AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS X

MODEL EXAMINATION PAPER 2023 AND ONWARDS

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. **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.

Aga Khan University Examination Board

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

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

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

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

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

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

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

Algebraic Manipulation

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

Linear Graphs and their Applications

1 mile $= \dfrac{8}{5}$ km

1 Hectare = 2.471 Acres

$°F = \dfrac{9}{5} \times °\text{C} + 32$

Quadratic Equations

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

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

Disc $= b^2 - 4ac$

Introduction to Coordinate Geometry

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$\left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$

Introduction to Trigonometry

$1° = \dfrac{\pi}{180}$ rad, $1\ rad = \left(\dfrac{180}{\pi}\right)°$

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

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

$l = r\theta$

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

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

Algebraic Formulae

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

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

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

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

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

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

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

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

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

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

Q.1. (Total 3 Marks)

The given data represent the distance covered by 30 cyclists in a race.

Distance (km)	Frequency	Class Width	Frequency Density
$0 \le x < 4$	7	4	1.75
$4 \le x < 10$	3	6	0.5
$10 \le x < 14$	8	4	2
$14 \le x < 22$	4	8	0.5
$22 \le x < 32$	8	10	0.8

Draw a histogram for the given data.

Space for Diagram

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

Q.2. (Total 4 Marks)

a. Simplify the expression $a\left(a^2x^2 - 2axb + b^2\right) \div a\left(a^2x^2 - b^2\right)$ to express as $\frac{ax - b}{ax + b}$.

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

b. Complete the solution of the square root of an algebraic expression by filling the space provided.

$$\text{.....} - 8x + \text{.....}$$

....	$36x^4 - \text{.....}x^3 + \text{.....}x^2 - 16x + \text{.....}$ .....
$12x^2 - \text{.....}x$ $- \text{.....}x$	$- 96x^3 + \text{.....}x^2$ $\mp 96x^3 \pm \text{.....}x^2$
$12x^2 - 16x + 1$	$\times \quad 12x^2 - \text{.....}x + \text{.....}$ $\text{.....}x^2 - 16x + \text{.....}$

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

Q.3. (Total 3 Marks)

a. Given that $k = k\sqrt{x+1} + k^2\sqrt{x+1}$, where $k > 0$. Show, by working, that the given equation reduces to $x+1 = \left(\frac{1}{k+1}\right)^2$.

b. It is given that $|x-9|+5>5$ and x is an integer. Find the values of x, which satisfies the given inequality.

Q.4. (Total 3 Marks)

Eight years ago, Mr Salman was 10 times as old as his neighbour. If the present age of Mr Salman and his neighbour is x and y respectively, then find an

i. expression of Mr Salman and his neighbour's age eight years ago.

ii. equation connecting x and y with the help of the given condition.

Q.5. (Total 3 Marks)

Find the values of x for the equation $3x^2 - 4x + 2 = 0,$ using quadratic formula.

Q.6. (Total 3 Marks)

If the midpoint of $P_1(x, -3)$ and $P_2(y, 7)$ is (a, b), then 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)

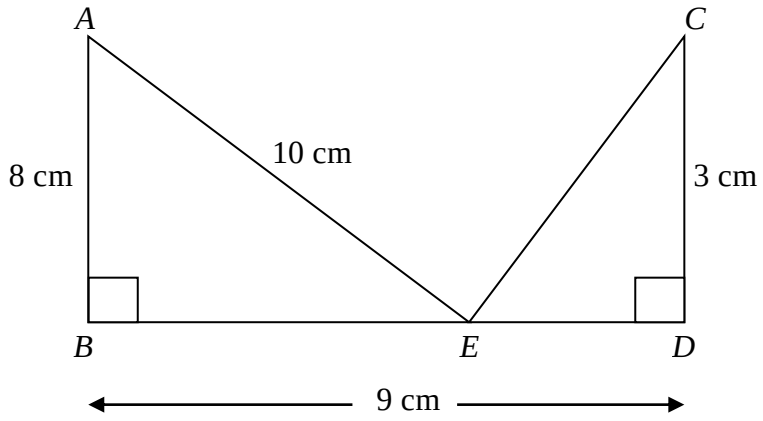
a. If the diameter of a circle is 10 cm and the central angle measured of a sector of the circle is 60^{o}, then find the

i. radius of the circle. (1 Mark)

ii. area of the sector. (3 Marks)

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

b. In the given diagram, *ABE* and *CDE* are two right-angled triangles. Calculate the length of *CE*.

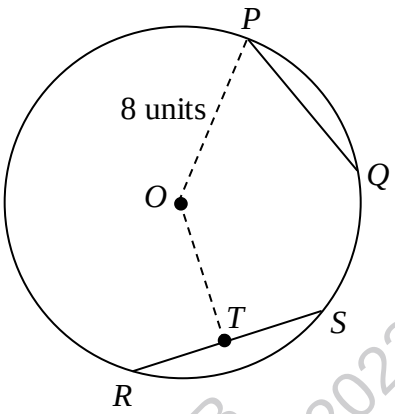


NOT TO SCALE

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

Q.8. (Total 4 Marks)

a. The given circle having centre O has a radius of 8 units. Two equal chords PQ and RS are of length l units.



