

AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX EXAMINATION 2008

Mathematics Paper II

Time allowed: 2 hours 20 minutes Marks 45

INSTRUCTIONS

Please read the following instructions carefully.

1. Check your name and school information. Sign that it is correct.

**I agree that this is my name and school.
Candidate's signature**

2. Write the number of the seat in which you are sitting.
3. RUBRIC. There are TWELVE questions. Answer EIGHT questions in all.
 - Attempt either Q.5. or Q.6.
 - Attempt either Q.7. or Q.8.
 - Attempt either Q.9. or Q.10.
 - Attempt either Q.11. or Q.12.
4. When answering the questions:
Read each question carefully.
Use ONLY black ink.
Do not use staples, paper clips, glue or correcting fluid.
DO NOT write outside the answer box.
Complete your answer in the allocated space only.
5. The marks for the questions are shown in brackets ().
6. You may use a simple calculator if you wish.

Q.1. (Total 6 Marks)

a. If $U = \{1, 2, 3, 4 \dots 9, 10\}$, $A = \{1, 2, 3, 4, 5\}$ and $B = \{2, 3, 6\}$, then find $(A \cap B) \times A^c$. (4 Marks)

b. (1 Mark)

i. For set $A = \{1, 2, 3\}$, write a binary relation R in $A \times A$.

ii. Write the domain of R . (1 Mark)

Q.2. (Total 4 Marks)

a. The populations of Pakistan and Bharat are approximately 167,700,000 and 1,148,000,000 respectively. Write these populations in scientific notation. (1 Mark)

- b. How many more people live in Bharat than Pakistan? (2 Marks)
(Write your answer in scientific notation)

- c. If $\log 4689$ is equal to 3.6710, then find the value of $\log 4.689$. (1 Mark)

Q.3. (Total 5 Marks)

- a. The sum of two algebraic expressions is $7x^3 - 11x^2 + 3x + 4$. If one algebraic expression is $2x^3 - 3x + 7$, find the other. (2 Marks)

- b. Prove that $(x - 1)(x + 1)(x^2 + 1)(x^4 + 1) = x^8 - 1$. (3 Marks)

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Q.4. (Total 6 Marks)
a. Solve $2y - 6 < 6y + 2$, where $y \in \mathbb{N}$. (2 Marks)

b. Solve $\sqrt{3x - 2} - 10 = 8$ and then verify the solution. (4 Marks)

(ATTEMPT EITHER Q.5. OR Q.6.)

Q.5.

(Total 7 Marks)

a. Factorise any TWO of the following.

(4 Marks)

i. $x^4y - xy^4$

ii. $12x^2 - 5x - 7$

iii. $8a^3 + 27b^3 + c^3 - 18abc$

b. Find the square root of $x^4 + 4x^3 + 2x^2 - 4x + 1$.

(3 Marks)

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(ATTEMPT EITHER Q.5. OR Q.6.)

Q.6. (Total 7 Marks)

a. Simplify (or write as a single fraction) $\frac{4}{2x-1} - \frac{3}{6x+3}$. (3 Marks)

b. Prove that $x+3$ is a factor of $x^3 - 5x + 12$. (2 Marks)

c. If $4x^2 + 8x + m$ is a perfect square, then prove that $m = 4$. (2 Marks)

(ATTEMPT EITHER Q.7. OR Q.8)

Q.7.

(Total 7 Marks)

a. Simplify $(16)^{\frac{1}{2}} \times \left(\frac{1}{8}\right)^{\frac{1}{3}}$.

(3 Marks)

b. Write an irrational number.

(1 Marks)

c. If $x = \sqrt{6} - \sqrt{5}$, then find $x + \frac{1}{x}$.

(3 Marks)

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(ATTEMPT EITHER Q.7. OR Q.8)

Q.8. (Total 7 Marks)
a. Write the additive identity for a set of real numbers. (1 Mark)

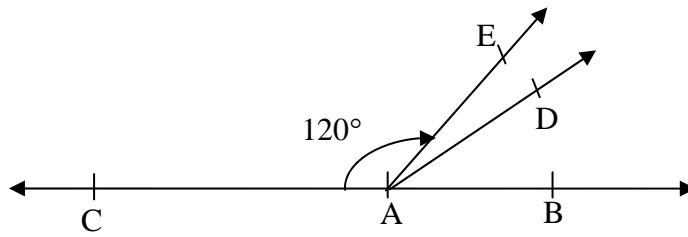
b. Write additive and multiplicative inverses of $-\frac{\sqrt{5}}{9}$. (2 Marks)

c. Simplify $\frac{8^{3m+2n+1} \times (27)^{2m+3n+1}}{6^{6m+9n+3}}$. (4 Marks)

(ATTEMPT EITHER Q.9. OR Q.10)

Q.9.

(Total 5 Marks)



Consider the above figure.

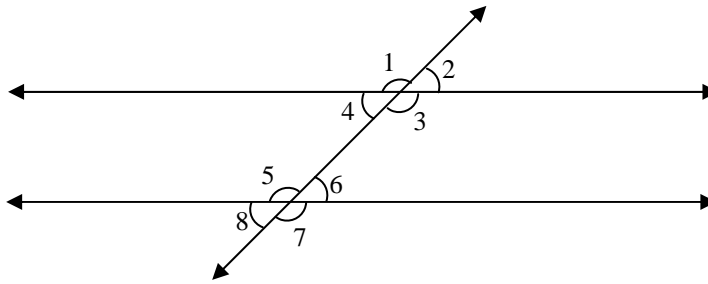
a. Name one of the pairs of adjacent angles. (1 Mark)

b. In the above figure $m\angle BAD = 2m\angle DAE$ and $m\angle CAE = 120^\circ$. Find $m\angle DAE$. (4 Marks)

(ATTEMPT EITHER Q.9. OR Q.10.)

Q.10.

(Total 5 Marks)



Consider the above figure.

a. Write one of the pairs of vertical angles. (1 Mark)

b. Write one of the pairs of adjacent angles. (1 Mark)

c. Write one of the pairs of corresponding angles. (1 Mark)

d. In the above figure if $m\angle 5 = 110^\circ$

i. Find $m\angle 7$. (1 Mark)

ii. Find $m\angle 6$. (1 Mark)

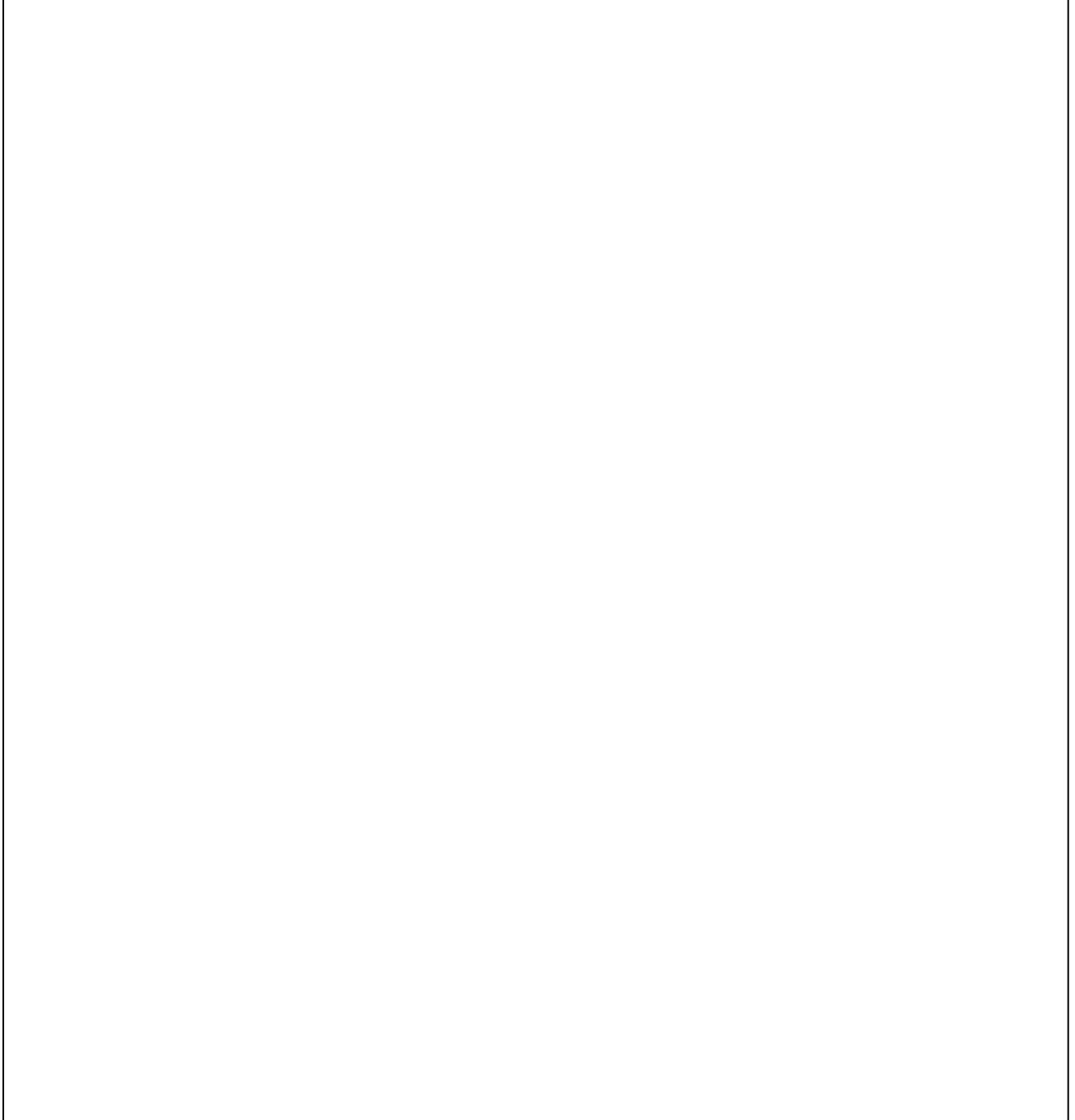
(ATTEMPT EITHER Q.11.OR Q.12.)

Q.11.

(Total 5 Marks)

a. Draw $\triangle ABC$ in which $AB = BC = CA = 6\text{cm}$. Also draw its medians.

(4 Marks)



b. Define the term, concurrent.

(1 Mark)

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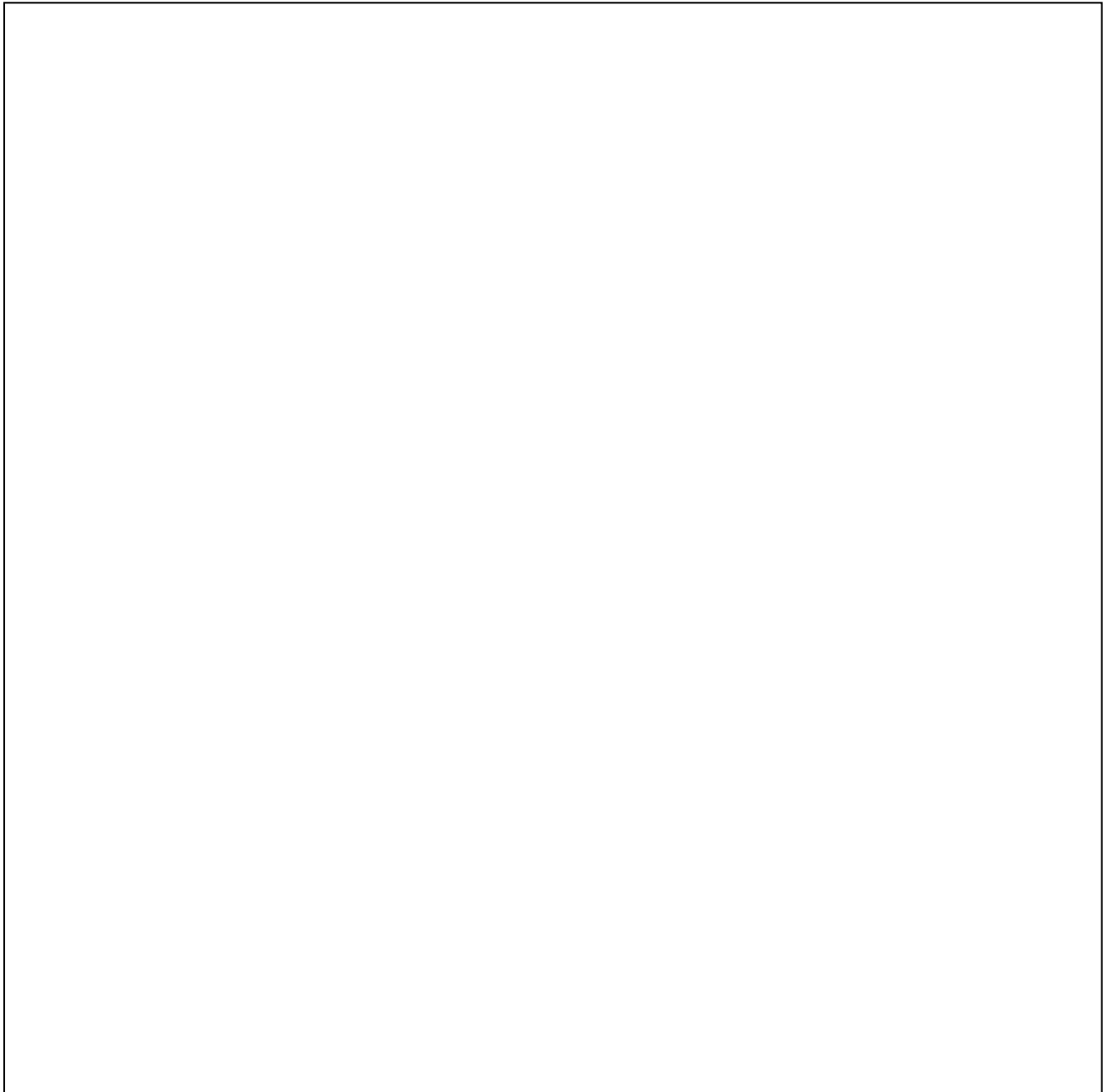
(ATTEMPT EITHER Q.11.OR Q.12.)

Q.12.

(Total 5 Marks)

a. Draw $\triangle ABC$ in which $AB = 6$ cm, $BC = 6$ cm and $CA = 5$ cm. Also draw its altitudes.

(4 Marks)



b. Are the altitudes of the above triangle concurrent? If yes, mark the point of concurrency in the above diagram.

(1 Mark)

AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX EXAMINATION 2009

Mathematics Paper II

Time allowed: 2 hours 20 minutes Marks 45

INSTRUCTIONS

Please read the following instructions carefully.

1. Check your name and school information. Sign that it is correct.

**I agree that this is my name and school.
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2. RUBRIC. There are FOURTEEN questions. Answer NINE questions in all. Choices are specified inside the paper.
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Read each question carefully.
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5. You may use a simple calculator if you wish.

