

**AGA KHAN UNIVERSITY EXAMINATION BOARD**

**SECONDARY SCHOOL CERTIFICATE**

**CLASS IX**

**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.  
Candidate's Signature**

**RUBRIC**

2. There are EIGHT 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.

**Sets and Functions**

$$A \Delta B = (A \cup B) - (A \cap B)$$

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

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

**Real and Complex Numbers**

$$x^m \times x^n = x^{m+n}$$

$$(x \times y)^n = x^n \times y^n$$

$$(x^m)^n = x^{mn}$$

$$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$$

$$\frac{x^m}{x^n} = x^{m-n}$$

$$a^{-m} = \frac{1}{a^m}$$

**Exponents and Logarithms**

$$\log_a(m \times n) = \log_a m + \log_a n$$

$$\log_a\left(\frac{m}{n}\right) = \log_a m - \log_a n$$

$$\log_a b = n \Leftrightarrow a^n = b$$

$$\log_a(m)^n = n \log_a m$$

$$\log_a n = \log_b n \times \log_a b$$

$$\log_a n = \frac{\log_b n}{\log_b a}$$

**Algebraic Formulae & Applications and Factorisation**

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

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

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

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

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

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

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

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

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

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

**Matrices and Determinants**

$$A^{-1} = \frac{1}{|A|} \text{Adj}A$$

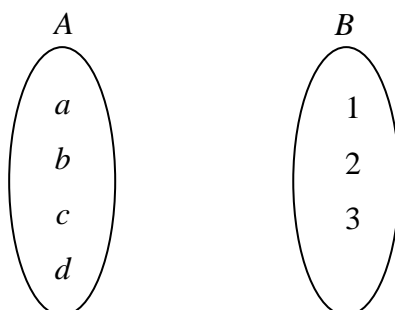
Q.1.

(Total 3 Marks)

For the given sets  $A$  and  $B$ , complete the given diagram.

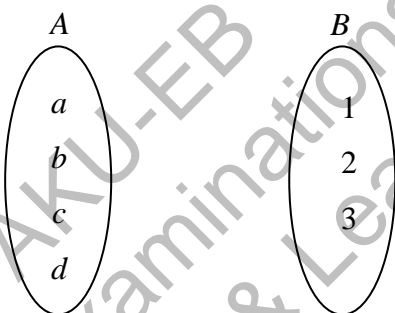
i. An onto (surjective) function from  $A$  to  $B$

(1 Mark)



ii. An into function from  $B$  to  $A$

(1 Mark)



iii. Can we write an onto function from  $B$  to  $A$ ? Justify with a reason.

(1 Mark)

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Q.2.

(Total 3 Marks)

Evaluate the value of  $x$ , if  $\log_2(x-1) + \log_2\left(\frac{1}{8}\right) = 0$ .

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

Q.3.

(Total 4 Marks)

- a. Find the continued product of the expression  $(1-2a)(1-2a+4a^2)(1+2a)(1+2a+4a^2)$ .
- b. If  $x = 2 - \sqrt{3}$ , then find the value of  $x + \frac{1}{x}$  in the simplest form.

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**(ATTEMPT EITHER PART a OR PART b OF Q.4.)**

Q.4.

(Total 4 Marks)

- Factorise  $(x^4 + 4)$  completely.
- Find the possible values of  $p$ , if  $(px - p)$  is divided by  $\left(x - \frac{4}{p}\right)$  and the remainder is  $p^2 - p$ .

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Q.5.

(Total 3 Marks)

If  $a : b :: c : d$ , then show that  $\frac{5a-3b}{5a+3b} = \frac{5c-3d}{5c+3d}$  by using  $K$ - method.

Q.6.

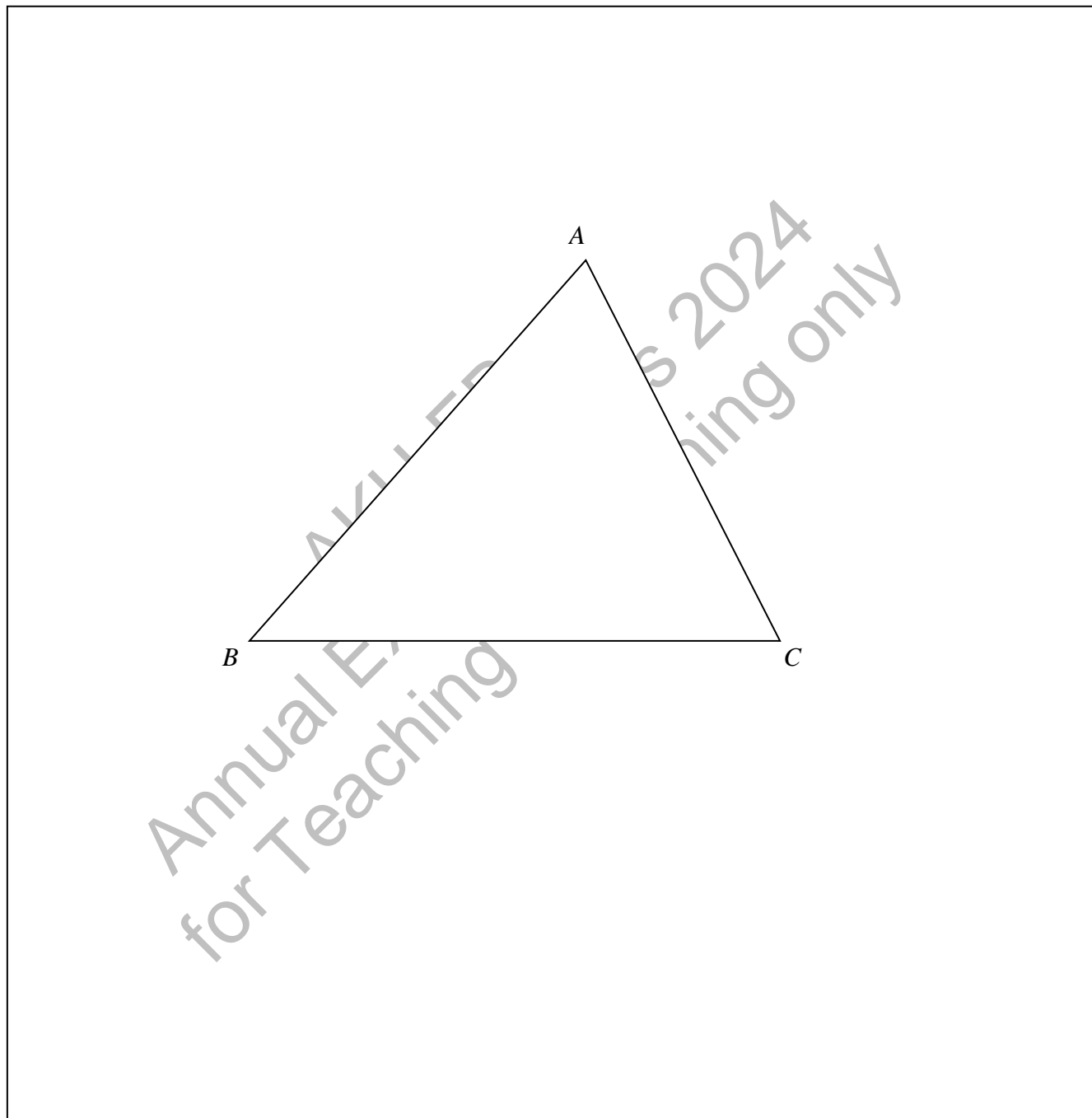
(Total 4 Marks)