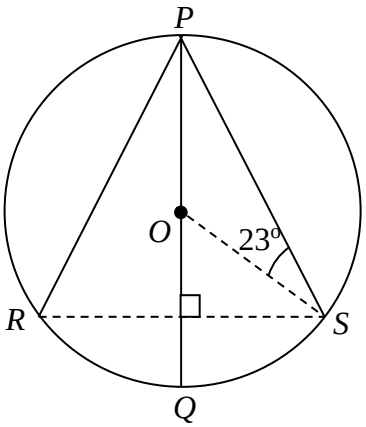
NOT TO SCALE

i. State, in terms of l, the length of TS. (1 Mark)

ii. Hence, find the value of l when $OT = 5$ units. (3 Marks)

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

b. In the diagram, O is the centre of the circle and it is given that $\angle OSP = 23^o$ and $PS = PR$.



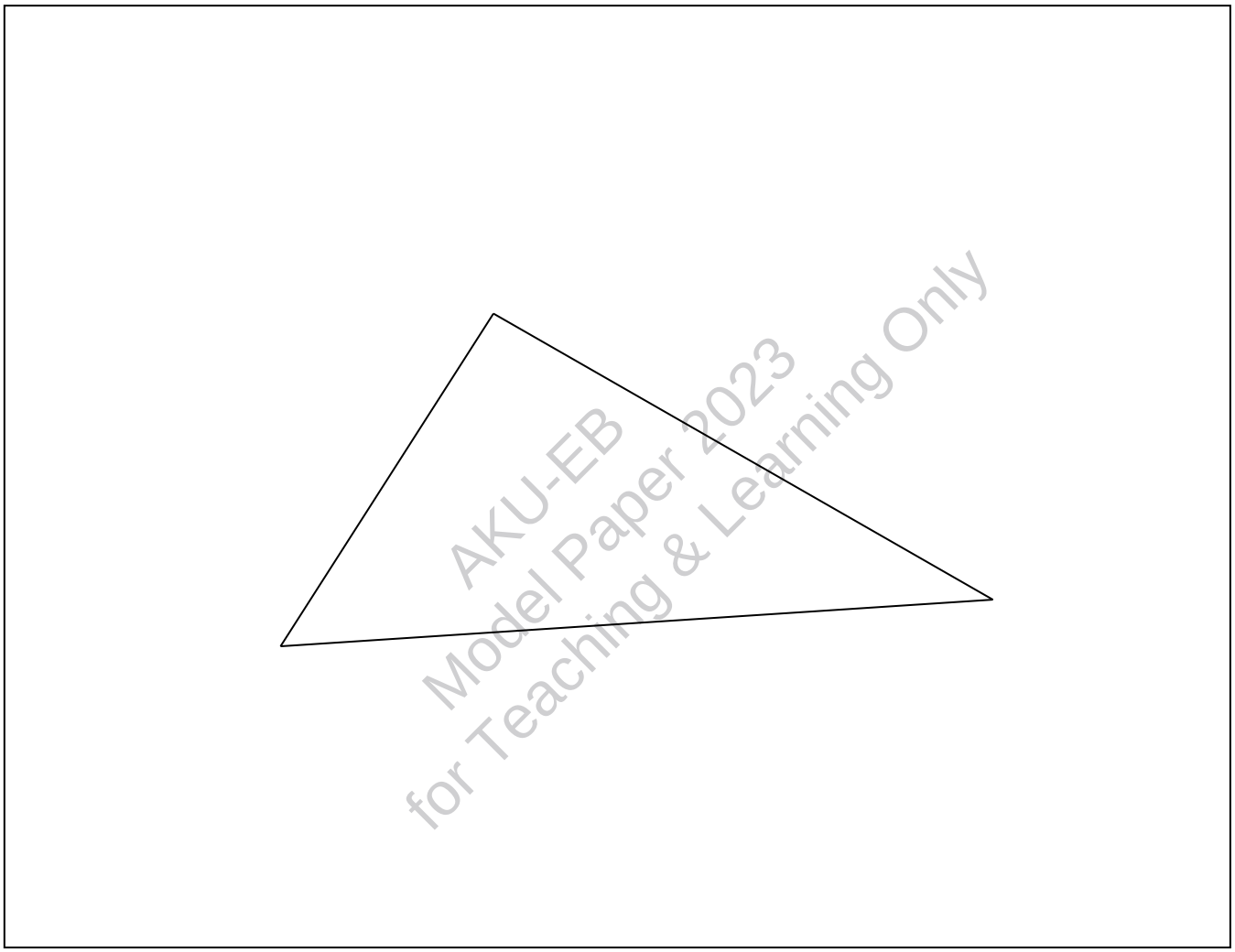
NOT TO SCALE

i. State the value of $\angle OPS$. (1 Mark)

ii. Find the value of $\angle SOR$. Show all the necessary working with a valid reason. (3 Marks)

Q.9. (Total 3 Marks)

Draw the inscribed circle of the given triangle.



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