AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS X

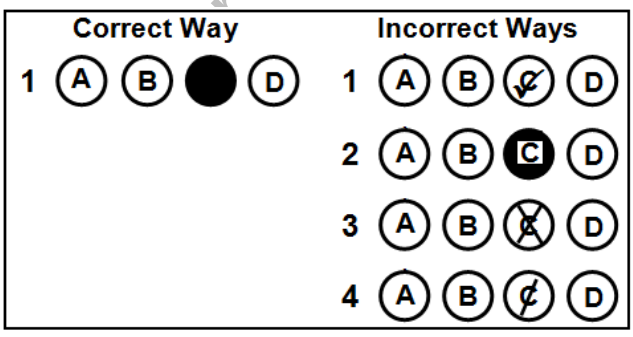
ANNUAL EXAMINATIONS (THEORY) 2024

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.



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.

List of Formulae

Note:

- All symbols used in the formulae have their usual meaning.

Basic Statistics

$\overline{X} = \dfrac{\sum x}{n}$

$\overline{X} = \dfrac{\sum fx}{n}$ or $\overline{X} = \dfrac{\sum fx}{\sum f}$

$\text{variance} = \dfrac{\sum x^2}{n} - \left(\dfrac{\sum x}{n}\right)^2$

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

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

$\text{Standard deviation} = \sqrt{\dfrac{\sum x^2}{n} - \left(\dfrac{\sum x}{n}\right)^2}$

Algebraic Manipulation

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

Linear Graphs and their Applications

$1 \text{ mile} = \dfrac{8}{5}\text{km}$ 1 Hectare = 2.471 Acres $^\circ F = \dfrac{9}{5} \times {}^\circ\text{C} + 32$

Quadratic Equations

$ax^2 + bx + c = 0,\ a \neq 0$ $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $\text{Disc} = b^2 - 4ac$

Introduction to Coordinate Geometry

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $M.P = \left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$

Introduction to Trigonometry

$1^\circ = \dfrac{\pi}{180}\text{ rad},\ 1\ rad = \left(\dfrac{180}{\pi}\right)^\circ$ $A = \dfrac{1}{2}r^2\theta$ $\sin^2\theta + \cos^2\theta = 1$

$l = r\theta$ $1 + \tan^2\theta = \sec^2\theta$ $1 + \cot^2\theta = \text{cosec}^2\theta$

Algebraic Formulae

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

$(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$ $(a+b)^2 - (a-b)^2 = 4ab$ $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

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

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

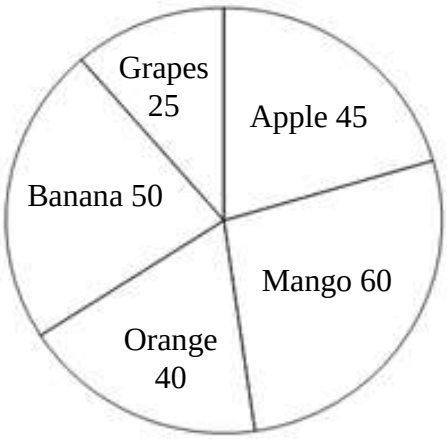
1. Consider the given table for grade 10 students' scores in a mathematics test, in a certain school. The scores are recorded out of 50.

Scores	Observations	Frequency
21 - 25	21, 23, 23, 25, 25	5
26 - 30	29, 29, 29	3
31 - 35	32, 33, 34, 35, 35,	5
36 - 40	38, 38, 38, 38, 40, 39, 38, 39, 39, 40	10
41 - 45	44, 44, 44, 44, 45, 45	6
46 - 50	49, 49, 50	3

The total number of students in grade 10 are

A. 10
B. 15
C. 32
D. 50

2. The given pie chart shows the number of students together with 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

3. If the mean of $b, b-1, b-2, b-3$ and $b-4$ is 30, then the value of b will be

   A. 8
   B. 20
   C. 28
   D. 32

4. The mean of 33, 35, 38, 39, 41, 42, 40, 38 and 36 is 38.

   To increase the mean from 38 to 40, what should be added to each observation in the data?

