of an angle is negative in the
- I. second quadrant
 II. third quadrant
 III. fourth quadrant
- A. I only.
 B. II only.
 C. I and III.
 D. II and III.

37. On simplification, the expression $\sqrt{2\sec^2 \theta - 2\tan^2 \theta}$ is equal to

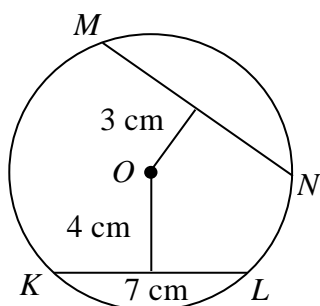
- A. $\sqrt{2}(\sec \theta - \tan \theta)$
- B. $2(\sec \theta - \tan \theta)$
- C. $\sqrt{2}$
- D. 2

38. In the given right-angled triangle DEF , if $DE = 2EF$, then the length of DF can be expressed as



- A. $DF = 3EF$
- B. $(DF)^2 = 3(DE)^2$
- C. $DF = 2DE + EF$
- D. $(DF)^2 = 4(EF)^2 + (EF)^2$

39. Consider two chords KL and MN in the given circle having centre O . If KL and MN are at a distance of 4 cm and 3 cm from the centre O respectively, then MN is



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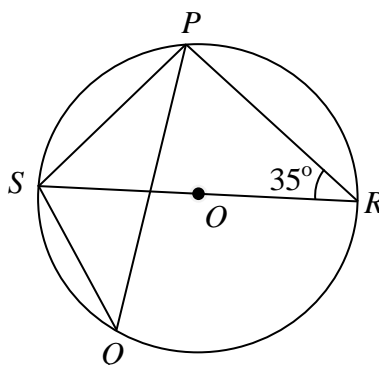
- A. less than 7 cm.
- B. greater than 7 cm.
- C. less than and equal to 7 cm.
- D. greater than and equal to 7 cm.

Use the given information to answer Q.40 and Q.41.

In the given diagram, O is the centre of the circle.

40. The value of $\angle RSP$

- A. is 35° .
- B. is 55° .
- C. is 70° .
- D. cannot be determined.



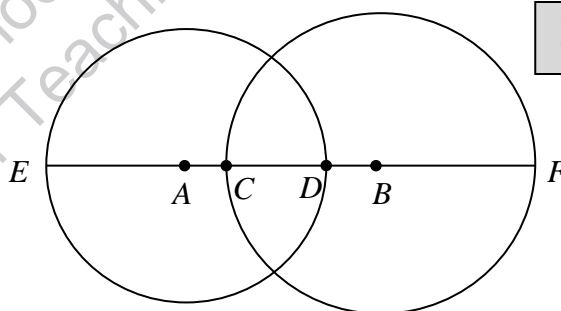
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41. The value of $2\angle SQP$ is equal to

- A. 70° .
- B. 110° .
- C. $2(70^\circ)$.
- D. $2(110^\circ)$.

42. In the given diagram, A and B are the centres of the given two circles with radii of 4 cm and 5 cm respectively. If $CD = 3$ cm, then EF is equal to

- A. 6 cm.
- B. 12 cm.
- C. 15 cm.
- D. 18 cm.

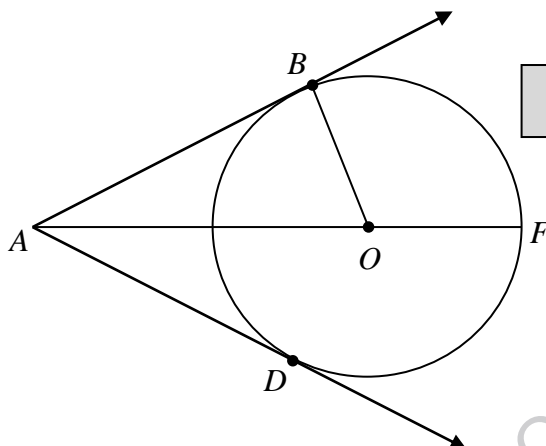


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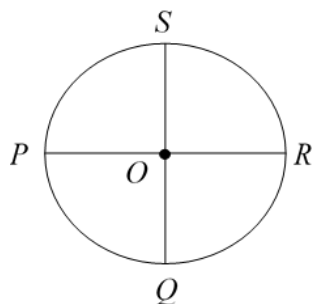
43. In the given diagram, AB and AD are tangents to the given circle at point B and point D respectively. If O is centre of the given circle, then which of the options is TRUE?

- I. $OB=OF$
 - II. $AO=AD$
 - III. $AD=AB$
- A. I only
 - B. II only
 - C. I and III
 - D. II and III



44. Consider the given circle with centre O . Which of the following statements is/ are correct?

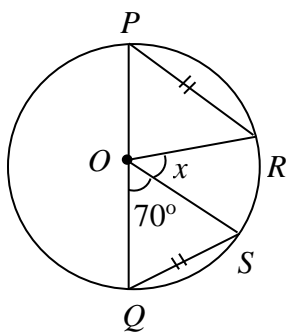
- I. $m \overline{OP} = m \overline{OR} \neq m \overline{OQ}$
- II. $m \overline{OP} = m \overline{OQ}$
- III. $m \overline{OP} = \text{radius of the circle}$



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

45. In the given figure, if O is the centre of the given circle and $\angle QOS = 70^\circ$, then the value of x will be

- A. 30° .
- B. 40° .
- C. 60° .
- D. 70° .



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