**AGA KHAN UNIVERSITY EXAMINATION BOARD**

**SECONDARY SCHOOL CERTIFICATE**

**CLASS X**

**ANNUAL EXAMINATIONS (THEORY) 2024**

**Mathematics Paper II**

**Time: 1 hour 40 minutes Marks: 30**



**INSTRUCTIONS**

**Please read the following instructions carefully**.

1. Check your name and school information. Sign if it is accurate.

| **I agree that this is my name and school.**<br>**Candidate's Signature** |
|---|
| |

**RUBRIC**

2. There are NINE questions. Answer ALL questions. Choices are specified inside the paper.

3. When answering the questions:

   Read each question carefully.
   Use a black pointer to write your answers. DO NOT write your answers in pencil.
   Use a black pencil for diagrams. DO NOT use coloured pencils.
   DO NOT use staples, paper clips, glue, correcting fluid or ink erasers.
   Complete your answer in the allocated space only. DO NOT write outside the answer box.

4. The marks for the questions are shown in brackets ( ).

5. A formulae list is provided on page 2. You may refer to it during the paper, if you wish.

6. 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

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

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

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

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

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

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

### Algebraic Manipulation

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

### Linear Graphs and their Applications

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

### Quadratic Equations

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

### Introduction to Coordinate Geometry

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

### Introduction to Trigonometry

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

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

### Algebraic Formulae

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

$$(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3 \qquad (a+b)^2 - (a-b)^2 = 4ab \qquad a^3 - b^3 = (a-b)\left(a^2 + ab + b^2\right)$$

$$(a+b)^2 + (a-b)^2 = 2\left(a^2 + b^2\right) \qquad (a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3 \qquad a^3 + b^3 = (a+b)\left(a^2 - ab + b^2\right)$$

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

Q.1. (Total 3 Marks)

A company has been tracking the daily sales figures for their products over the last month. The figures are as follows: 492, 215, 384, 793, 523, 707, 821, 422, 930, 156, 361, 499, 682, 448, 291

Consider the given figures to complete the following table.

| **Class Interval** | **Class Boundary** | **Frequency** | **Cumulative Frequency** |
|---|---|---|---|
| 100 – 299 | | | |
| 300 – 499 | | | |
| 500 – 699 | | | |
| 700 – 899 | | | |
| 900 – 1099 | | | |
| Total | | | |

**(ATTEMPT EITHER PART a OR PART b OF Q.2.)**

Q.2. (Total 4 Marks)

a. Find the least common multiple (LCM) of the polynomials $P(x) = 3x^3 - 27x$ and $Q(x) = x^2 - 6x + 9$

b. For what value of '*a*' the expression $x^4 + 4x^3 + 3ax^2 + 16x + 4a$ will become a perfect square.

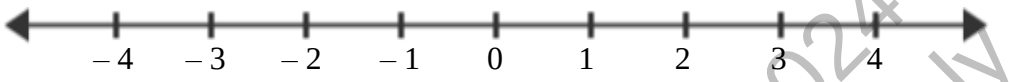
**(ATTEMPT EITHER PART a OR PART b OF Q.3.)**

Q.3. (Total 3 Marks)

a. Find the value of $x$ for the given equation $\frac{5\sqrt{x}}{2} - \frac{7\sqrt{x}}{3} = \frac{7}{3}$

(**Note**: Verification is not required.)

b. Solve the inequality $|2x - 3| > 5$ and illustrate the solution on the given number line.



Q.4. (Total 3 Marks)

Use algebraic method to find the values of $x$ and $y$ for the equations $x + 2y = 8$ and $2x + 2y = 16$.

Q.5. (Total 3 Marks)

Find the discriminant of the equation $x^2 - x - 1 = 0$. Using the discriminant, state the nature of the roots.

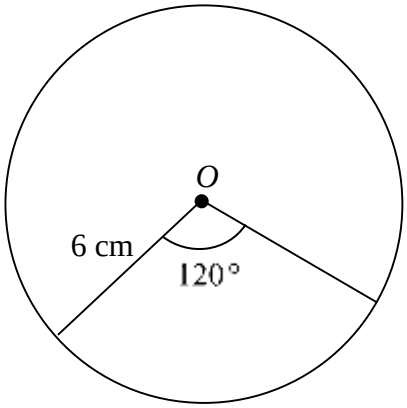
Q.6. (Total 3 Marks)

The midpoint of $P_1(x,-3)$ and $P_2(y,\ 7)$ is $(a,b)$. Show that $a-b=\frac{1}{2}(x+y-4)$.