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

5. The given table shows the weights in kilograms (kg) of 5 workers in a super store.

Weight x (kg)	x^2
45	2025
45	2025
47.5	2256.25
49.6	2460.16
50.5	2550.25
$\sum x = 237.6$	$\sum x^2 = 11316.66$

   The standard deviation in the weights of workers is

   A. 67.24
   B. 47.07
   C. 5.18
   D. 2.27

6. If the range of a data set is 7 and its lowest term is −3, then the highest term is

   A. − 10
   B. − 4
   C. 4
   D. 10

7. The highest common factor (HCF) of the expressions $4x^2-4x+1$ and $4x^2-2x$ is

   A. $2x$
   B. $2x-1$
   C. $2x(2x^2-1)^2$
   D. $2x^2+2x-1$

8. The least common multiple (LCM) of (x^3-1) and (x^2+x+1) is

   A. $x-1$
   B. x^2+x+1
   C. $(x-1)(x^2+x+1)$
   D. $(x-1)(x^2+x+1)^2$

9. On simplifying the expressions $\frac{1}{(x-y)^2}+\frac{1}{[-(x-y)]^2}$, we get

   A. 0
   B. $\frac{2}{(x-y)^2}$
   C. $\frac{-2}{(x-y)^2}$
   D. $\frac{2x^2+2y^2}{(x-y)^2(y-x)^2}$

10. The simplest form of $\frac{3x}{x^2-2x+1}\div\frac{x}{x-1}$ is

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

11. $\frac{x+1}{x-3}$ is the reduced form of

A. $\frac{(x+1)(x^2-1)}{(x-3)(x-1)}$.

B. $\frac{(x-1)(x^2+1)}{(x-3)(x+1)}$.

C. $\frac{(x^2-1)(x-3)}{(x-3)^2(x-1)}$.

D. $\frac{(x^2+1)(x-3)}{(x-3)^2(x+1)}$.

12. $\sqrt{\frac{t^6}{s^4}+\frac{t^3}{s^2}+\frac{1}{4}}$ is equal to

A. t^3

B. $\sqrt{4t^6+s^4}$

C. $\left(\frac{t^3}{s^2}+\frac{1}{2}\right)$

D. $\left(\frac{t^3}{s^3}+\frac{1}{2}\right)$

13. To resolve $\frac{3x-7}{(3x+2)^2(3x+7)}$ into its partial fractions, the CORRECT form is

A. $\frac{A}{(3x+2)^2}+\frac{B}{3x+7}$.

B. $\frac{A}{(3x+2)^2}-\frac{B}{3x+7}$.

C. $\frac{A}{3x+2}+\frac{B}{(3x+2)^2}+\frac{C}{3x+7}$.

D. $\frac{A}{3x+2}+\frac{Bx+C}{(3x+2)^2}-\frac{D}{3x+7}$.

14. The solution of $2x - 3 = -3 - 2x$ is

A. 0
B. – 1.5
C. – 3
D. not possible

15. Which of the following condition(s) is/ are possible for $|x|$?

I. $|x| < 0$
II. $|x| = 0$
III. $|x| > 0$

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

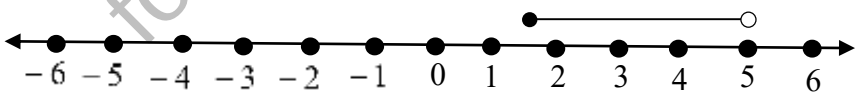
16. Two times of a number x reduced by 3 is 5. The equation representing the given situation is