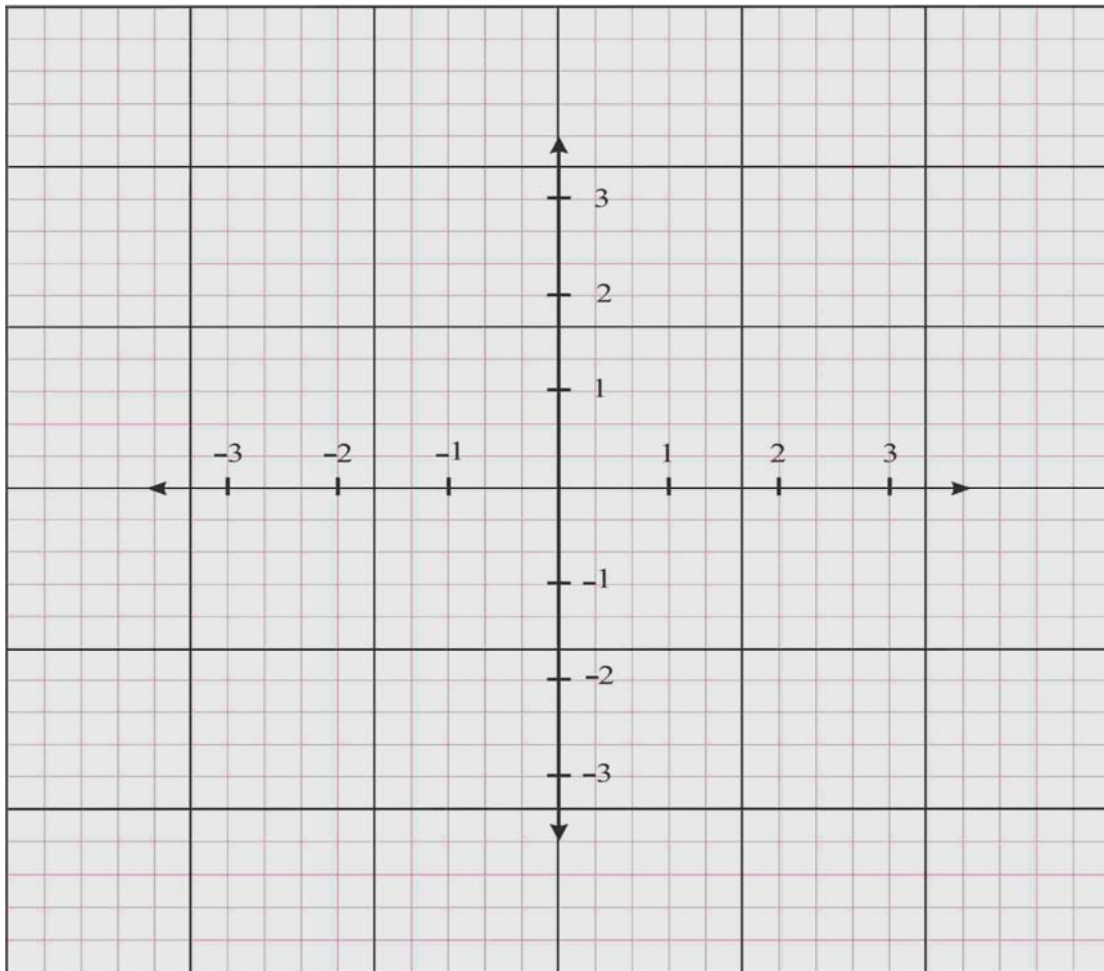
(ATTEMPT EITHER Q.1 OR Q.2)

Q.1. (Total 6 Marks)

If $A = \{-1, 2\}$ and $B = \{0, -3\}$, then

a. Find $A \times B$. (2 Marks)

b. Plot all points of $A \times B$. (2 Marks)



c. Write TWO one-one functions from A to B. (2 Marks)

(ATTEMPT EITHER Q.1 OR Q.2)

Q.2.

(Total 6 Marks)

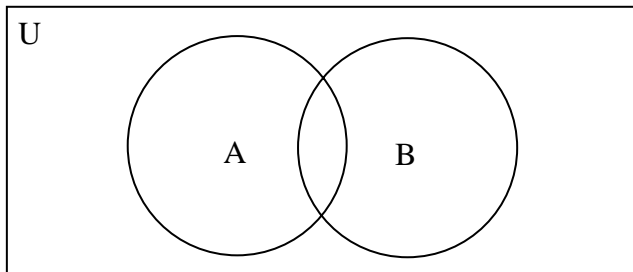
a. Write the given set $A = \{2x \mid x \in Z \wedge x - 3 \geq 2\}$ in tabular form.

(4 Marks)

b. Do as directed:

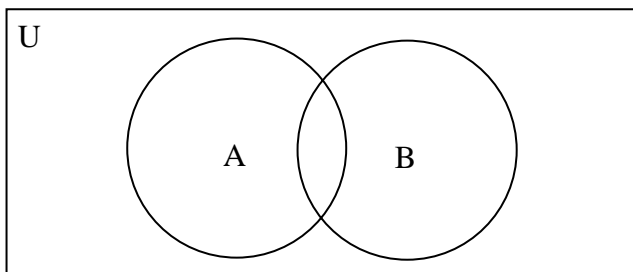
i. Shade $A \cup B$ in the following Venn diagram.

(1 Mark)



ii. Shade $(A \cup B)'$ in the following Venn diagram.

(1 Mark)



Q.3. (Total 4 Marks)

Correctly match each of the items in column A with one of the properties in column B by an arrow (→) .

Column A	Column B
$3+0=0+3=3$	Associative property w.r.t addition
$3 \times \frac{1}{3} = 1 = \frac{1}{3} \times 3$	Multiplicative inverse
$2+(3+5)=(2+3)+5$	Distributive property of multiplication over addition
$2(3+5)=2 \times 3+2 \times 5$	Additive identity

(ATTEMPT EITHER Q.4. OR Q.5.)

Q.4. (Total 3 Marks)

Simplify $\sqrt[3]{263} \times \sqrt{(256)^{\frac{1}{2}}}$.

(ATTEMPT EITHER Q.4. OR Q.5.)

Q.5. (Total 3 Marks)

Separate the rational and irrational numbers. $\sqrt{3}, \frac{22}{7}, 2.25, 1+\sqrt{2}, \sqrt{4}, 0.20200200020000200000\dots$

Rational Number	Irrational Number

Q.6.

(Total 4 Marks)

Prove that $\log_a(xy) = \log_a x + \log_a y$.

(ATTEMPT EITHER Q.7. OR Q.8.)

Q.7.

(Total 5 Marks)

Given that $(a + b)^2 = 49$ and $ab = 10$, find the values of $a - b$ and $a^2 + b^2$.

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(ATTEMPT EITHER Q.7. OR Q.8.)

Q.8. (Total 5 Marks)

a. Find and simplify the product of $(x + 1)$ and $(x^2 + x - 2)$. (2 Marks)

b. Divide $x^3 + 2x^2 + 3$ by $x^2 - 1$ to find the remainder. (3 Marks)

(ATTEMPT EITHER Q.9. OR Q.10.)

Q.9.

(Total 7 Marks)

a. Find the square root of $\frac{9}{25x^2} - \frac{y}{5x} + \frac{y^2}{36}$. (3 Marks)

b. Simplify $\frac{2(x^2 + 5x - 6) \times (x + 1)^2}{4x^2 - 4}$. (4 Marks)

(ATTEMPT EITHER Q.9. OR Q.10.)

Q.10.

(Total 7 Marks)

- a. If $x - 2$ is one of the factors of $P(x) = x^3 + x^2 - 6x$, then find the other two factors of $P(x)$.
(4 Marks)

- b. Find the Highest Common Factor (H.C.F) of $x^2 + x$ and $x^3 + 1$. (3 Marks)

(ATTEMPT EITHER Q.11. OR Q.12.)

Q.11.

(Total 6 Marks)

a. Solve $\left| \frac{1}{y-1} \right| = 5; y \neq 1.$

(3 Marks)

b. Solve $\frac{1}{y} - \frac{1}{7} < \frac{1}{7}; y \neq 0.$

(3 Marks)

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(ATTEMPT EITHER Q.11. OR Q.12.)

Q.12.

(Total 6 Marks)

a. Find the solution set of $\frac{\sqrt{x+2}}{\sqrt{2}-2} = 0$.

(3 Marks)

b. Solve the following equation:

(3 Marks)

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

Q.13.

(Total 5 Marks)

a. Find the values of x , y and z in the following figure.

(4 Marks)

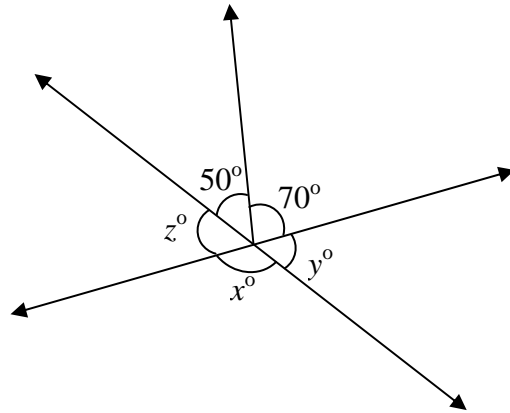


Diagram is not drawn to scale.

b. Identify ONE pair of supplementary angles in the figure given in part a above

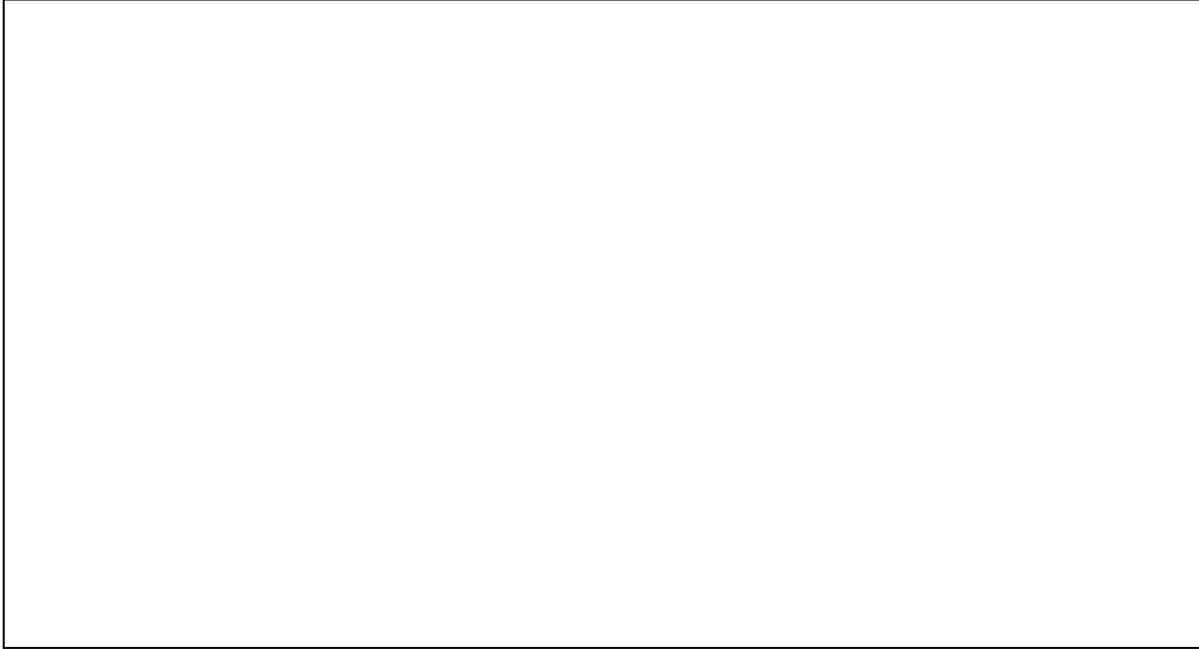
(1 Mark)

Q.14.

(Total 5 Marks)

a. Construct a right angle and its angle bisector with the help of a ruler (scale) and a compass.

(2 Marks)



b. Construct a triangle with the following measures, if possible

$m\overline{AB} = 6cm, m\overline{BC} = 2cm$ and $m\angle BAC = 35^\circ$

(3 Marks)



END OF PAPER

AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX EXAMINATION 2010

Mathematics Paper II

Time allowed: 2 hours 20 minutes Marks 45

INSTRUCTIONS

Please read the following instructions carefully.

1. Check your name and school information. Sign that it is correct.

**I agree that this is my name and school.
Candidate's signature**

2. RUBRIC. There are SEVENTEEN questions. Answer ELEVEN questions in all. Choices are specified inside the paper.
3. When answering the questions:

Read each question carefully.
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. You may use a simple calculator if you wish.

(ATTEMPT EITHER Q.1 OR Q.2)

Q.1. (Total 4 Marks)

a. Find TWO rational numbers between 0 and 1 if they exist. Write your answer in fraction form. (2 Marks)

b. Simplify $a^2 \times a^{\frac{3}{4}} \times a^{\frac{1}{4}}$. (2 Marks)

(ATTEMPT EITHER Q.1 OR Q.2)

Q.2. (Total 4 Marks)

If $z = 2 + 3i$ is a complex number, then find:

a. conjugate of z (i.e. \bar{z}) (1 Mark)

b. $z + \bar{z}$ (1 Mark)

c. $z \times \bar{z}$ (2 Marks)

(ATTEMPT EITHER Q.3 OR Q.4)

Q.3.

(Total 4 Marks)

a. List the members of the set A , where $A = \{\text{whole numbers divisible by } 3\}$. (1 Mark)



b. If $B = \{1,3,5,7\}$ and $C = \{2,8,10,12\}$, then find $(B \cup C) - (B \cap C)$. (3 Marks)



(ATTEMPT EITHER Q.3 OR Q.4)

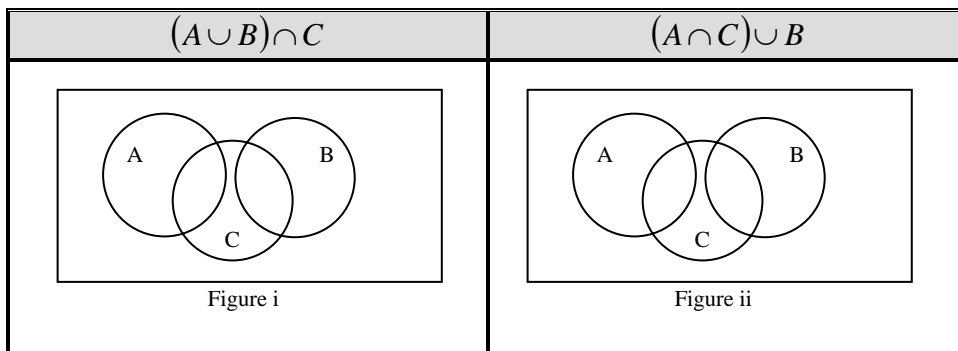
Q.4.

(Total 4 Marks)

Consider the Venn diagrams given in figure i and figure ii. Shade the (i) and (ii) in pencil.

(i) $(A \cup B) \cap C$ (Shade the region $(A \cup B)$ as  and $(A \cup B) \cap C$ as )

(ii) $(A \cap C) \cup B$ (Shade the region $(A \cap C)$ as  and $(A \cap C) \cup B$ as )



Q.5.

(Total 3 Marks)

If $\log(mn) = 2 \log m$, then prove that $m = n$.

(ATTEMPT EITHER Q.6 OR Q.7)

Q.6.

(Total 4 Marks)

Reduce $\frac{x^2 + 2x - 3}{x^2 - 3x + 2}$ to its lowest form.

(ATTEMPT EITHER Q.6 OR Q.7)

Q.7.

(Total 4 Marks)

Prove that $\frac{x+1}{x-1} + \frac{x-1}{x+1} = 2 + \frac{4}{x^2-1}$.

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(ATTEMPT EITHER Q.8 OR Q.9)

Q.8. (Total 5 Marks)

a. If x^4 is divided by $x - 3$, then find its remainder. (2 Marks)

b. Factorize completely $16a^4 + 4b^4$. (3 Marks)

(ATTEMPT EITHER Q.8 OR Q.9)

Q.9. (Total 5 Marks)

a. Factorize completely $6p^2 - 17pq + 10q^2$. (3 Marks)

b. Factorize completely $(c + 2)^2 - 4$. (2 Marks)

(ATTEMPT EITHER Q.10 OR Q.11)

Q.10.