**(ATTEMPT EITHER PART a OR PART b OF Q.7.)**

Q.7. (Total 4 Marks)

a. The given diagram shows a circle having radius 6 cm and centre at *O*.




**NOT TO SCALE**

If the sector subtends a central angle of 120°, then calculate the

i. arc-length for the minor sector. (2 Marks)

ii. area of the minor sector. (1 Mark)

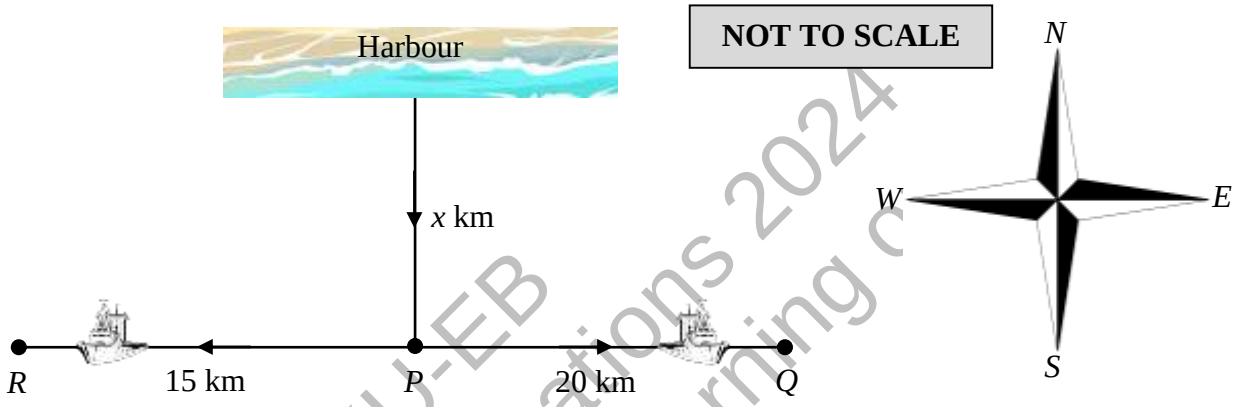
iii. arc-length of the major arc. (1 Mark)

**(ATTEMPT EITHER PART a OR PART b OF Q.7.)**

b. Two ships *A* and *B* leave their harbour together and sail to south for *x* km. After reaching at point *P*,

- ship *A* turns East and sails for 20 km to reach at point Q.
- ship *B* turns West and sails for 15 km to reach at point R.

The route is shown in the given diagram.






If the shortest distance of ship *B* from point R to the harbour is 18 km, then find the

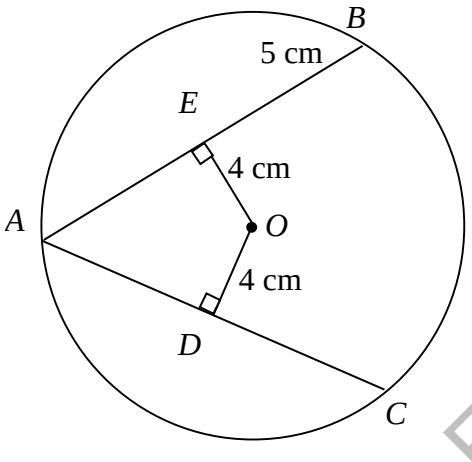
i. distance between ship *A* and ship *B* when they reached at point Q and R respectively. (1 Mark)

ii. shortest distance of ship *A* when it reached point Q to the harbour. (3 Marks)

**(ATTEMPT EITHER PART a OR PART b OF Q.8.)**

Q.8. (Total 4 Marks)

a. In the given circle with centre $O$, $\overline{BE} = 5$ cm and $\overline{OE} = \overline{OD} = 4$ cm.