A. $x^2 - 3 = 5$
B. $2x - 3 = 5$
C. $2x + 3 = 5$
D. $2(x - 3) = 5$

17. The roots which satisfy the equation $|4x - 2| = 14$ are

A. − 4 and 3
B. − 3 and 4
C. − 12 and 16
D. − 16 and 12

18. The given number line is the result of



A. $y \leq -5$
B. $y > -5$
C. $1.5 \leq y < 5$
D. $1.5 < y \leq 5$

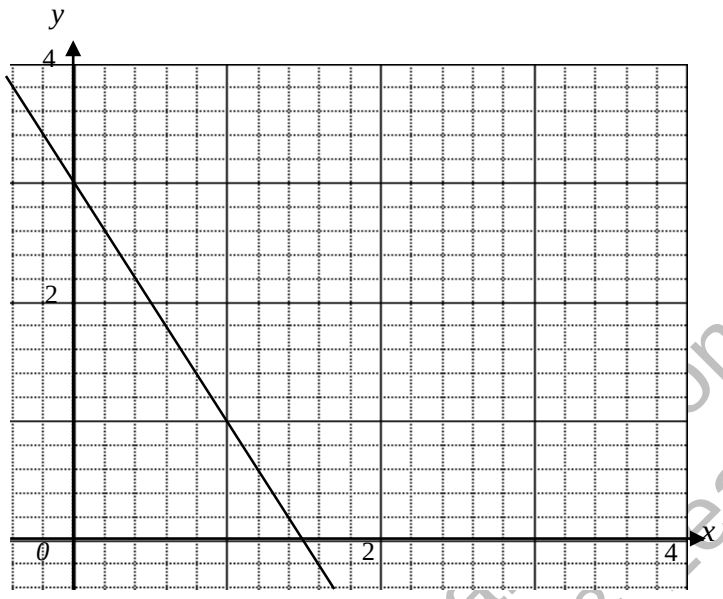
19. The solution set of $|x| < -2$ is

A. {−2, −3, −4, …}.
B. {−2, −1, 0, 1, 2}.
C. {−1, 0, 1}.
D. { }.

20. If (a, b) is a point in the Cartesian plane and $a > 0$ and $b < 0,$ then the point lies in the

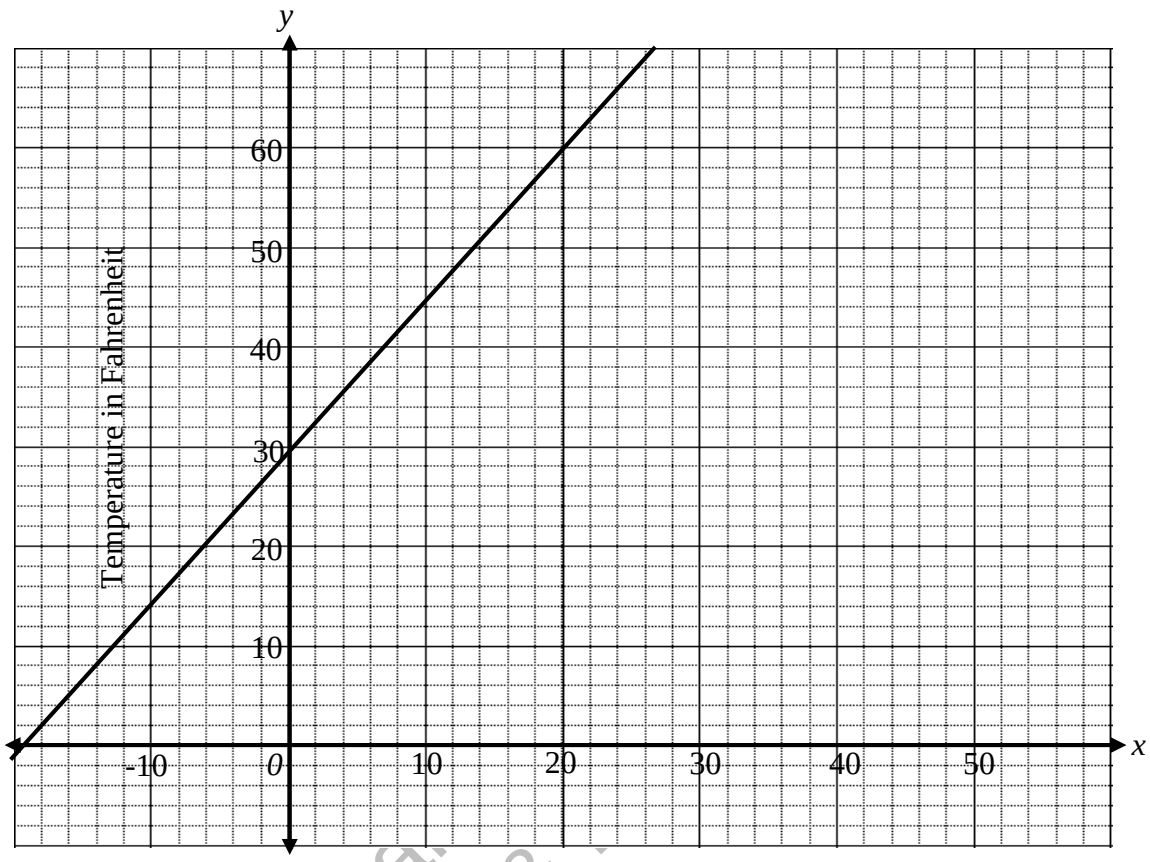
A. I quadrant.
B. II quadrant.
C. III quadrant.
D. IV quadrant.