(Total 4 Marks)

56 electronic markers are required to assess 1,75,000 scripts in 8 days while working for 5 hours daily. How many e-markers are required for assessing 2,00,000 scripts in 10 days working for 4 hours a day? [assuming rate of script assessment is constant]

(ATTEMPT EITHER Q.10 OR Q.11)

Q.11.

(Total 4 Marks)

If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f}$, then prove that $\frac{c}{d} = \sqrt{\frac{a^2 - c^2 + e^2}{b^2 - d^2 + f^2}}$.

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Q.12.

(Total 5 Marks)

If $A \times B = I$ where $A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then find matrix B .

Q.13. (Total 4 Marks)

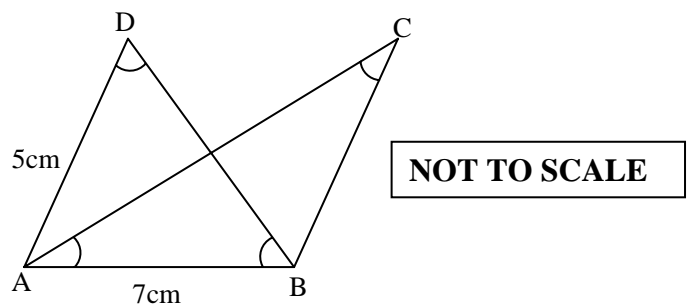
100 students participated in a drawing competition. The participants were marked out of 50. The table below shows information about the participants' marks.

Calculate the arithmetic mean of the average marks obtained by the participants in the competition.

Marks	Number of Participants		
1 – 10	9		
11 – 20	13		
21 – 30	15		
31 – 40	36		
41 – 50	27		
Total			

Q.14. (Total 4 Marks)

In the following figure, $\angle BAC \cong \angle ABD$, $\angle ADB \cong \angle ACB$ and perimeter (sum of all sides) of the $\triangle ABC$ is 20cm. Find $m\overline{BD}$.

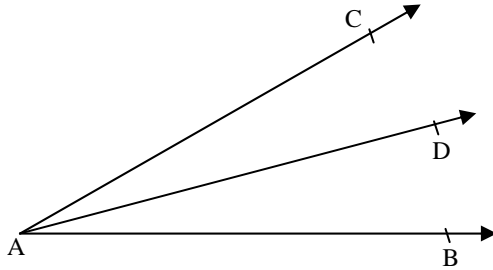


(ATTEMPT EITHER Q.15 OR Q.16)

Q.15.

(Total 4 Marks)

In the following figure, AD is the angle bisector of $\angle BAC$. If P and Q are any two distinct points lying on the angle bisector AD, then write True or False for each statement in the given box.



(i) P and Q are always collinear

(ii) P and Q are always equidistant from any point on AD

(iii) P and Q are equidistant from AB

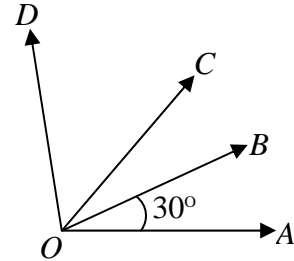
(iv) If QB and QC are perpendicular to AB and AC respectively, then $m\overline{QC} = m\overline{QB}$

(ATTEMPT EITHER Q.15 OR Q.16)

Q.16.

(Total 4 Marks)

In the following figure, OB and OC are angle bisectors of $\angle COA$ and $\angle DOA$ respectively. Find the $m\angle DOC$ and $m\angle DOA$.



Q.17.

(Total 4 Marks)

Construct a triangle ABC with $mAB = 6\text{cm}$, $m\angle A = 60^\circ$ and $m\angle B = 70^\circ$. Also verify that medians of the given triangle are concurrent.

AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX EXAMINATION

MAY 2011

Mathematics Paper II

Time allowed: 2 hours 20 minutes Marks 45

INSTRUCTIONS

Please read the following instructions carefully.

1. Check your name and school information. Sign that it is correct.

**I agree that this is my name and school.
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4. The marks for the questions are shown in brackets ().
5. You may use a simple calculator if you wish.

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

Q.1. (Total 4 Marks)

a. Prove that $\left[\left(\frac{x^2}{y^2} \right)^{\frac{2}{3}} \right]^{-\frac{3}{4}} = \frac{y}{x}$.

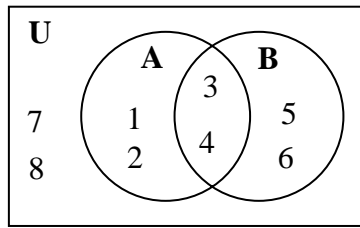
b. Divide $2+3i$ by $1+i$ and separate real and imaginary parts of the answer.

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

Q.2. (Total 4 Marks)

a. If $A = \{1,3,5,7,9\}$ and $B = \{7,9,10,11\}$, then find $(A \cup B) - (A \cap B)$ and $(A \cap B) - (A \cup B)$. (4 Marks)

b. For the given Venn diagram:



i. shade $(A \cup B)'$.

(1 Mark)

ii. find $A' \cap B'$.

(2 Marks)

iii. compare the results of i and ii and write a relation between $(A \cup B)'$ and $A' \cap B'$. (1 Mark)

Q.3.

(Total 3 Marks)

Find the value of x for $\log_4(3x - 3) = \frac{1}{2}$.

(ATTEMPT EITHER Q.4. OR Q.5.)

Q.4. (Total 4 Marks)

a. If $a + b + c = 16$ and $ab + bc + ca = 56$, then find the value of $a^2 + b^2 + c^2$. (3 Marks)

b. If $x = 2$, then find the value of $x^3 - 1$. (1 Mark)

(ATTEMPT EITHER Q.4. OR Q.5.)

Q.5. (Total 4 Marks)

Prove that $(a + b)(a - b)(a^2 + ab + b^2)(a^2 - ab + b^2) = a^6 - b^6$.

(ATTEMPT EITHER Q.6. OR Q.7.)

Q.6.

(Total 5 Marks)

Factorize the following completely:

i. $(a + b)^2 - 49$

(2 Marks)

ii. $20x^2y - 20xy + 5y$

(3 Marks)

(ATTEMPT EITHER Q.6. OR Q.7.)

Q.7.

(Total 5 Marks)

Factorize $(x + 1)(x + 4)(x + 2)(x + 3) - 24$ completely.

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(ATTEMPT EITHER Q.8. OR Q.9.)

Q.8. (Total 4 Marks)

a. If $4 : x :: 2x : 9$, then find the value of x . (2 Marks)

b. The model of an apartment is in the scale $1 : 40$. If the apartment is 25 meters high, then find the height of the model apartment. (2 Marks)

(ATTEMPT EITHER Q.8. OR Q.9.)

Q.9. (Total 4 Marks)

Find the value of x for $\frac{\sqrt{x+3} - \sqrt{x-3}}{\sqrt{x+3} + \sqrt{x-3}} = \frac{2}{3}$.

Q.10.

(Total 5 Marks)

Prove that the product of matrix $\begin{bmatrix} -3 & 5 \\ -1 & 2 \end{bmatrix}$ and its inverse is equal to unit matrix.

Q.11.

(Total 4 Marks)

The thickness of 8 randomly selected steel strips is shown below:

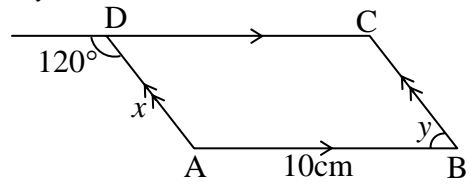
Sample	1	2	3	4	5	6	7	8
Thickness (in mm)	17.5	17.6	18.3	18.5	18.5	18.6	19.1	19.3

Find the standard deviation in thickness of the steel strips.

Q.12.

(Total 4 Marks)

The perimeter of the given parallelogram $ABCD$ is 38 cm. Find x and y .



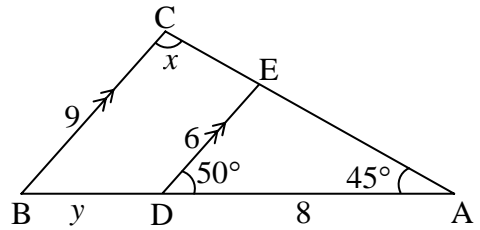
(ATTEMPT EITHER PART a OR PART b OF Q.13.)

Q.13.

(Total 4 Marks)

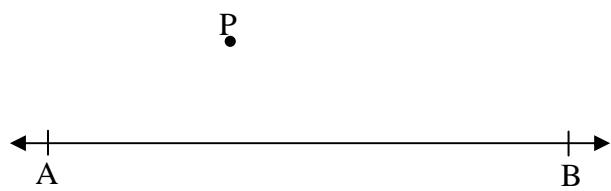
a. In the following diagram BC is parallel to DE . Find the values of x and y .

(4 Marks)



b. If a point C is lying on line AB , then construct a line PC such that PC is the shortest distance between point P and line AB . Also write measurement of \overline{PC} .

(4 Marks)



Q.14.

(Total 4 Marks)

Construct a triangle ABC with $mAB = 6\text{cm}$, $m\angle A = 50^\circ$ and $m\angle B = 60^\circ$. Also draw two medians of the triangle ABC .



END OF PAPER

AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX EXAMINATION

MAY 2012

Mathematics Paper II

Time allowed: 2 hours 20 minutes Marks 45

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4. The marks for the questions are shown in brackets ().
5. You may use a simple calculator if you wish.

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

Q.1. (Total 4 Marks)

a.

i. Write multiplicative and additive inverse of $-\frac{1}{\sqrt{2}}$. (2 Marks)

ii. If $z = a + ib$, then find \bar{z} and $z + \bar{z}$, where \bar{z} is the conjugate of z . (2 Marks)

b. Simplify $\frac{\sqrt[4]{16x^8y^4}}{\sqrt{16x^4y^2}}$. (4 Marks)

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

Q.2.

(Total 4 Marks)

a. If $A = \{1, 2, 3, 4, 5\}$ and $B = \{3, 4, 5, 6, 7\}$, then find $A \Delta B$.

Where $A \Delta B = (A \cup B) - (A \cap B)$. Also represent $A \Delta B$ through a Venn diagram. (4 Marks)

b. If $A = \{2, 4, 5\}$ and $B = \{x, y\}$, then

i. find $A \times B$.

(2 Marks)

ii. write one binary relation from A to B containing three elements. Also write its range.

(2 Marks)

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Q.3.

(Total 3 Marks)

Find the value of a if $\log_a 343 = 3$.

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

Q.4.

(Total 4 Marks)

a.

- i. Find the value of $\frac{xy^2 - x^2y}{x^2 + y^2}$ when $x = 2$ and $y = -1$. (2 Marks)

- ii. Simplify $\frac{(x + y)^2 - (x - y)^2}{2x^2y^2}$. (2 Marks)

b.

- i. Write the conjugate of $\sqrt{2} - \sqrt{3}$. (1 Mark)

- ii. If $a - b = 1$ and $a^3 - b^3 = 19$, then find the value of $3ab$. (3 Marks)

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(ATTEMPT EITHER PART a OR PART b OF Q.5.)

Q.5. (Total 5 Marks)

a. Factorize $(x^4 + 4)$ completely. (5 Marks)

b.
i. Factorize $(24t^3 - 3)$ completely. (3 Marks)

ii. Factorize $(9x^2 - 16)$ completely. (2 Marks)

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

Q.6.

(Total 4 Marks)

- a. If t is inversely proportional to the square root of r and it is known that $t = 9$ for $r = 16$, then find the value of t when $r = 36$.

- b. If $a : b :: c : d$, then prove that $3a + 7b : 3c + 7d :: 3a - 7b : 3c - 7d$.

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Q.7. (Total 5 Marks)

i. If $A^{-1} = \begin{bmatrix} 5 & 7 \\ 2 & 3 \end{bmatrix}$ and $|A| = 1$, then find matrix A . (3 Marks)

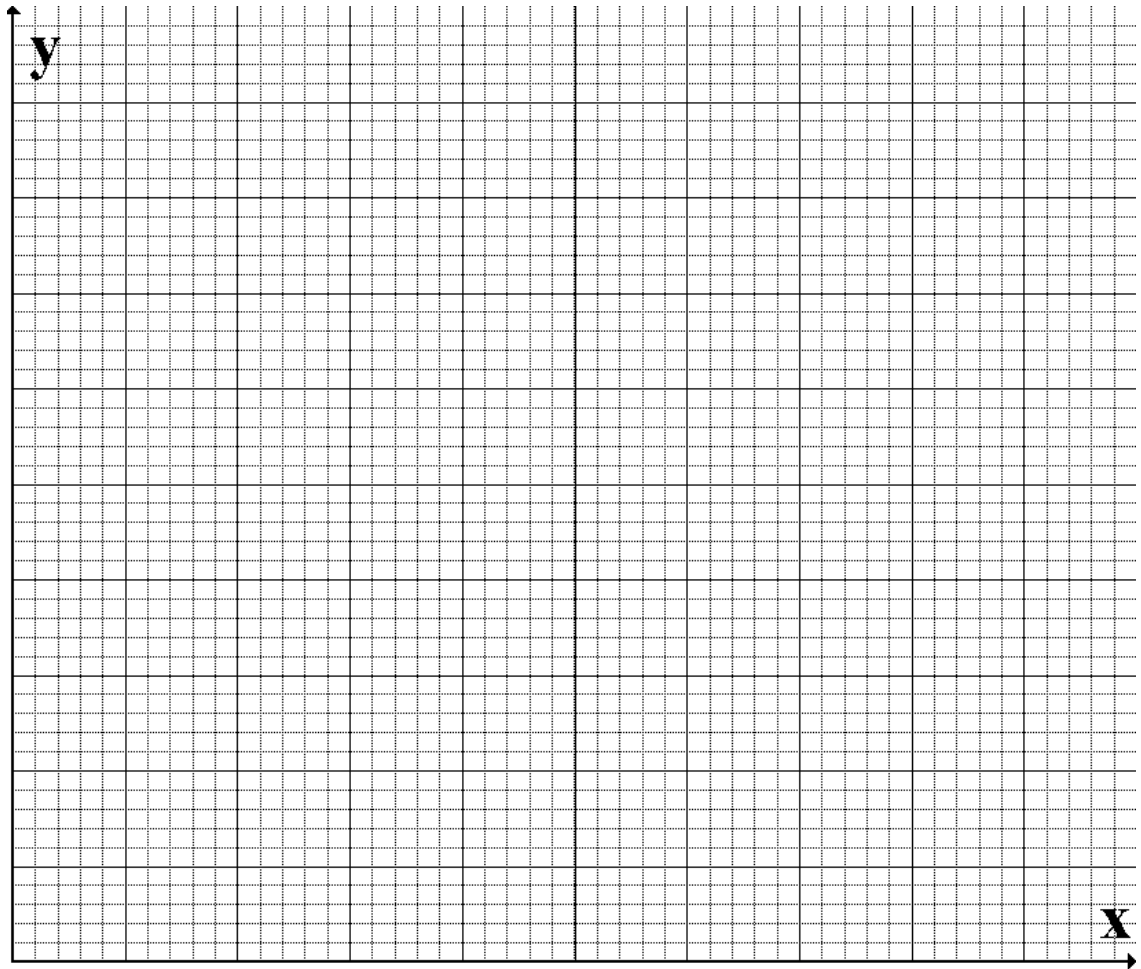
ii. If $\begin{bmatrix} 2 & 3 \\ 9 & 8 \end{bmatrix} + B = \begin{bmatrix} 3 & 3 \\ 9 & 9 \end{bmatrix}$, then find B . (2 Marks)

Q.8.

(Total 4 Marks)

Complete the following table and draw a cumulative frequency polygon for the height of 80 plants.

