AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX

ANNUAL EXAMINATIONS (THEORY) 2024

General 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 colour pencils.
   DO NOT use staples, paper clips, glue or correcting fluid.
   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:

The symbols have their usual meanings.

Business Mathematics

$$\text{Loss }\% = \left(\frac{\text{Loss}}{CP} \times 100\right) \qquad \text{Profit }\% = \left(\frac{\text{Profit}}{CP} \times 100\right) \qquad SP = CP \times \left(\frac{100 + \text{profit}\,\%}{100}\right)$$

$$SP = CP \times \left(\frac{100 - \text{loss}\%}{100}\right) \qquad \text{Discount }\% = \frac{\text{Discount}}{MP} \times 100$$

Sets and Functions

$$(A \cup B)^c = A^c \cap B^c \qquad (A \cap B)^c = A^c \cup B^c$$

Exponents and Logarithms

$$a^m \times a^n = a^{m+n} \qquad a^m \div a^n = a^{m-n} \qquad \frac{a^m}{b^m} = \left(\frac{a}{b}\right)^m$$

$$\left(a^m\right)^n = a^{mn} \qquad (a \times b)^m = a^m \times b^m \qquad a^{\frac{m}{n}} = \sqrt[n]{a^m}$$

$$\log_a (m)^n = n \log_a m \qquad \log_a (m \times n) = \log_a m + \log_a n \qquad \log_a \left(\frac{m}{n}\right) = \log_a m - \log_a n$$

$$\log_a n = \log_b n \times \log_a b \qquad \log_a b = n \Leftrightarrow a^n = b$$

Algebraic Formulae and Applications/ Factorisation

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

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

$$(a+b)^2 - (a-b)^2 = 4ab \qquad (a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

Linear Graphs

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

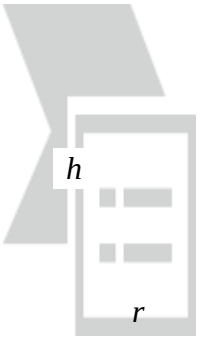
Matrices and Determinants

$$A^{-1} = \frac{1}{|A|} AdjA$$

(ATTEMPT EITHER PART a OR PART b OF Q.1.)

Q.1. (Total 3 Marks)

a. The surface area of a cylinder is directly proportional to its height '*h*' and radius '*r*'.



If the surface area is represented by *S*, then

i. express *S* in terms of *r* and *h*. (2 Marks)

ii. find the constant of proportionality *k*, if $S = 131.88\ cm^2$ for $r = 3$ cm and $h = 7$cm. (1 Mark)

(ATTEMPT EITHER PART a OR PART b OF Q.1.)

b. A sports teacher conducted a survey to inquire about the game choices of students in a school. The available choices were cricket, football and volleyball. It was found that the ratio of students who chose cricket, football and volleyball was 9:5:2 respectively.

If the number of students choosing football is 20, then find the total number of students who participated in the survey.

Q.2. (Total 4 Marks)

Imrana started a business with a capital of Rs 6,000,000. Irfan joined the business after 6 months contributing a capital of Rs 1,200,000. After three months of Irfan's joining, Kiran joined the business with a capital of Rs 1,800,000. At the end of the year, the business earned a profit of Rs 300,000.

Calculate the share of each person in the profit.

(**Note:** Assuming all the three persons will get the profit for whole year.)

Q.3. (Total 3 Marks)

If $A = \{1, 2, 3, 4\}$ and $B = \{a, b\}$, then

i. find $B \times A$. (2 Marks)

ii. state whether $A \times B = B \times A$? Justify your answer with a reason. (1 Mark)

Q.4. (Total 3 Marks)

If $\log 3 = 0.4771$ and $\log 5 = 0.6989$, then find the value of $\log 45$.

Q.5. (Total 4 Marks)

Apply the laws of exponents to reduce $\sqrt[3]{125 \times \frac{x^{-4}}{x^2}} \times \sqrt{\frac{x^4}{25}}$ in its simplest form.

(ATTEMPT EITHER PART a OR PART b OF Q.6.)

Q.6. (Total 4 Marks)

a. Factorise the expression $16p^4 + 4p^2 + 1$ completely.

b. Using the factor theorem,

i. show that $x - 1$ is a factor of $x^3 - 2x^2 - 5x + 6$. (2 Marks)

ii. find the remaining factors of $x^3 - 2x^2 - 5x + 6$. (2 Marks)