21. The slope and *y* intercept in the given graph are



A. − 2 and 3 respectively.
B. − 2 and 1.5 respectively.
C. − 0.5 and 3 respectively.
D. − 0.5 and 1.5 respectively.

22. The given graph shows the relation between temperature in Fahrenheit and Celsius scale.



From the given graph, the value of −10 degree Celsius on Fahrenheit scale would be

A. − 14
B. − 11
C. 14
D. 50

23. The standard form of the quadratic equation $\frac{3}{2} + x^2 = 2x$ is

A. $2x^2 + 4x + 3 = 0$
B. $2x^2 - 4x + 3 = 0$
C. $x^2 + 4x + 3 = 0$
D. $x^2 - 2x + 3 = 0$

24. To complete the square of the equation $2y^2 - 10y + m = 0$, the value of m will be

A. $-\frac{25}{2}$.

B. $-\frac{25}{8}$.

C. $\frac{25}{8}$.

D. $\frac{25}{2}$.

25. The discriminant of the equation $5x^2 = 20$ is

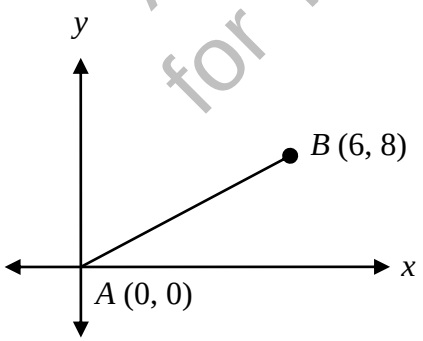
A. -400
B. -380
C. 380
D. 400

26. Asfar walks at an average speed of $\left(x - \frac{1}{x}\right)$ km/ h for x hours. After this, he cycles at an average speed of $(3x + 2)$ km/ h for x hours. If he covers 10 km in this journey, then the expression representing total distance covered will be

(**Note**: Distance = speed × time)

A. $4x^2 + 2x - 1 = 10$
B. $3x^2 + 2x - 1 = 10$
C. $4x^2 - 2x + 1 = 10$
D. $3x^2 + 2x + 1 = 10$

27. In the given diagram, the length of line segment $\overline{AB}$ is



NOT TO SCALE

A. 6
B. 7
C. 8
D. 10

28. Which of the given set of points is non-collinear?

A. (0, 1), (0, 3), (0, 5)
B. (1, 0), (3, 0), (5, 0)
C. (−1, 0), (0, 1), (0, 0)
D. (−1, −1), (0, 0), (1, 1)

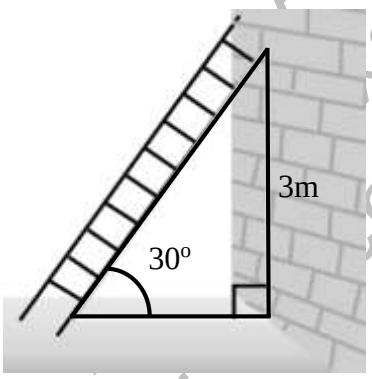
29. The decimal form of the angle 25° 18' 36" is

A. 25.15^{o}
B. 25.31^{o}
C. 25.41^{o}
D. 25.91^{o}

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

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

Use the given image to answer Q.31 and Q.32.