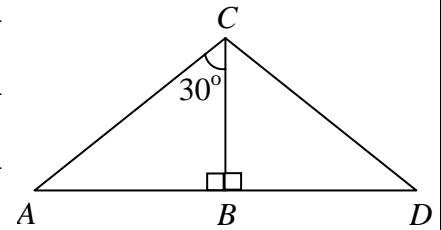
Height (cm)	Number of plants		
5 – 10	5		
11 – 16	15		
17 – 22	25		
23 – 28	20		
29 – 34	15		



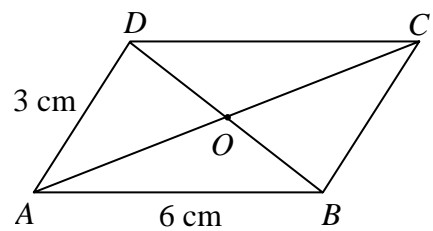
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Q.9. (Total 4 Marks)

i. If $\triangle ABC \cong \triangle BCD$, then find $m \angle D$. Also justify your answer. (2 Marks)



ii. In the given diagram ABCD is the parallelogram. If $m \overline{AC} = b$ cm and $m \overline{BD} = a$ cm, then find $m \overline{BC}$ and $m \overline{OA}$. Also justify your answer. (2 Marks)



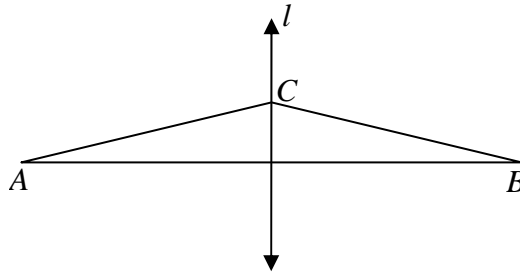
(ATTEMPT EITHER PART a OR PART b OF Q.10.)

Q.10.

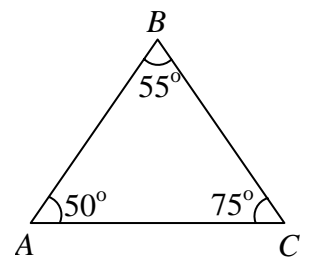
(Total 4 Marks)

a.

- i. If $m \overline{AB} = 8 \text{ cm}$, $m \overline{AC} = 5 \text{ cm}$ and l is the right bisector of \overline{AB} , then find $m \overline{BC}$.
Also justify your answer. (2 Marks)



- ii. Identify the smallest side of the triangle ABC. Also justify your answer. (2 Marks)

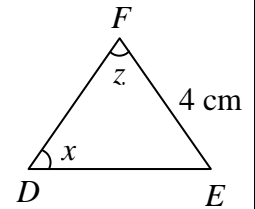
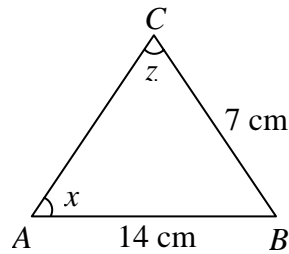


(ATTEMPT EITHER PART a OR PART b OF Q.10.)

b.

i. Are $4\sqrt{3}$, $4\sqrt{3}$ and $8\sqrt{3}$ sides of a triangle? Also justify your answer. (2 Marks)

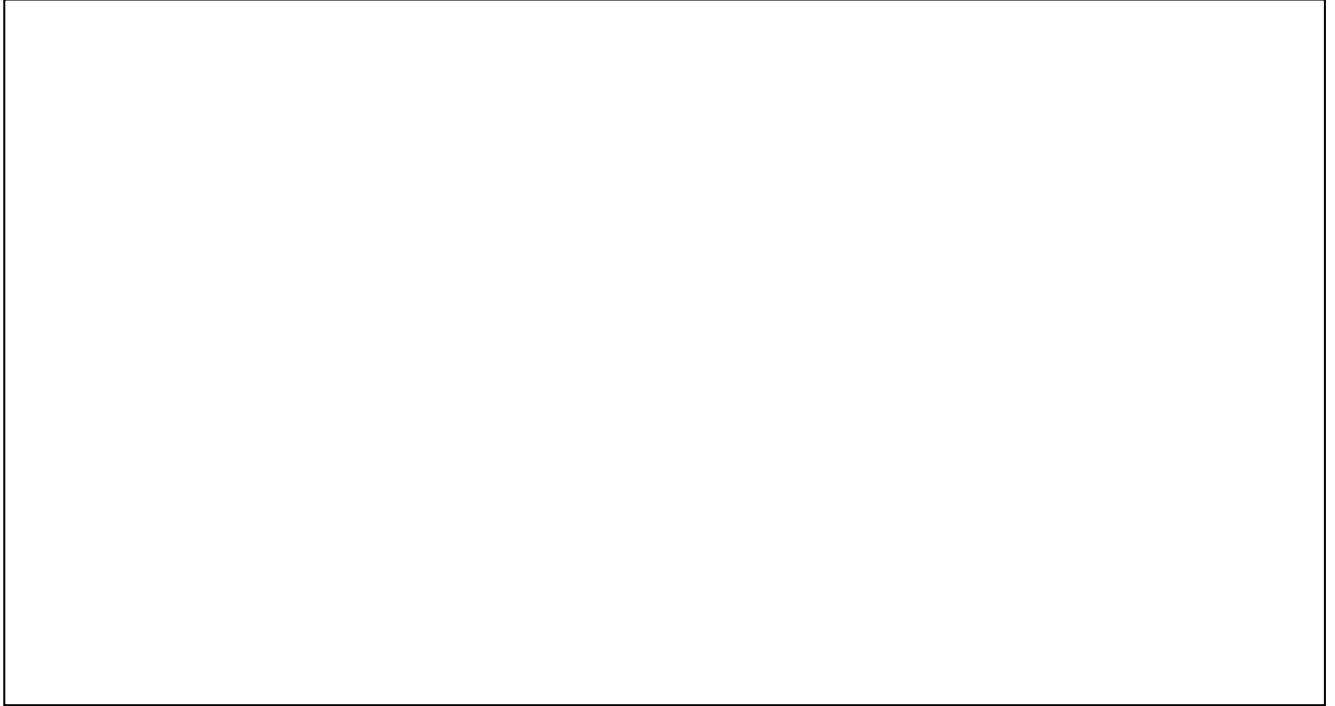
ii. If $\triangle ABC$ is similar to $\triangle DEF$, then find $m\overline{DE}$. (2 Marks)



Q.11.

(Total 4 Marks)

Construct a triangle ABC with $m \overline{AB} = 6 \text{ cm}$, $m \angle A = 50^\circ$ and $m \angle B = 60^\circ$.
Also draw perpendicular bisectors of any two sides of the triangle.



END OF PAPER

AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX EXAMINATION

MAY 2013

Mathematics Paper II

Time: 2 hours 20 minutes Marks: 45

INSTRUCTIONS

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

Q.1. (Total 4 Marks)

a. If $\bar{w} = -2 - i$ is a complex number, then find

i. w (1 Mark)

ii. $\bar{w} \div w$ (3 Marks)

b. Evaluate $\sqrt[3]{512} + \frac{64}{\sqrt{64}} \times \sqrt[3]{10^6} - 16$ (4 Marks)

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

Q.2.

(Total 4 Marks)

a. Given that $A = \{x \mid x \text{ is an integer greater than or equal to zero}\}$.

Write set B whose elements are x^2 , where $x \in A$. Also find $A \cup B$ and $A \cap B$.

b. If $T = \{0, \phi\}$ and $R = \{\phi\}$, then find $[T \cup (T - R)] \cap (R - T)$.

Q.3.

(Total 3 Marks)

If $\log_a \sqrt{m - 2} = 1$, then find m in terms of a , where $a > 0$ and $a \neq 1$.

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

Q.4.

(Total 4 Marks)

a. Show that $1 - \frac{\sqrt{a}}{1 + \sqrt{a}}$ can also be written as $\frac{1 - \sqrt{a}}{1 - a}$.

b. If $3pq = -15$ and $(p - q)^3 = 216$, then find the value of $p^3 - q^3$.

(ATTEMPT EITHER PART a OR PART b OF Q.5.)

Q.5.

(Total 5 Marks)

- a. Find the possible values of p , if $(px - p)$ is divided by $\left(x - \frac{4}{p}\right)$ and the remainder is $p^2 - p$.
- b. Factorize $25a^6 - 25b^6$ completely.

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

Q.6. (Total 4 Marks)

a. If $\sqrt{y} \propto \sqrt{x}$ and $y = x = a^2$, then find the equation connecting x and y .

Hence, find the value of y when $x = \frac{a^2}{4}$.

b. If $\frac{c}{p} = \frac{d}{q} = \frac{e}{r}$, then show that $\frac{c+e}{p+r} = \frac{c+d}{p+q}$.

Q.7.

(Total 5 Marks)

Given that the matrix $M = \begin{bmatrix} \frac{3}{2} & -1 \\ P & 2 \end{bmatrix}$ and $N = \begin{bmatrix} 1 & 3 & 1 \\ 2 & 3 & 2 \end{bmatrix}$.

i. Find the determinant of the matrix M in terms of p . (1 Mark)

ii. If M is a singular matrix, then find the value of p . (2 Marks)

iii. Find if possible the transpose of the matrix $N \times M$. Give a reason to support your answer. (1 Mark)

iv. Why can the determinant of the matrix N NOT be determined? (1 Mark)

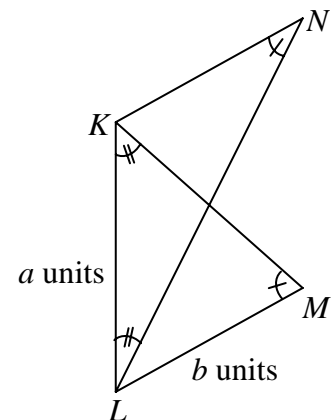
Q.8. (Total 4 Marks)

Fill in the missing entries in the given table. Hence, find the arithmetic mean for the given data.

Marks	Number of Candidates	Class Mark (x)	fx
1 – 5	9	3	
6 – 10	13	8	104
11 – 15		13	195
16 – 20		18	
21 – 25	27	23	621
Total	100		1595

Q.9. (Total 4 Marks)

Given that $\triangle LKM$ is congruent to $\triangle KLN$ as shown in the diagram. Find $m \overline{KM}$ and $m \overline{NL}$ if the sum of all the sides of the $\triangle KLN$ is 15 units. Also give reasons for all the necessary steps.



(ATTEMPT EITHER PART a OR PART b OF Q.10.)

Q.10.

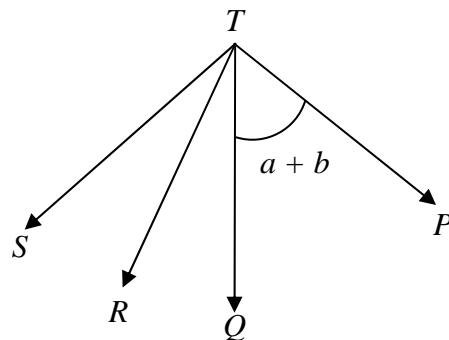
(Total 4 Marks)

a. Given that TQ and TR are the angle bisectors of $\angle STP$ and $\angle STQ$ respectively, as shown in the diagram, find

- i. $m \angle STR$
- ii. $m \angle STP$

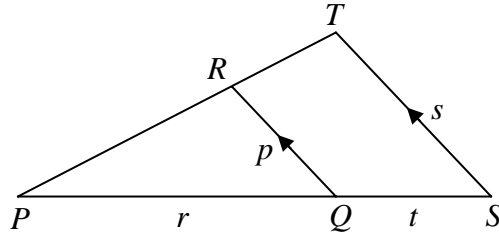
Give a reason for each of your answers.

(4 Marks)



(ATTEMPT EITHER PART a OR PART b OF Q.10.)

b. The given diagram shows ΔPRQ is similar to ΔPTS .



Comprehend the diagram and complete the following statements.

i. $m\angle PRQ$ is equal to (1 Mark)

ii. ΔRPQ is similar to (1 Mark)

iii. $\frac{PR}{PT}$ is equal to (1 Mark)

iv. $\frac{p}{s}$ is equal to (1 Mark)

Q.11.

(Total 4 Marks)

Draw an equilateral triangle ABC whose one side measures 5 cm.
Hence, draw any TWO altitudes of the triangle.



END OF PAPER

AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX EXAMINATION

MAY 2014

Mathematics Paper II

Time: 2 hours 20 minutes Marks: 45

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5. You may use a simple calculator if you wish.

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

(Total 4 Marks)

Q.1.

a. Prove that $\frac{2 - 2\sqrt{-1}}{2i} = -1 - i$

b. Simplify $\sqrt{\frac{32a^2b^3c^6}{2b^{-3}c^2}}$

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

Q.2.

(Total 4 Marks)

a. If $A = \{1, 2, 3, 4\}$, $B = \{2, 6, 4\}$ and $C = \{4, 6, 8\}$, then prove that $A \cup (B \cap C) = (A \cup B) \cap C$

(4 Marks)

b. For $A = \{0, 1, 3\}$ and $B = \{-1, 0\}$ do as directed.

i. Find $A \times B$

(1 Mark)

ii. Find a function from A to B

(1 Mark)

iii. Find domain of the function

(1 Mark)

iv. Find range of the function

(1 Mark)

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Q.3. (Total 3 Marks)

If $\log_x 729 = 3$, then find the value of x .

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

Q.4.

(Total 4 Marks)

a.

i. Evaluate $\frac{x^2y - 2z^3}{2x^2z}$ for $x = -1, y = 1$ and $z = 2$ (2 Marks)

ii. Simplify $(x^2 - 4) \times \frac{x+2}{x-2}$ (2 Marks)

b. Simplify $(\sqrt{a} + \frac{1}{\sqrt{b}})(\sqrt{a} - \frac{1}{\sqrt{b}})(a + \frac{1}{b})(a^2 + \frac{1}{b^2})$ (4 Marks)

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Q.7. (Total 5 Marks)

Find the inverse of the matrix $\begin{bmatrix} -3 & 5 \\ -1 & 2 \end{bmatrix}$. Verify that the product of the matrix and its inverse is equal to the unit matrix.

Q.8. (Total 4 Marks)

The given table shows information about the height (in centimetres) of 150 plants.

Height (in cm)	Frequency	
20 – 29	7	
30 – 39	13	
40 – 49	70	
50 – 59	40	
60 – 69	20	

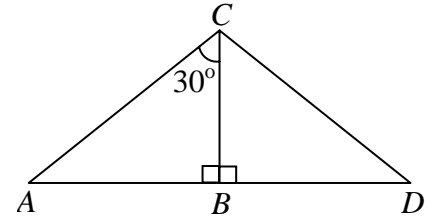
Complete the above table and draw a histogram.

Q.9.

(Total 4 Marks)

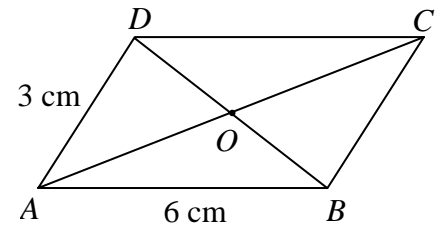
i. If $\triangle ABC \cong \triangle DBC$, then find $m\angle D$. Also justify your answer.

(2 Marks)



ii. In the given diagram if $ABCD$ is the parallelogram having $m\overline{AC} = b$ cm and $m\overline{BD} = a$ cm, then find $m\overline{BC}$ and $m\overline{OA}$. Also justify your answer.

(2 Marks)

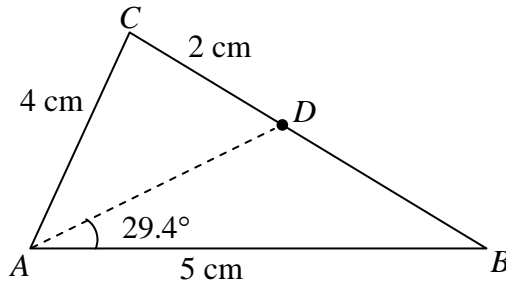


(ATTEMPT EITHER PART a OR PART b OF Q.10.)