If  $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ , then verify that  $(AB)^{-1} = B^{-1} \times A^{-1}$ .

Q.7.

(Total 3 Marks)

Using compass, draw the altitudes for the given triangle and identify the point of concurrency.

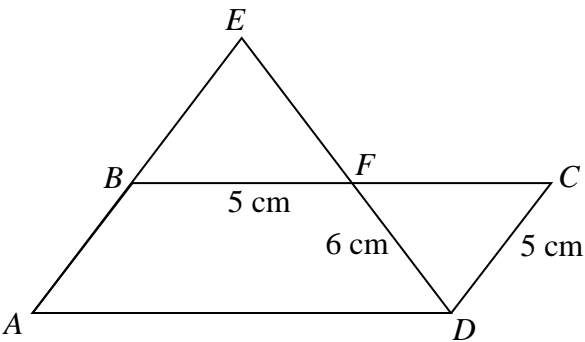


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(ATTEMPT ANY TWO PARTS OF a, b AND c OF Q.8.)

Q.8. (Total 6 Marks)

- a. In the given diagram,  $ABCD$  is a parallelogram and the side  $BC$  of the parallelogram is passing through the midpoints  $AE$  and  $ED$  of the triangle  $AED$ .



NOT TO SCALE

Find the length of

- i.  $AD$ . (1 Mark)

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- ii.  $BE$ . (1 Mark)

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- iii.  $CF$ . (1 Mark)

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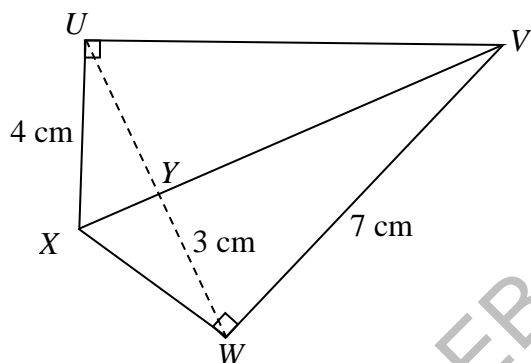


**(ATTEMPT ANY TWO PARTS OF a, b AND c OF Q.8.)**

- b. Sarah was playing with a thread connecting to pins on a soft board. The positions of the pins were labelled as  $U$ ,  $V$ ,  $W$  and  $X$ .

She measured the threads connecting the pins as  $VW = 7$  cm,  $UX = 4$  cm and  $WY = 3$  cm.

She observed that the angles  $UVX$  and  $WVX$  were equal in measurement and the thread  $XV$  bisected the thread connected to  $UW$  at right angle.



**NOT TO SCALE**

Based on the given information,

- i. find the length of the threads connecting  $U$  and  $V$ . (1 Mark)

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- ii. find the length of the threads connecting  $W$  and  $X$ . (1 Mark)

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- iii. what would be the minimum length of thread required to connect  $U$  and  $W$ ? (1 Mark)

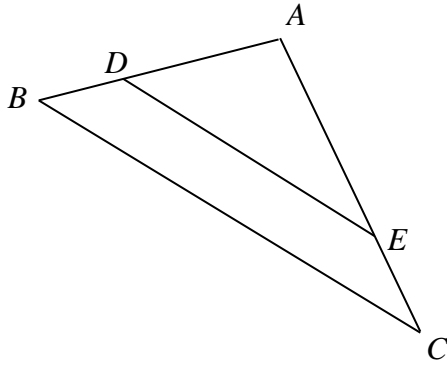
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(ATTEMPT ANY TWO PARTS OF a, b AND c OF Q.8.)

- c. In the given diagram,  $AE = 9$  cm,  $EC = 6$  cm,  $DE = 12$  cm and  $BC = 20$  cm. (3 Marks)



NOT TO SCALE

Prove that the triangles  $ADE$  and  $ABC$  are similar.

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