NOT TO SCALE

31. With reference to the trigonometric ratios, the distance of the ladder from the wall is

A. $2\sqrt{3}$ m.
B. $3\sqrt{3}$ m.
C. $\frac{3}{2}$ m.
D. 6 m.

32. The angle of depression is

A. 30°
B. 60°
C. 120°
D. 150°

33. The value of $\frac{\sec(45°)}{\sin(45°)}$ in simplest form will be

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

34. If $\sin x = \frac{3}{5}$ and the terminal arm of the angle is in II quadrant, then cot x is

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

35. The expression $\tan^2\theta\cos^2\theta$ can also be expressed as

A. $\text{cosec}^2\theta$.
B. $\sec^2\theta$.
C. $\sin^2\theta$.
D. $\cos^2\theta$.

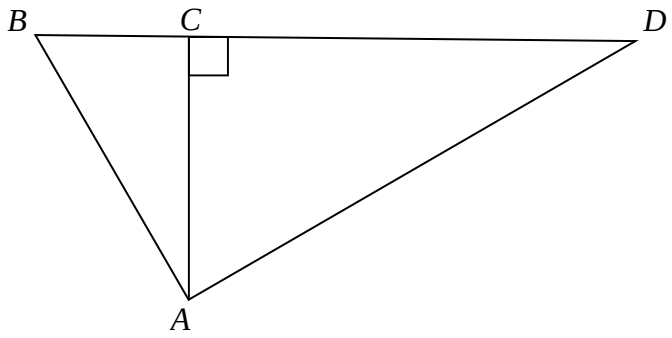
36. If cos (−240) = sin x, then the value of x will be