Q.10.

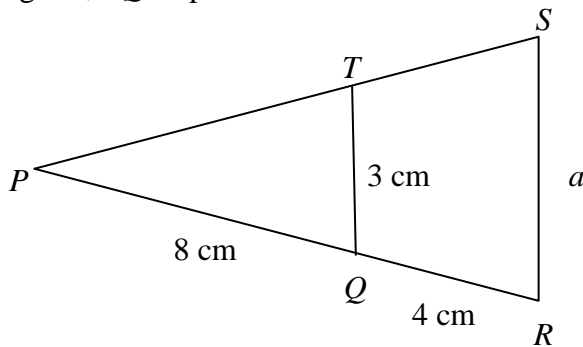
(Total 4 Marks)

- a. In the given $\triangle ABC$, if \overline{AD} is the angle bisector of $\angle BAC$ and $m\overline{CD} = 2\text{cm}$, then find $m\overline{DB}$, $m\angle CAD$ and name the largest angle of the triangle $\triangle ABC$.



NOT TO SCALE

- b. In the given diagram, \overline{TQ} is parallel to \overline{SR} .



NOT TO SCALE

Find the value of a and also write ratio of \overline{PT} to \overline{TS} .

Q.11.

(Total 4 Marks)

Construct a $\triangle ABC$ with $m\overline{AB} = 6\text{cm}$, $m\angle A = 60^\circ$ and $m\overline{BC} = 7\text{cm}$. Also draw the angle bisector of $\angle C$.



END OF PAPER

AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX EXAMINATION

MAY 2015

Mathematics Paper II

Time: 2 hours 20 minutes Marks: 45

INSTRUCTIONS

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4. The marks for the questions are shown in brackets ().
5. You may use a simple calculator if you wish.

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

(Total 4 Marks)

Q.1.

a. Simplify $z = \frac{1}{-1+i} + 1 - 4i$ and express z in the form of $a + ib$.

b. Simplify $\sqrt{\frac{128m^{-3}n^3}{2m^{-7}n^9}}$, giving your answer in **positive** exponents.

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

Q.2.

(Total 4 Marks)

a. Two sets A and B are defined as $A = \{1, 2\}$ and $B = \{0, 1, 2\}$.

i. Find the cartesian product $A \times B$.

(1 Mark)

ii. Is $A \times B$ a function? Write a statement to justify your answer.

(1 Mark)

iii. Write an **into** function from A to B .

(1 Mark)

iv. If R is a binary relation such that the domain of $R = \{1\}$ and the range of $R = \{1, 2\}$, write down the relation R in $A \times B$.

(1 Mark)

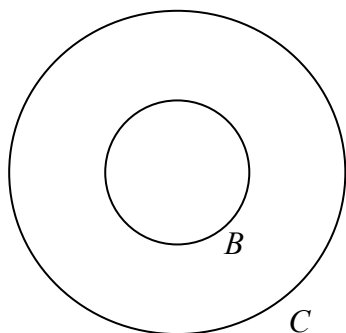
(ATTEMPT EITHER PART a OR PART b OF Q.2.)

b.

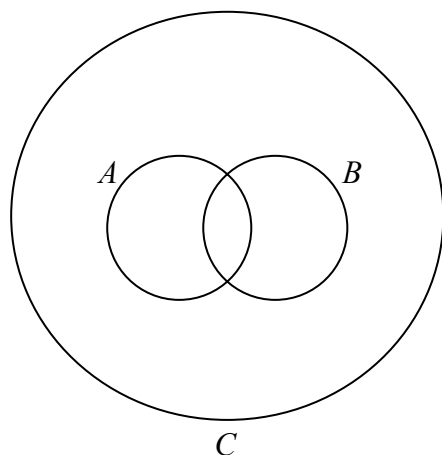
i. If $A = \{1, 3, 5, 7\}$, $B = \{2, 3, 4, 5\}$ and $C = \{1, 2, 3, 4, 5, 6, 7\}$, find $A \cap (B \cup C)$. (2 Marks)

ii. Shade the following regions in the given Venn diagrams.

I. $B \cup C$ (1 Mark)



II. $A \cap (B \cup C)$ (1 Mark)



Q.3.

(Total 3 Marks)

Find the value of x if $\frac{1}{2} \log_4(3x-2) = \frac{1}{2}$.

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

Q.4.

(Total 4 Marks)

a. If $x + \frac{1}{x} = a$, find the value of $x^3 + \frac{1}{x^3}$.

b. If the square of the sum of three quantities a, b, c is 40 and the sum of their squares is 16, find the value of $(ab + bc + ca)$.

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(ATTEMPT EITHER PART a OR PART b OF Q.5.)

Q.5. (Total 5 Marks)

a. Factorize $64 - z^6$.

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

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

Q.6.

(Total 4 Marks)

a. If t^2 is inversely proportional to s , when $s = 16$ and $t = 4$, find the value of t when $s = 4$.

(4 Marks)

b.

i. Find the value of x if $5 : 2x = 3 : 2x - 4$.

(2 Marks)

ii. If $x : y = u : v$, prove that $3x + 7y : 3x - 7y = 3u + 7v : 3u - 7v$.

(2 Marks)

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Q.8.

(Total 4 Marks)

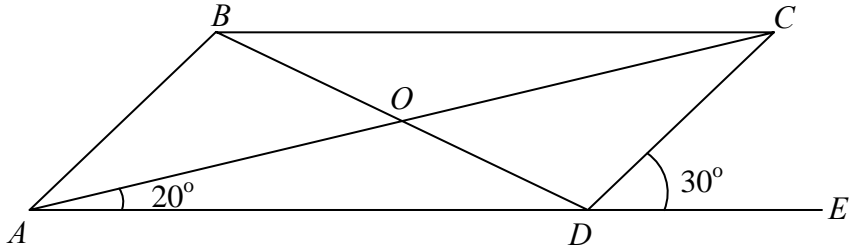
A small office has a staff of 20 employees. The distance (km) of the office from their homes is shown in the table given below. Complete the table and find the standard deviation for this data.

Distance (km)	Number of Employees	Class Mark		
1 – 4	2	2.5		
5 – 8	1	6.5		
9 – 12	6	10.5		
13 – 16	10	14.5		
17 – 20	1	18.5		
Total		–		

PLEASE TURN OVER THE PAGE

Q.9. (Total 4 Marks)

A parallelogram $ABCD$ is given below.



NOT TO SCALE

Find

i. $m\angle ABC$ (1 Mark)

ii. $m\angle OCD$ (1 Mark)

iii. $m\angle BAO$ (1 Mark)

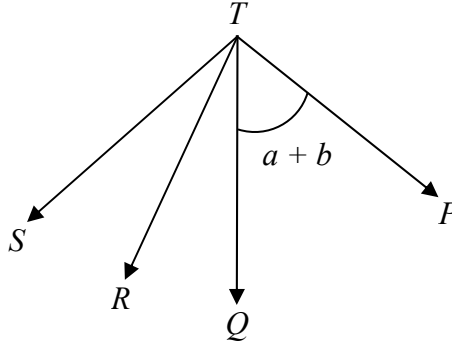
iv. $m\angle BCA$ (1 Mark)

(ATTEMPT EITHER PART a OR PART b OF Q.10.)

Q.10.

(Total 4 Marks)

- a. Given that TQ and TR are the angle bisectors of $\angle STP$ and $\angle STQ$ respectively, as shown in the diagram.



Find the following and write a statement to justify each of your answers.

i. $m\angle STR$

(2 Marks)

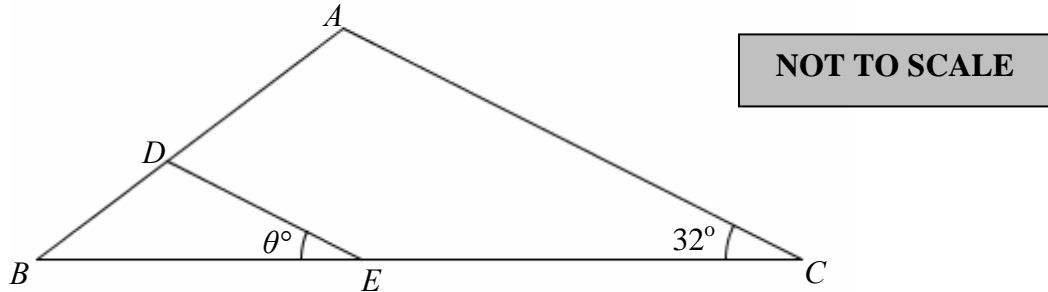
ii. $m\angle STP$

(2 Marks)

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(ATTEMPT EITHER PART a OR PART b OF Q.10.)

b.



In triangle ABC , $m\overline{AB} = 5$ cm, $m\overline{AD} = 3$ cm, $m\overline{BC} = 10$ cm, $m\overline{EC} = 6$ cm, $m\overline{AC} = 6$ cm and $m\overline{DE} = \frac{12}{5}$ cm.

i. Is triangle ABC similar to triangle DBE ? Write a statement to justify your answer. (2 Marks)

ii. Is \overline{AC} parallel to \overline{DE} ? Write a statement to justify your answer. (1 Mark)

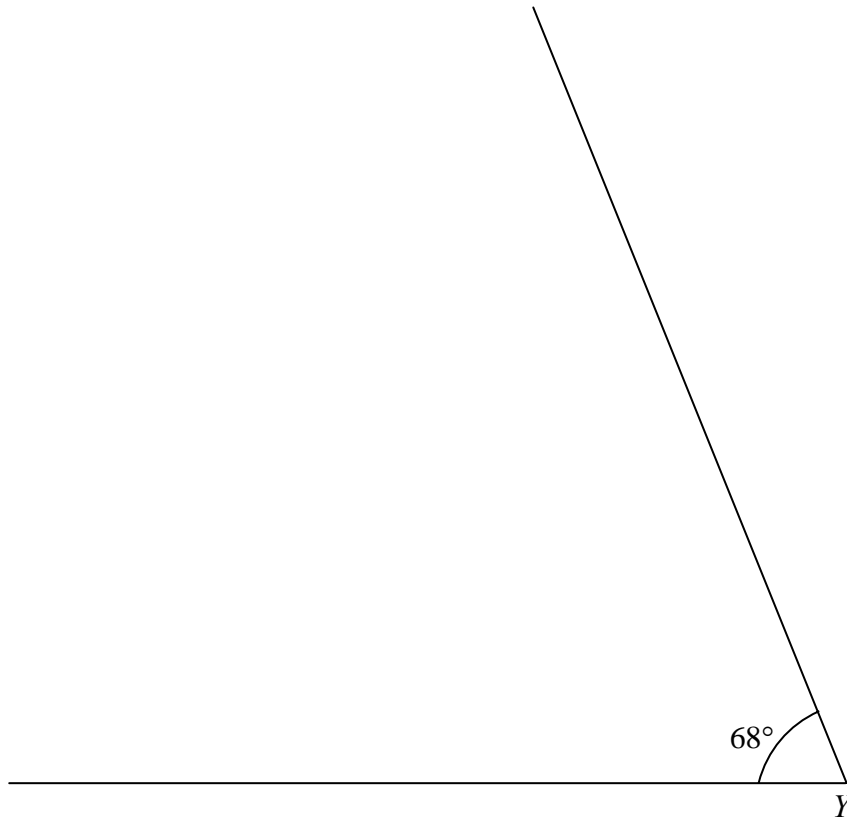
iii. Find the value of θ . (1 Mark)

Q.11.

(Total 4 Marks)

Given below is an incomplete scaled diagram of a triangle XYZ such that $m \overline{XY} = 8.8$ cm, $m\angle X = 56^\circ$ and $m\angle Y = 68^\circ$.

- i. Complete the given diagram of the triangle. (2 Marks)
- ii. Locate a point O such that O is at the same distance from each vertex of the triangle. Write down the distance of point O from any vertex. (2 Marks)



END OF PAPER

AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX EXAMINATION

MAY 2016

Mathematics Paper II

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5. You may use a simple calculator if you wish.

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

Q.1. (Total 4 Marks)

a. Verify that $\left(\frac{8a^8b^2}{a^2b^5}\right)^{\frac{1}{3}} = \frac{2a^2}{b}$.

b. Simplify $\frac{3+3i+5-2i-6}{2-i}$ to the form $a+ib$.

AKU-EB MAY EXAMINATIONS 2016

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

Q.2.

(Total 4 Marks)

- a. For the sets $U = \{1, 2, 3, 4, 5\}$, $A = \{1, 2, 3\}$ and $B = \{2, 4, 5\}$, find the value of $(A \cup B) \cap (A \cap B)^C$.
(4 Marks)

- b. If $A = \{2, 4, 6\}$ and $B = \{5, 10, 15\}$ are the given sets, then
- i. decide whether the relation $r = \{(2, 5), (4, 10), (4, 15)\}$ is a function from A to B or not? Justify your answer. (2 Marks)

- ii. find the domain and range of r . (2 Marks)

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Q.3. (Total 3 Marks)

By applying laws of logarithm, express $\log m - \log n + \frac{1}{2} \log p$ as a single logarithmic term.

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

Q.4. (Total 4 Marks)

a. Reduce $\frac{xy(x-y)}{2(x+y)} \div \frac{x^2y - xy^2}{2(x^2 + 2xy + y^2)}$ to its simplest form.

b. Apply continued product to verify that $(2x+1)(2x-1)(4x^2 + 2x + 1)(4x^2 - 2x + 1) = 64x^6 - 1$.

(ATTEMPT EITHER PART a OR PART b OF Q.5.)

Q.5.

(Total 5 Marks)

- a. Factorise $(z^2 - z - 3)(z^2 - z + 1) + 4$ completely.
- b. Find the zeros of the polynomial $y^2 - 5y + 6$. Hence, find the remainder when $y^2 - 5y + 6$ is divisible by $y - 3$.

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

Q.6. (Total 4 Marks)

a. x varies jointly as the values of y and z . If the value of x is 45 when $y = 72$ and $z = 0.5$, then find the value of y when $x = 18$ and $z = 2$.

b. If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = k$, then verify that $k^2 = \frac{a^2 + c^2 + e^2}{b^2 + d^2 + f^2}$.