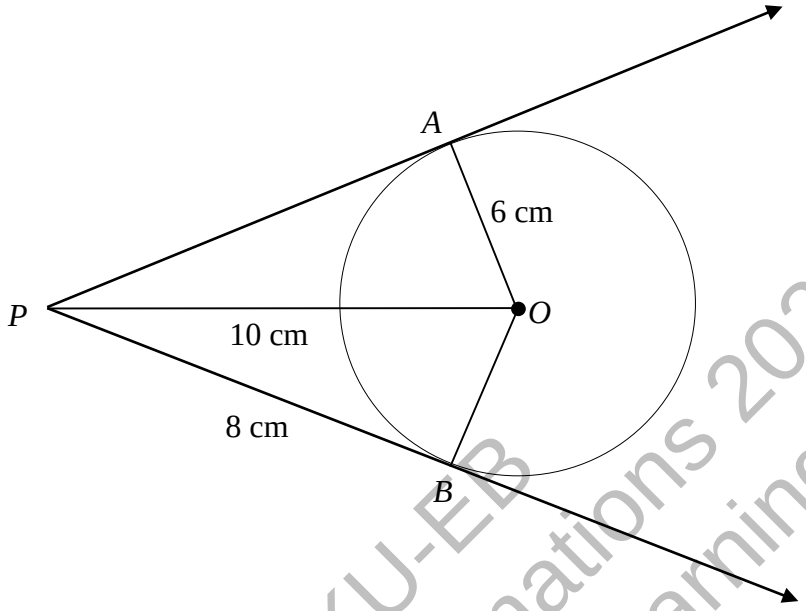

**NOT TO SCALE**

i. Find the length of $\overline{DC}$ and write a statement to justify your answer. (2 Marks)

ii. Find the length of $\overline{AB}$ and write a statement to justify your answer. (2 Marks)

**(ATTEMPT EITHER PART a OR PART b OF Q.8.)**

b. In the given diagram a circle with centre $O$ is shown. $PA$ and $PB$ are tangents to the circle at point $A$ and $B$ respectively.




**NOT TO SCALE**

State the value of

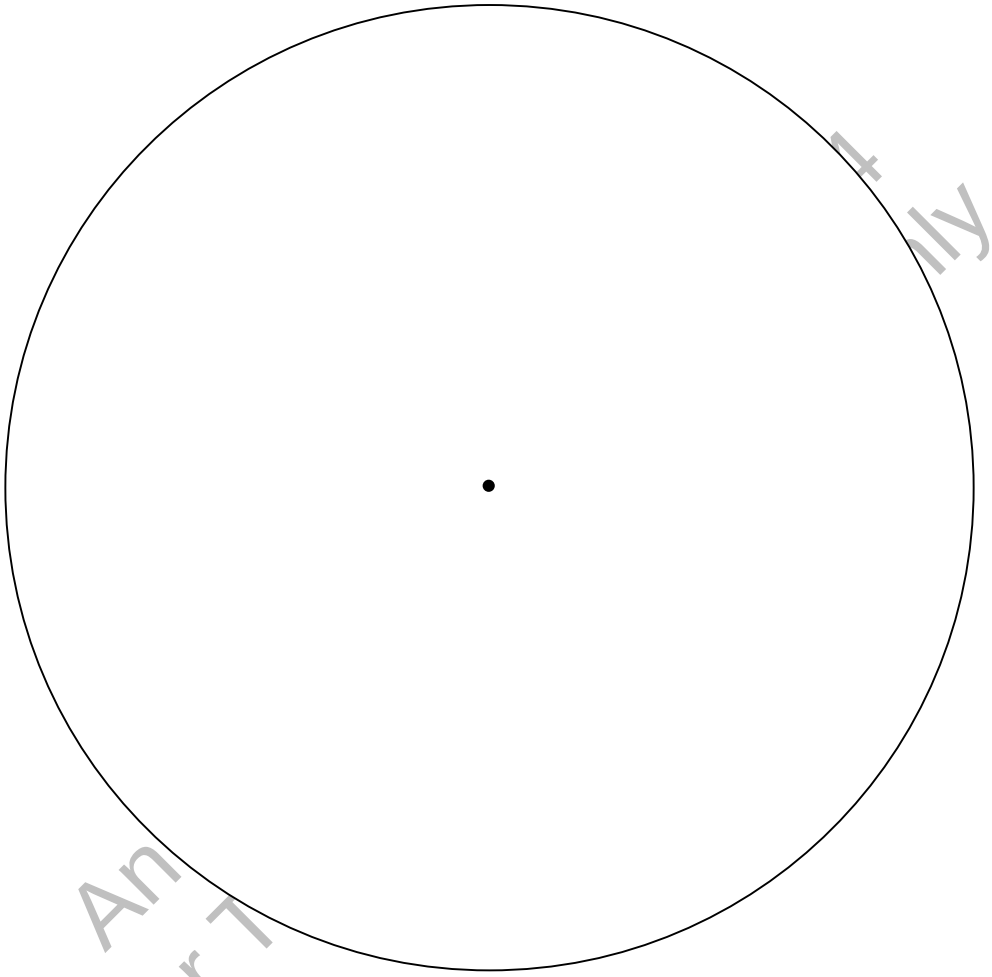
i. $\angle OAP$ and justify your answer (2 Marks)

ii. $\overline{OB}$ (1 Mark)

iii. $\overline{AP}$ (1 Mark)

Q.9. (Total 3 Marks)

Draw an inscribed square about the given circle.





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