A. − 240
B. − 150
C. 150
D. 240

37. If the lengths of sides of a right angled triangle are 5 cm, 5 cm and $(a+2)$ cm, then the value of a will be

A. $3\sqrt{2}$ cm.
B. $7\sqrt{2}$ cm.
C. $(5\sqrt{2}-2)$ cm.
D. $(5\sqrt{2}+2)$ cm.

38. In the given figure, if $AB = 5$ cm and $AC = 3$ cm,

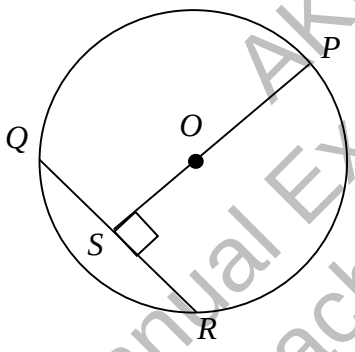


NOT TO SCALE

then BC is equal to

A. $\sqrt{2}$ cm.
B. 4 cm.
C. $\sqrt{34}$ cm.
D. 8 cm.

39. In the given circle with centre O, PS is perpendicular to QR at point S.

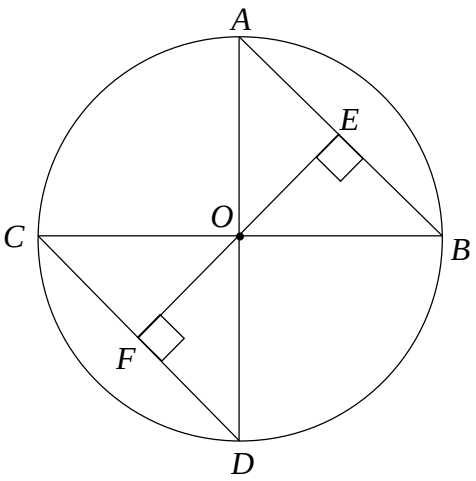


NOT TO SCALE

If $\angle OQS = 72^o$, then the value of $\angle ROS$ is equal to

A. 9^o
B. 18^o
C. 36^o
D. 54^o

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

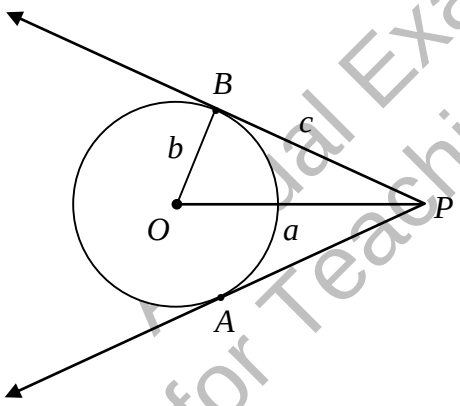


NOT TO SCALE

If $OE = OF$, then which one is TRUE?

A. $AD = CD$.
B. $AB = CD$.
C. $OC = OF$.
D. $OA = OF$.

41. In the given diagram, AP and PB are the two tangents to the given circle with centre O at points A and B respectively.



NOT TO SCALE

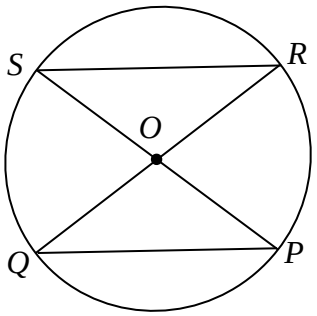
The length of AP is

A. a.
B. b.
C. c.
D. $a - b$.

42. The radii of two circles are 7 cm and 4 cm. If the distance between their centres is 8 cm, then the circles will

A. not touch at any point.
B. touch each other internally.
C. touch each other externally.
D. intersect each other at two points.

43. In the given circle with centre O, if PQ and RS are equal chords, then the equal angles are

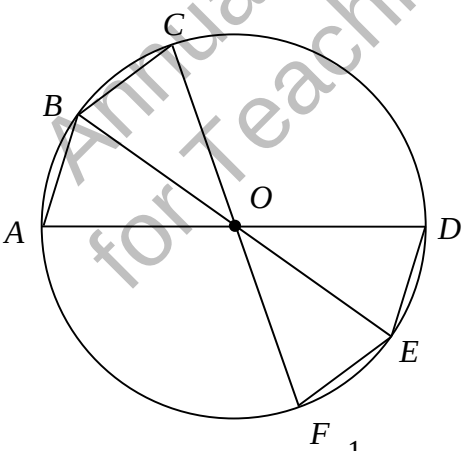


NOT TO SCALE

I. $\angle POQ = \angle ROS$
II. $\angle POR = \angle QOS$
III. $\angle ORS = \angle POQ$

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

44. The given diagram shows a circle having centre at O. The chord AB and BC are congruent.

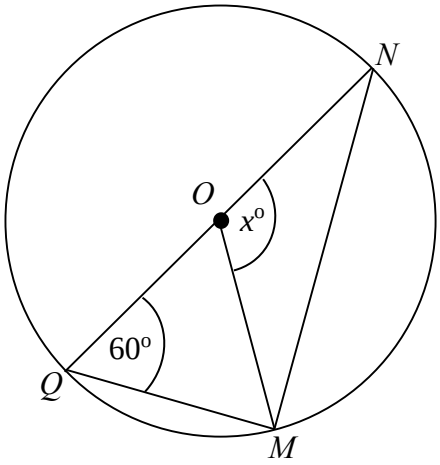


NOT TO SCALE

If the length of chord $BC = \frac{1}{2}a$ cm, then the sum of lengths of chord DE and chord EF is

A. $2a$ cm.
B. a cm.
C. $\frac{1}{2}a$ cm.
D. $\frac{1}{4}a$ cm.

45. Given is an inscribed triangle *MNQ*, where *O* is the centre of the circle.



NOT TO SCALE

The value of *x* is

A. 90°
B. 100°
C. 120°
D. 135°

END OF PAPER

Please use this page for rough work

Please use this page for rough work

Please use this page for rough work

Please use this page for rough work