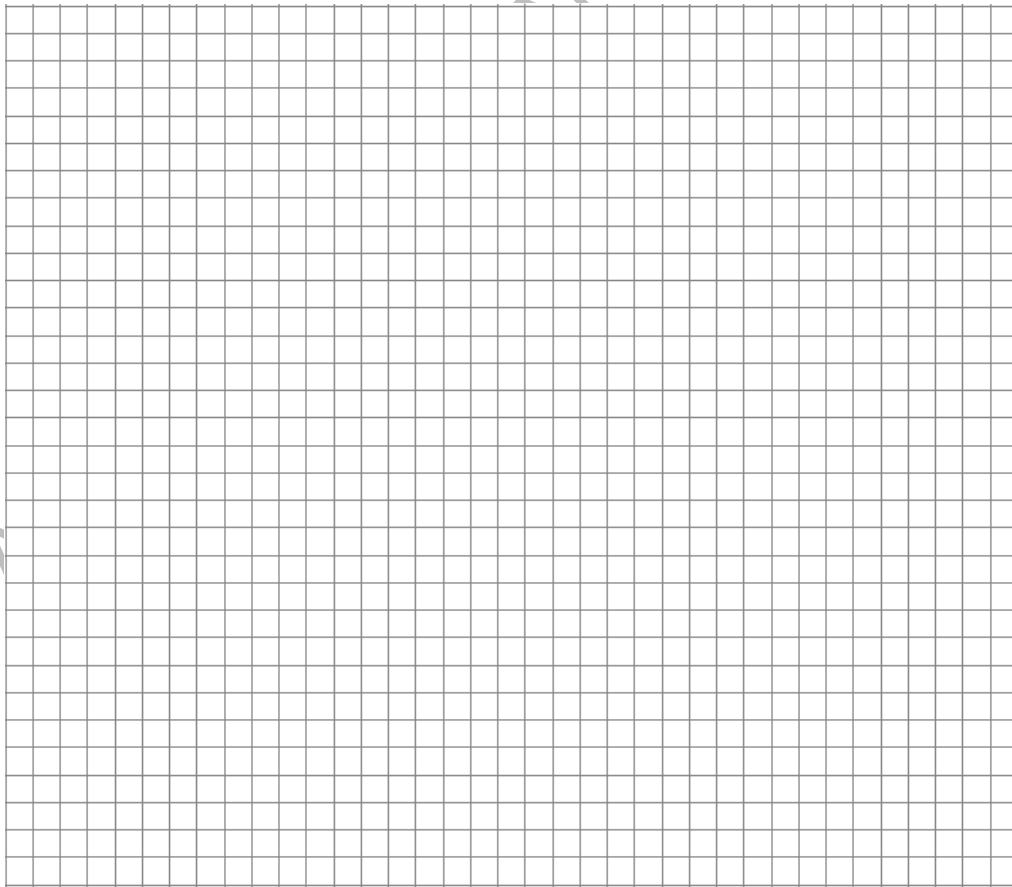
AKU-EB MAY EXAMINATIONS 2016

Q.8. (Total 4 Marks)

In the given space, draw the cumulative frequency curve to represent the given frequency distribution.

Life of Bulb (Days)	Frequency (f)	Cumulative Frequency	Upper Class Boundary
300 – 309	4	4	309.5
310 – 319	5	9	319.5
320 – 329	7	16	329.5
330 – 339	9	25	339.5
340 – 349	7	32	349.5
350 – 359	3	35	359.5
Total	35	-	-

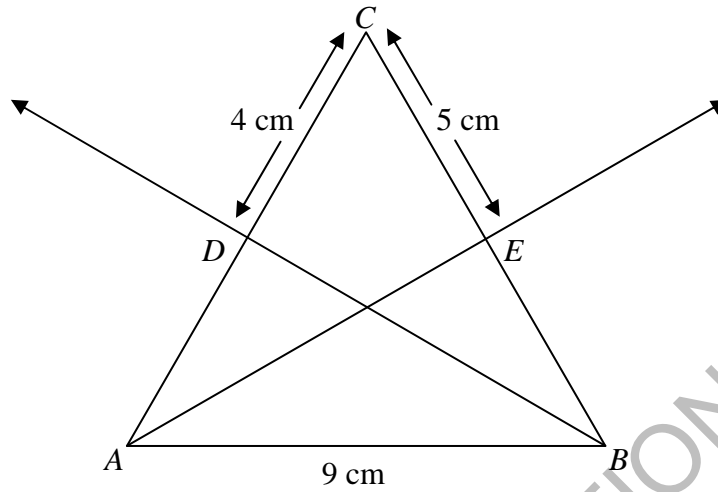
Space for diagram



Q.9.

(Total 4 Marks)

In the given triangle ABC , \overrightarrow{BD} and \overrightarrow{AE} are the medians of the triangle.



i. Find $m\overline{DE}$ and $m\overline{BC}$.

(2 Marks)

ii. Is \overline{DE} parallel to \overline{AB} ? Give a reason to justify your answer.

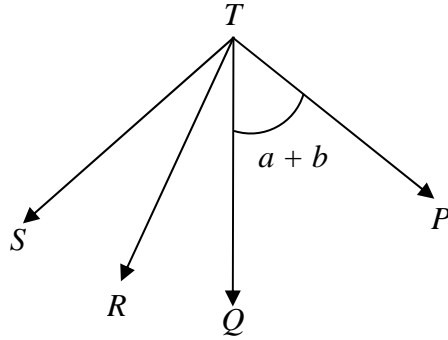
(2 Marks)

(ATTEMPT EITHER PART a OR PART b OF Q.10.)

Q.10.

(Total 4 Marks)

- a. Given that TQ and TR are the angle bisectors of $\angle STP$ and $\angle STQ$ respectively, as shown in the diagram, find the following.



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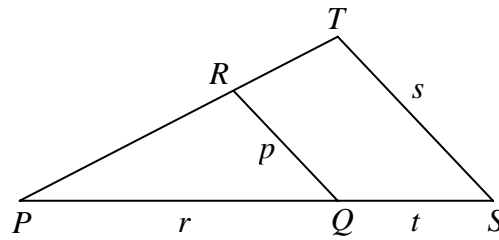
- i. $m \angle STR$

(2 Marks)

- ii. $m \angle STP$

(2 Marks)

- b. The given diagram shows $\triangle PRQ$ is similar to $\triangle PTS$.



Comprehend the diagram to complete the following statements.

- i. $m\angle PRQ$ is equal to _____
- ii. $\triangle RPQ$ is similar to _____
- iii. $\frac{PR}{PT}$ is equal to _____
- iv. In terms of r and t , $\frac{P}{s}$ is equal to _____

AKU-EB MAY EXAMINATIONS 2016

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SECONDARY SCHOOL CERTIFICATE

CLASS IX EXAMINATION

APRIL/ MAY 2017

Mathematics Paper II

Time: 2 hours 20 minutes Marks: 45

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**

2. **RUBRIC.** There are ELEVEN 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. You may use a simple calculator if you wish.

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

(Total 4 Marks)

Q.1.

a. If $z = -2 - 3i$ and $\bar{z} = -2 + 3i$, then find $\frac{\bar{z}}{z}$, giving your answer in the form $a + ib$.

b. Express $\frac{m^{\frac{7}{3}}n}{\sqrt{m^{-4}n^{-2}}}$ in its simplest form.

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

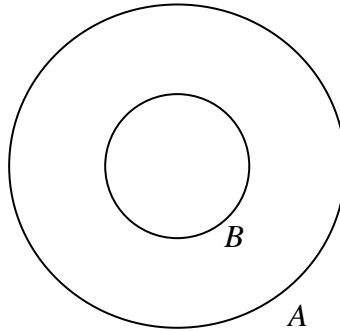
Q.2.

(Total 4 Marks)

a. If A and B are two non-empty sets, shade each of the following set operations in the corresponding Venn diagrams.

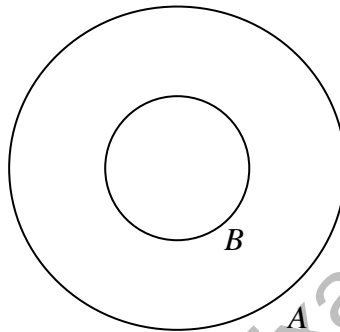
i. $A \cup B$

(1 Mark)



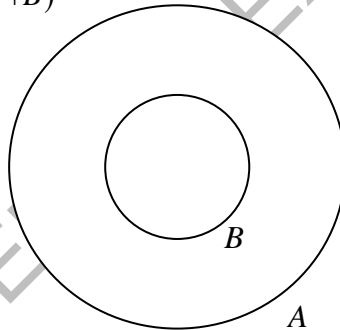
ii. $A \cap B$

(1 Mark)



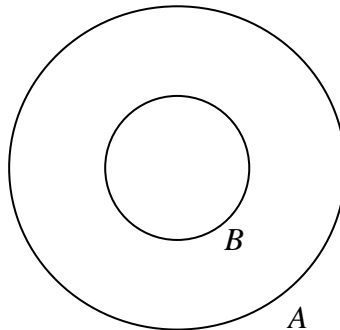
iii. $(A \cup B) - (A \cap B)$

(1 Mark)



iv. $A - B$

(1 Mark)



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

b. For two non-empty sets A and B , an **onto function** from A to B is defined as $f_1 = \{(p, 10), (q, 10), (r, 25), (s, 30)\}$. Answer the following.

i. Find the domain of f_1 . (1 Mark)

ii. Find the set A . (1 Mark)

iii. Select and write down the possible set B from the given two choices. (1 Mark)

- Choice I: {10, 25, 30}
Choice II: {10, 15, 20, 25, 30}

iv. Write down a function f_2 from A to B . (1 Mark)

(Note: f_2 should not be the same as f_1)

Q.3.

(Total 3 Marks)

Given that $\log_3 x = m$, find the value of the following in terms of m .

i. x

(1 Mark)

ii. $\log_3 \frac{x}{3}$

(2 Marks)

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

Q.4.

(Total 4 Marks)

a. Show that $\frac{a^3 - b^3}{a^2 + ab + b^2} + \frac{1}{a+b} = \frac{a^2 - b^2 + 1}{(a+b)}$.

b. Find the value of $a^2 + b^2 + c^2$, when $a + b + c = 7$ and $ab + bc + ca = 18$.

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(ATTEMPT EITHER PART a OR PART b OF Q.5.)

Q.5.

(Total 5 Marks)

- a. Find the zeros of the polynomial $y^2 - 5y + 6$. Hence, find the remainder when $y^2 - 5y + 6$ is divisible by $y - 3$.
- b. Factorise $(z^2 - z - 3)(z^2 - z + 1) + 4$ completely.

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

Q.6. (Total 4 Marks)

a. If $\frac{m}{n} = \frac{l}{p} = \frac{q}{r} = k$, then using K-method verify $\frac{mlq}{npr} = \frac{m^3 + l^3 + q^3}{n^3 + p^3 + r^3}$.

b. Given that p varies inversely as the square root of q . If $q = 100$ when $p = \frac{1}{5}$, find p when $q = 144$.

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Q.7.

(Total 5 Marks)

Find the value of x and y in the following matrix equation.

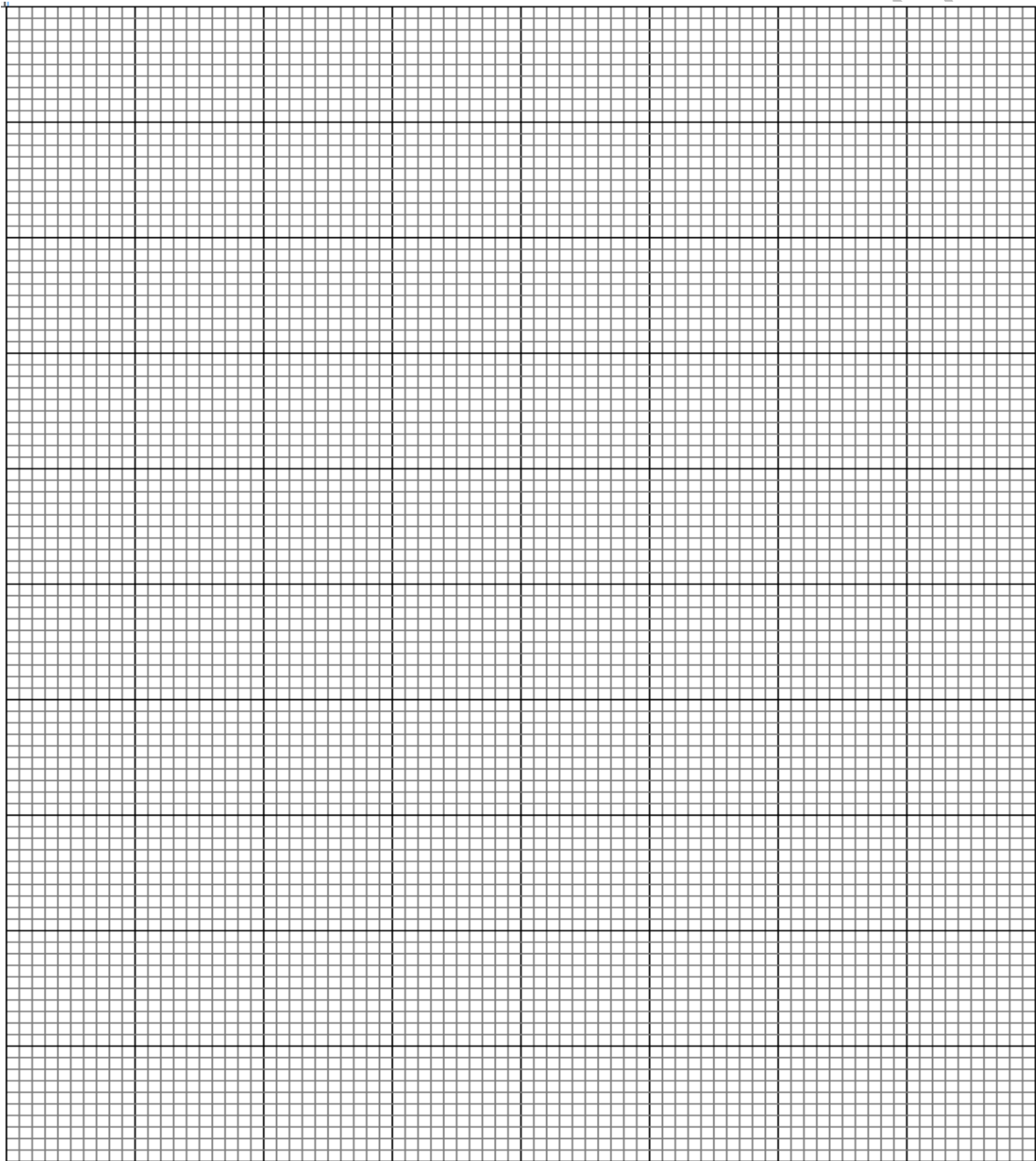
$$2 \begin{bmatrix} 3 & x \\ 4 & 5 \end{bmatrix} + \begin{bmatrix} 6x & -2x \\ 0 & 6y \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 8 & 3 \end{bmatrix}$$

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Q.8. (Total 4 Marks)

The given data shows the height (in centimetres) of 27 plants. Complete the given table and use it to construct a cumulative frequency curve.

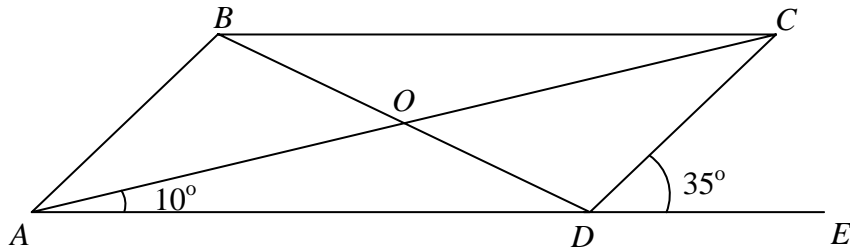
Height (cm)	0 – 2	2 – 4	4 – 6	6 – 8	8 – 10
Frequency	2	5	10	8	2
Cumulative Frequency					



Q.9.

(Total 4 Marks)

A parallelogram $ABCD$ is given. Find



NOT TO SCALE#

i. $\angle ABC$ (1 Mark)

ii. $\angle BAO$ (1 Mark)

iii. $\angle OCD$ (1 Mark)

iv. $\angle BCA$ (1 Mark)

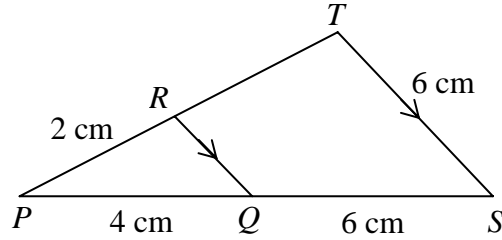
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(ATTEMPT EITHER PART a OR PART b OF Q.10.)

Q.10.