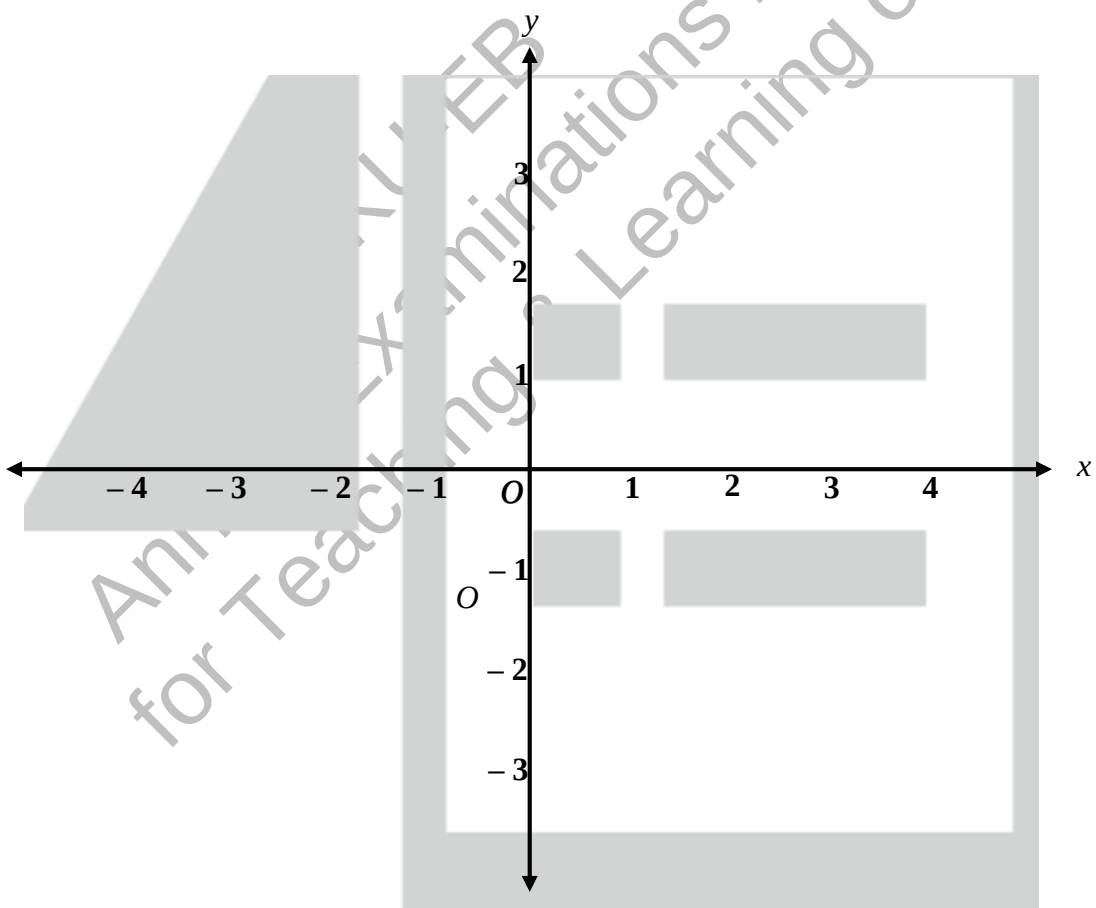
Q.7. (Total 3 Marks)

A straight line is represented by the equation $y = \frac{1}{2}x + 1$. Using this equation,

i. Complete the given table. (1 Mark)

x	-4	-2	0	
$y = \frac{1}{2}x + 1$		0	1	3

ii. Using the given table, draw the graph of the graph for $y = \frac{1}{2}x + 1$. (2 Marks)



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

Q.8. (Total 3 Marks)

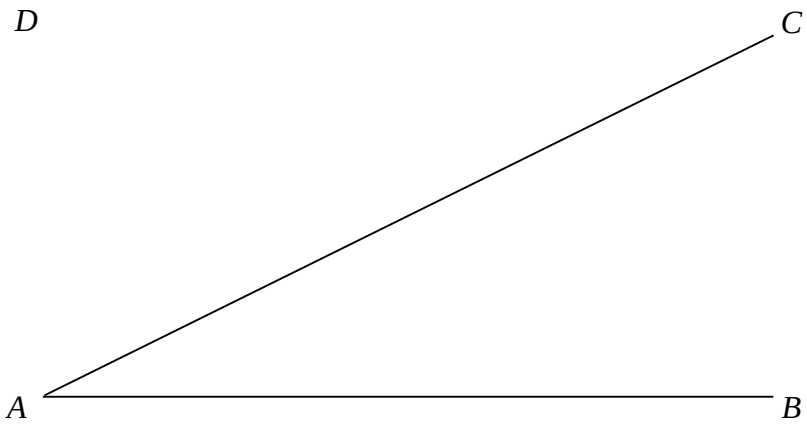
a. Use the adjoint method to find the inverse of the matrix $A = \begin{bmatrix} 1 & -1 \\ -1 & -2 \end{bmatrix}$.

b. Solve the matrix equation using Crammer's rule to find the value of x.

$$\begin{bmatrix} 2 & -1 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -1 \\ 0 \end{bmatrix}$$

Q.9. (Total 3 Marks)

The given diagram shows the diagonal *AC* and the side *AB* of a rectangle. With the help of *AC* and *AB*, draw the rectangle using compass.



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