(Total 4 Marks)

a. In the given triangle PST , $PS = 10$ cm, $ST = 6$ cm, and $PR = 2$ cm. Find the length of



NOT TO SCALE

i. PT

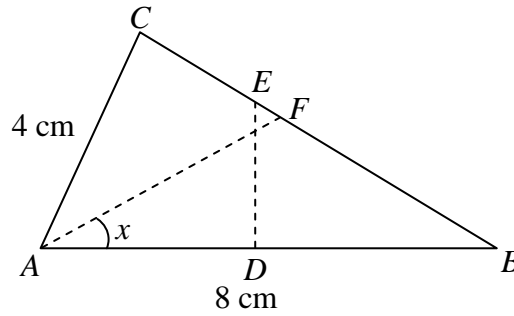
(2 Marks)

ii. QR

(2 Marks)

(ATTEMPT EITHER PART a OR PART b OF Q.10.)

- b. In the given triangle ABC , $AB = 8$ cm and $AC = 4$ cm. Also, DE is the perpendicular bisector of AB and AF is the angle bisector of $\angle BAC$.



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- i. Find $\angle CAB$ in terms of x . (1 Mark)

- ii. Find the length of DB . (1 Mark)

- iii. If $BF = 6$ cm, find the length of FC . (2 Marks)

Q.11.

(Total 4 Marks)

Draw a triangle ABC such that $AB = 9$ cm, $\angle A = 45^\circ$ and $\angle B = 40^\circ$. Also draw any TWO medians of the triangle.

Space for diagram

AKU-EB May Examination 2017

END OF PAPER

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SECONDARY SCHOOL CERTIFICATE

CLASS IX EXAMINATION

APRIL/ MAY 2018

Mathematics Paper II

Time: 2 hours 20 minutes Marks: 45

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**

2. RUBRIC. There are ELEVEN questions. Answer ALL questions. Choices are specified inside the paper.
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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. You may use a simple calculator if you wish.

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

Q.1. (Total 4 Marks)

a. Simplify the following and express it in the lowest exponential form.

i. $\frac{a^2b^3}{(ab^3)^5}$ (2 Marks)

ii. $a^0 \times a^{\frac{3}{4}} \times a$ (2 Marks)

b. Separate the real and imaginary parts of $\frac{(2-i)^2}{1+i}$. (4 Marks)

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

Q.2.

(Total 4 Marks)

- a. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ is a universal set, $A = \{1, 2, 3, 4, 5, 6\}$ and $B = \{2, 4, 6, 8, 10\}$, then show that $(A \cup B)' = A' \cap B'$.

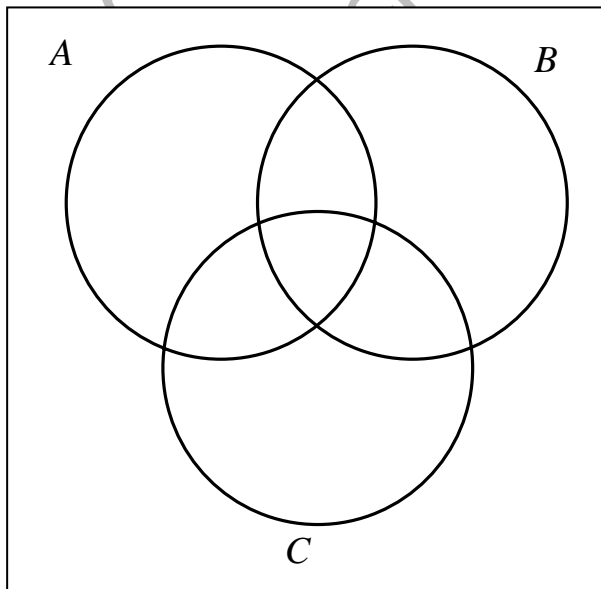
- b. Sets A , B and C are defined as follows.

$$A = \{1, 2, 3, 4\}$$

$$B = \{-1, 0, 1, 2\}$$

$$C = \{-1, 1, 3, 5\}$$

Place the elements of sets A , B and C in the given Venn Diagram.



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Q.3. (Total 3 Marks)

Find the value of x for $\log_6 1 + \frac{\log_6 216}{\log_6 36} = x$.

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

Q.6.

(Total 4 Marks)

- a. The width w units of a rectangular solid with a fixed volume, is inversely proportional to its length l units and breadth b units.

Width (w units)	Length (l units)	Breadth (b units)
3	4	2
?	6	2.5

Using the table, find the missing width of the rectangular solid.

- b. If $\frac{a}{b} = \frac{c}{d}$, then prove that $\frac{5a + 3c}{5b + 3d} = \sqrt[5]{\frac{a^5}{b^5}}$ using K-method.

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Q.7. (Total 5 Marks)

a. Find the value of p and q for the given matrix equation.

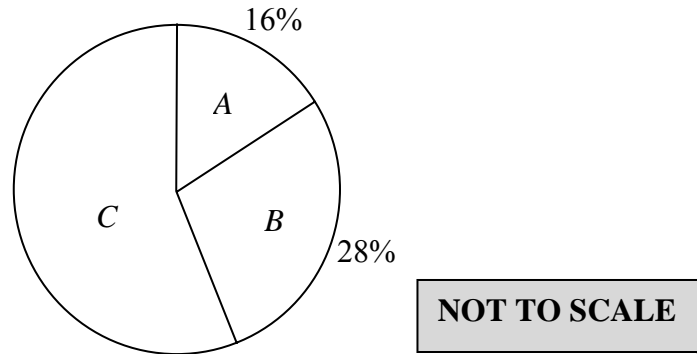
$$2 \begin{bmatrix} 2 & p \\ 1 & 5 \end{bmatrix} + \begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix} = \begin{bmatrix} 5 & 2 \\ q & 10 \end{bmatrix} \quad (3 \text{ Marks})$$

b. Given that $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 1 \end{bmatrix} \times \begin{bmatrix} 0 & 2 \\ 1 & 3 \\ 5 & 1 \end{bmatrix}$. State the reason why these two matrices are conformable for multiplication. (2 Marks)

Q.8.

(Total 4 Marks)

In a survey, employees of a company were asked their preferred lunch menu from choices *A*, *B* and *C*. The results are represented in the given pie chart containing three sections.



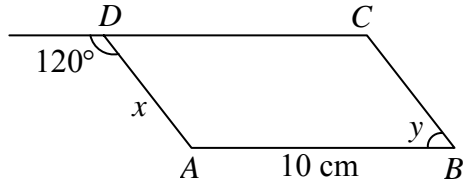
Use the given information to complete the given table.

Menu	Percentage of Employee	Number of Employee	Angle of Section
A	16%	64	
B	28%		
C			

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Q.9. (Total 4 Marks)

The perimeter of the given parallelogram $ABCD$ is 38 cm. Find x and y .



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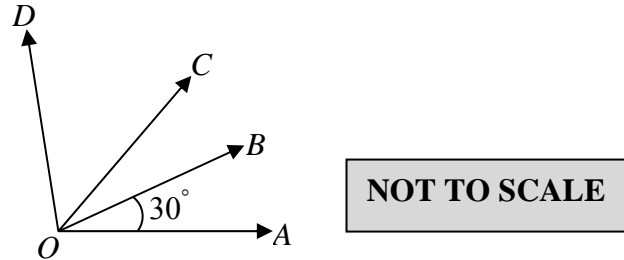
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(ATTEMPT EITHER PART a OR PART b OF Q.10.)

Q.10.

(Total 4 Marks)

a. In the following figure, OB and OC are angle bisectors of $\angle COA$ and $\angle DOA$ respectively.



Find

i. $\angle DOC$

(2 Marks)

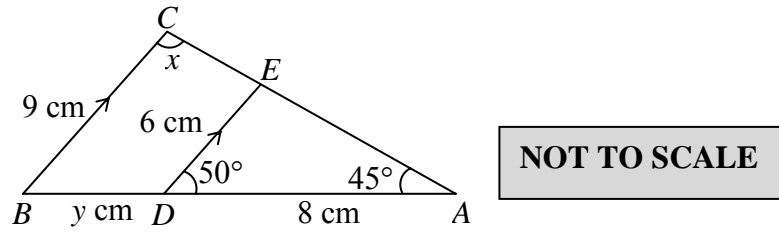
ii. $\angle DOA$

(2 Marks)

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(ATTEMPT EITHER PART a OR PART b OF Q.10.)

- b. In the following diagram, BC is parallel to DE . Find the values of x and y . (4 Marks)



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Q.11.

(Total 4 Marks)

Construct a triangle ABC with $AB = 10$ cm, $\angle A = 30^\circ$ and $BC = 6$ cm. Also draw two medians of the triangle.

Space for diagram

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for
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END OF PAPER

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CLASS IX EXAMINATION

APRIL/ MAY 2019

Mathematics Paper II

Time: 2 hours 10 minutes Marks: 40

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. You may use a simple calculator if you wish.

Q.1. (Total 4 Marks)

For two non-empty sets A and B , an **onto function** from A to B is defined as $f_1 = \{(p, 10), (q, 10), (r, 25), (s, 30)\}$.

Using the given information, answer the following parts:

i. Find the domain of f_1 . (1 Mark)

ii. Find the set A . (1 Mark)

iii. Select and write down the possible set B from the given two choices. (1 Mark)

Choice I: {10, 25, 30}

Choice II: {10, 15, 20, 25, 30}

iv. Write down a function f_2 from A to B . (1 Mark)

(Note: f_2 should not be the same as f_1)

Q.2.

(Total 4 Marks)

Simplify $\sqrt[3]{\frac{64x^{12}y^2}{x^3y^{-4}}}$.

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Q.3.

(Total 4 Marks)

For the given logarithmic equation $x = \log_3 27 + \log_3 3 - \log_3 3^2$, find the value of x .

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Q.7.

(Total 5 Marks)

a. For the given matrix $A = \begin{bmatrix} 2 & 3 \\ 6 & 2 \end{bmatrix}$, find its

i. determinant. (1 Mark)

ii. adjoint. (1 Mark)

iii. inverse. (1 Mark)

b. Using result of part a, show that $A^{-1} \times A = I$. (2 Marks)

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Q.8.

(Total 3 Marks)

For the given triangle ABC , show that the altitudes of the triangles are concurrent.



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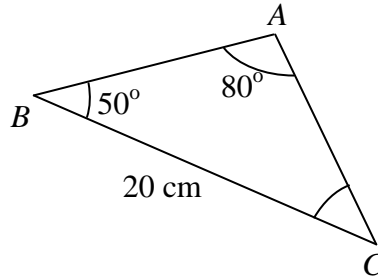
(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.9.)

Q.9. (Total 6 Marks)

a. In the given figure, ABC is a triangle and sum of all its sides are 30.56 cm.

Find the length of the side AB .

(3 Marks)



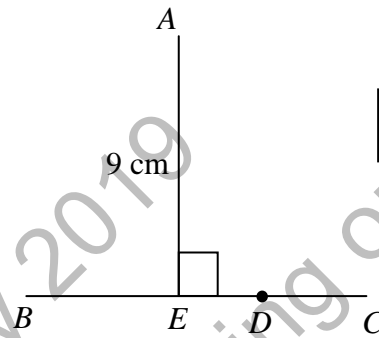
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b.

- i. If lengths of any two sides of a triangle are 5 cm and 7 cm, then write any TWO possible lengths for the third side of the triangle. (1 Mark)

- ii. In the given diagram find any possible length of AD . Justify your answer (2 Marks)

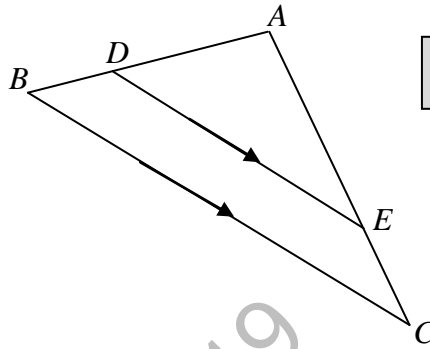


(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.9.)

c. In the given figure ABC is a triangle and DE is parallel to BC .

Find the length of DB if $AB = 6$ cm, $AC = 8$ cm and $EC = 2$ cm.

(3 Marks)



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AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX

ANNUAL EXAMINATIONS (THEORY) 2023

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

$$A \Delta B = (A \cup B) - (A \cap B) \quad (A \cap B)^c = A^c \cup B^c \quad (A \cup B)^c = A^c \cap B^c$$

Real and Complex Numbers

$$x^m \times x^n = x^{m+n} \quad (x \times y)^n = x^n \times y^n \quad (x^m)^n = x^{mn}$$

$$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n} \quad \frac{x^m}{x^n} = x^{m-n} \quad a^{-m} = \frac{1}{a^m}$$

Exponents and Logarithms

$$\log_a(m \times n) = \log_a m + \log_a n \quad \log_a\left(\frac{m}{n}\right) = \log_a m - \log_a n \quad \log_a b = n \Leftrightarrow a^n = b$$

$$\log_a(m)^n = n \log_a m \quad \log_a n = \log_b n \times \log_a b \quad \log_a n = \frac{\log_b n}{\log_b a}$$

Algebraic Formulae & Applications and Factorisation

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

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

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

$$(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca \quad (a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

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

Matrices and Determinants

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

Q.1.

(Total 3 Marks)

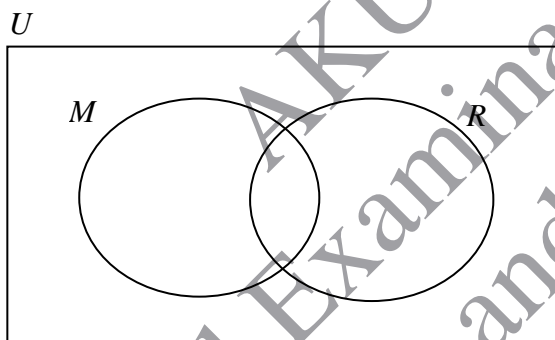
If $U = \{a, e, i, o, u\}$, $M = \{a, i, u\}$, $N = \{u\}$ and $R = \{e, o, u\}$, then represent

i. M and N in the incomplete Venn diagram given below. (1 Mark)



ii. N^c on the Venn diagram completed in part (i) by shading. (1 Mark)

iii. $(M \cap R)^c$ in the Venn diagram given below, by shading. (1 Mark)



Q.2.

(Total 3 Marks)

If the value of $\log 3 = 0.4771$, then find the value of $\log 81$.

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(ATTEMPT PART a OR PART b ONLY FOR Q.3.)

Q.3. (Total 4 Marks)

a. If $m = 2 - \sqrt{3}$ and $n = \frac{1}{2 + \sqrt{3}}$, then

i. show that $m + n = \frac{2}{2 + \sqrt{3}}$. (2 Marks)

ii. express $m + n$ in the form $a - b\sqrt{c}$ by rationalising the denominator. (2 Marks)

b. Prove that the simplest form of $r = \left\{ \frac{m-1}{2} \div (m^2 - 1) \right\} \times \left(1 + \frac{1}{m} \right)$ is $r = \frac{1}{2m}$.

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Q.5. (Total 3 Marks)

The quantity m varies directly as n^2 . If $m = 4$ and $n = 6$, then find the relation between m and n in terms of an equation.

Q.6. (Total 4 Marks)

For the matrices $S = \begin{bmatrix} 2 & -1 \\ s & 4 \end{bmatrix}$ and $T = \begin{bmatrix} 0 & 1 \\ -s & -1 \end{bmatrix}$, find the

i. matrix $2(S - T)$. (2 Marks)

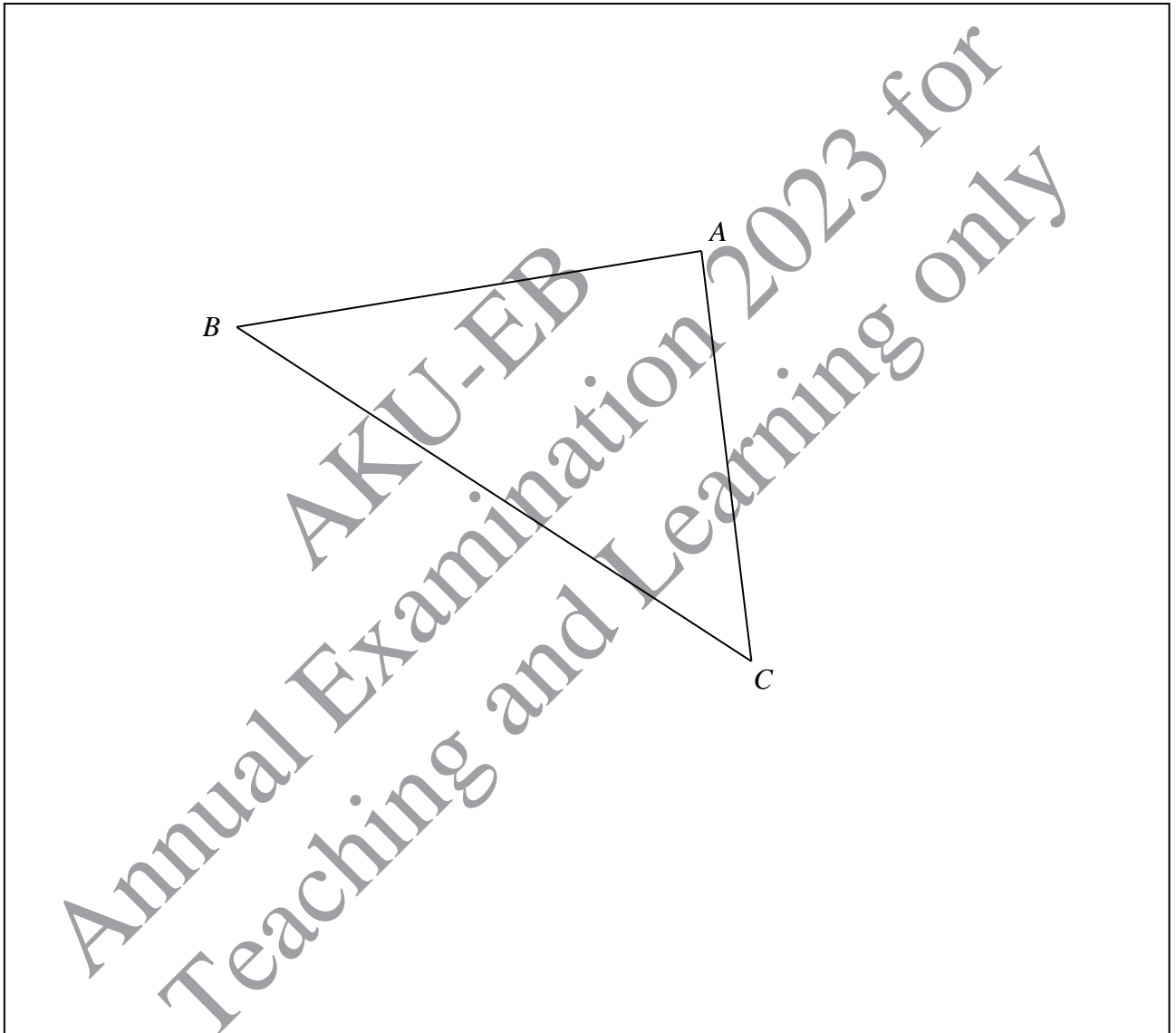
ii. value of s , if $S - T$ is a singular matrix. (2 Marks)

Q.7.

(Total 3 Marks)

For the given triangle ABC , draw the

- i. angle bisector of angle A . (1 Mark)
- ii. median passing through vertex B . (1 Mark)
- iii. altitude from vertex A to its opposite side. (1 Mark)

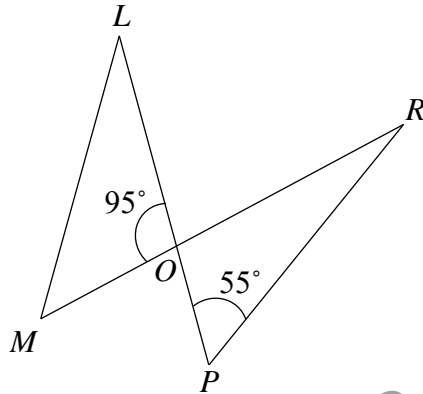


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(ATTEMPT ANY TWO PARTS OF a, b AND c OF Q.8.)

Q.8. (Total 6 Marks)

a. In the given diagram, $OM = OP$ and $OL = OR$



NOT TO SCALE

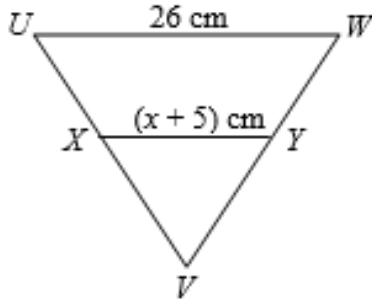
In the correspondence $\triangle MOL \leftrightarrow \triangle POR$,

i. find the unknown angle R . (2 Marks)

ii. find the unknown angle M . (1 Mark)

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

- b. In the given figure, X and Y are the midpoints of UV and WV respectively.



NOT TO SCALE

If $UW = 26\text{ cm}$ and $XY = (x + 5)\text{ cm}$, then

- i. find the value of x .

(2 Marks)

- ii. recalling the statement of a relevant theorem, complete the given sentence.

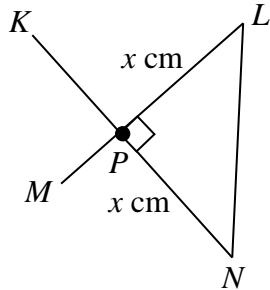
(1 Mark)

XY and UW are lines _____ to each other.

PLEASE TURN OVER THE PAGE

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

c. In the given diagram, $PL = PN = x$ cm and KN is perpendicular to ML .



NOT TO SCALE

If $KN = y$ cm, then find an expression for the shortest distance from K to ML .

(Note: The expression shall be in terms of x , and y .)

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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

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

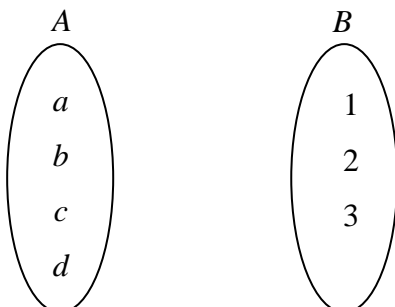
Q.1.

(Total 3 Marks)

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

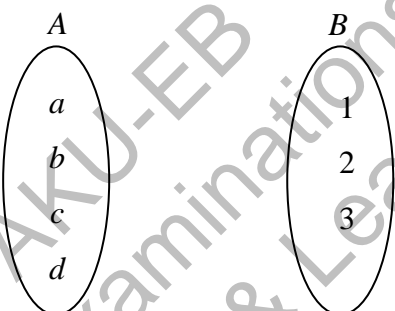
i. An onto (surjective) function from A to B

(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)

Q.2.

(Total 3 Marks)

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

PLEASE TURN OVER THE PAGE

(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)

a. Factorise $(x^4 + 4)$ completely.

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

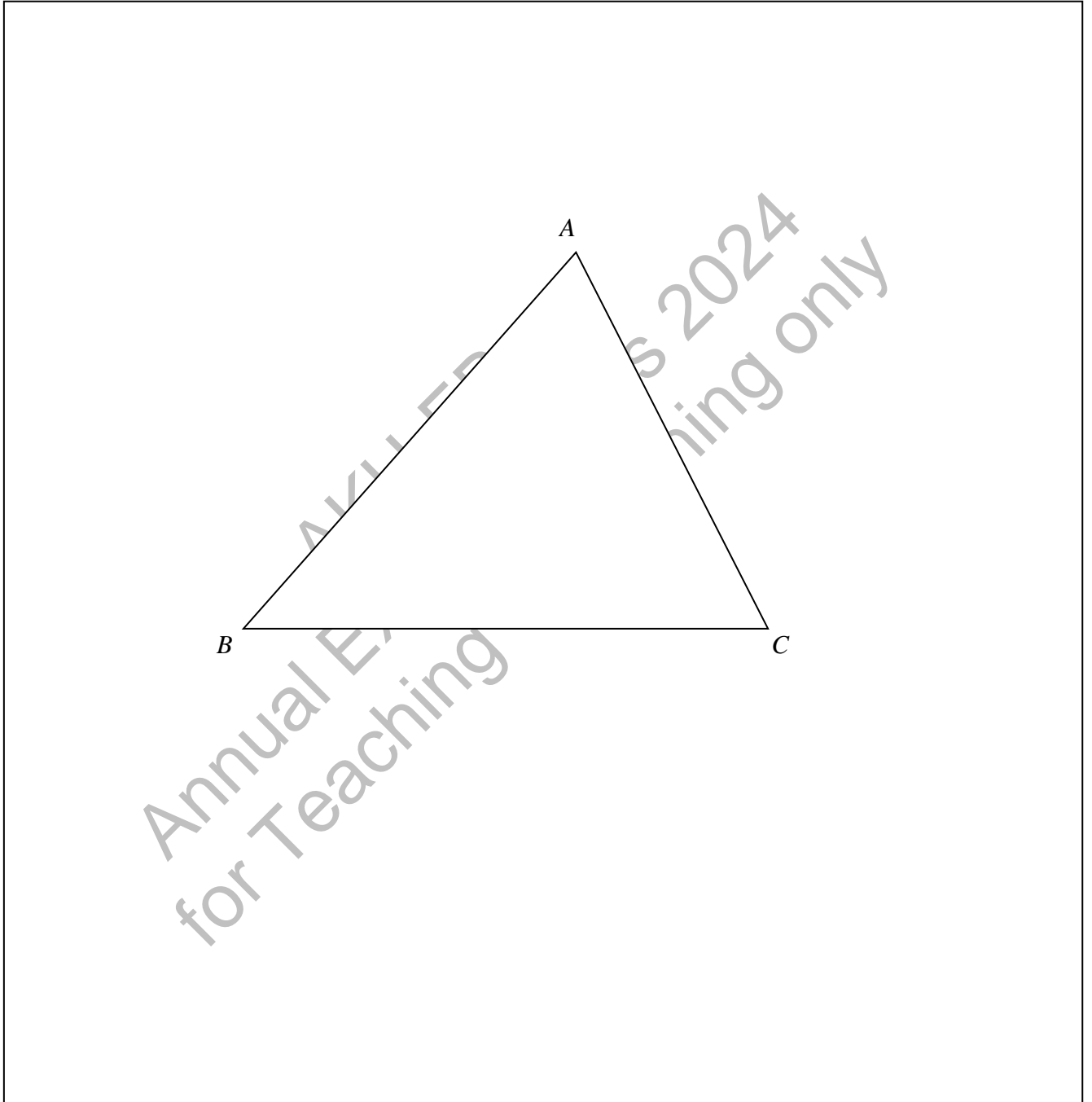
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Q.7.

(Total 3 Marks)

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

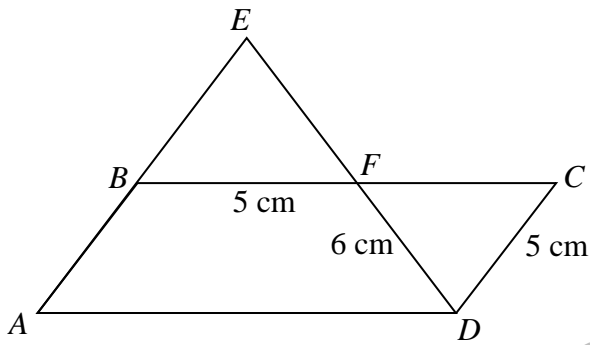


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(ATTEMPT ANY TWO PARTS OF a, b AND c OF Q.8.)

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)

- ii. BE . (1 Mark)

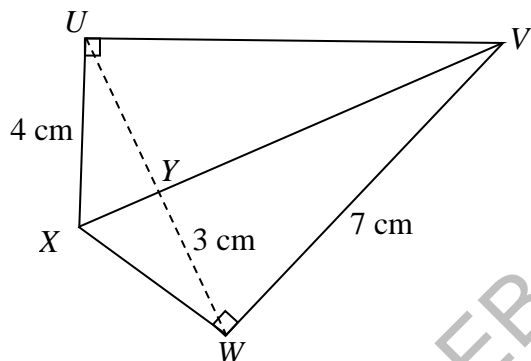
- iii. CF . (1 Mark)

(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,

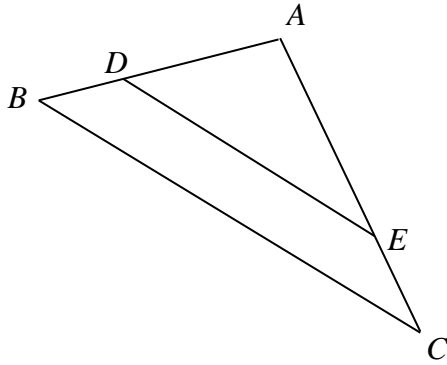
- i. find the length of the threads connecting U and V . (1 Mark)

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

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

(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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END OF PAPER

AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX

ANNUAL EXAMINATIONS (THEORY) 2025

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

$$A \Delta B = (A \cup B) - (A \cap B) \quad (A \cap B)^c = A^c \cup B^c \quad (A \cup B)^c = A^c \cap B^c$$

Real and Complex Numbers

$$x^m \times x^n = x^{m+n} \quad (x \times y)^n = x^n \times y^n \quad (x^m)^n = x^{mn}$$

$$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n} \quad \frac{x^m}{x^n} = x^{m-n} \quad a^{-m} = \frac{1}{a^m}$$

Exponents and Logarithms

$$\log_a(m \times n) = \log_a m + \log_a n \quad \log_a\left(\frac{m}{n}\right) = \log_a m - \log_a n \quad \log_a b = n \Leftrightarrow a^n = b$$

$$\log_a(m)^n = n \log_a m \quad \log_a n = \log_b n \times \log_a b \quad \log_a n = \frac{\log_b n}{\log_b a}$$

Algebraic Formulae & Applications and Factorisation

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

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

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

$$(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca \quad (a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

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

Matrices and Determinants

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

Q.1.

(Total 3 Marks)

If $N = \{1, 2, 3, \dots\}$ and $W = \{0, 1, 2, \dots\}$, then find $N \Delta W$.

Q.2.

(Total 3 Marks)

Using the laws of logarithm, expand $\log \sqrt{\frac{x}{x+1}}$.

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

Q.3. (Total 4 Marks)

a.

i. Prove that $(2x - 3y + z)^2 = 4x^2 + 9y^2 + z^2 - 12xy - 6yz + 4xz$. (2 Marks)

ii. If $2x - 3y + z = 10$ and $-6xy - 3yz + 2xz = 15$, then find the value of $4x^2 + 9y^2 + z^2$.
(Note: Use the expression from part i.) (2 Marks)

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

b. Find the continued product in simplified form for the given expression.

$$(16p^2 - 1)(16p^2 + 4p + 1)(16p^2 - 4p + 1)$$

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

Q.4. (Total 4 Marks)

- a. Using factor theorem, find the factors of the polynomial $P(x) = x^3 - x^2 - 4x + 4$.
- b. Completely factorise the expression $15x^3 - 24x^2 + 9x$.

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Q.5.

(Total 3 Marks)

If $a : b :: c : d$, then use k-method to prove $\frac{a^4 + c^4}{a^3b + c^3d} = k$.

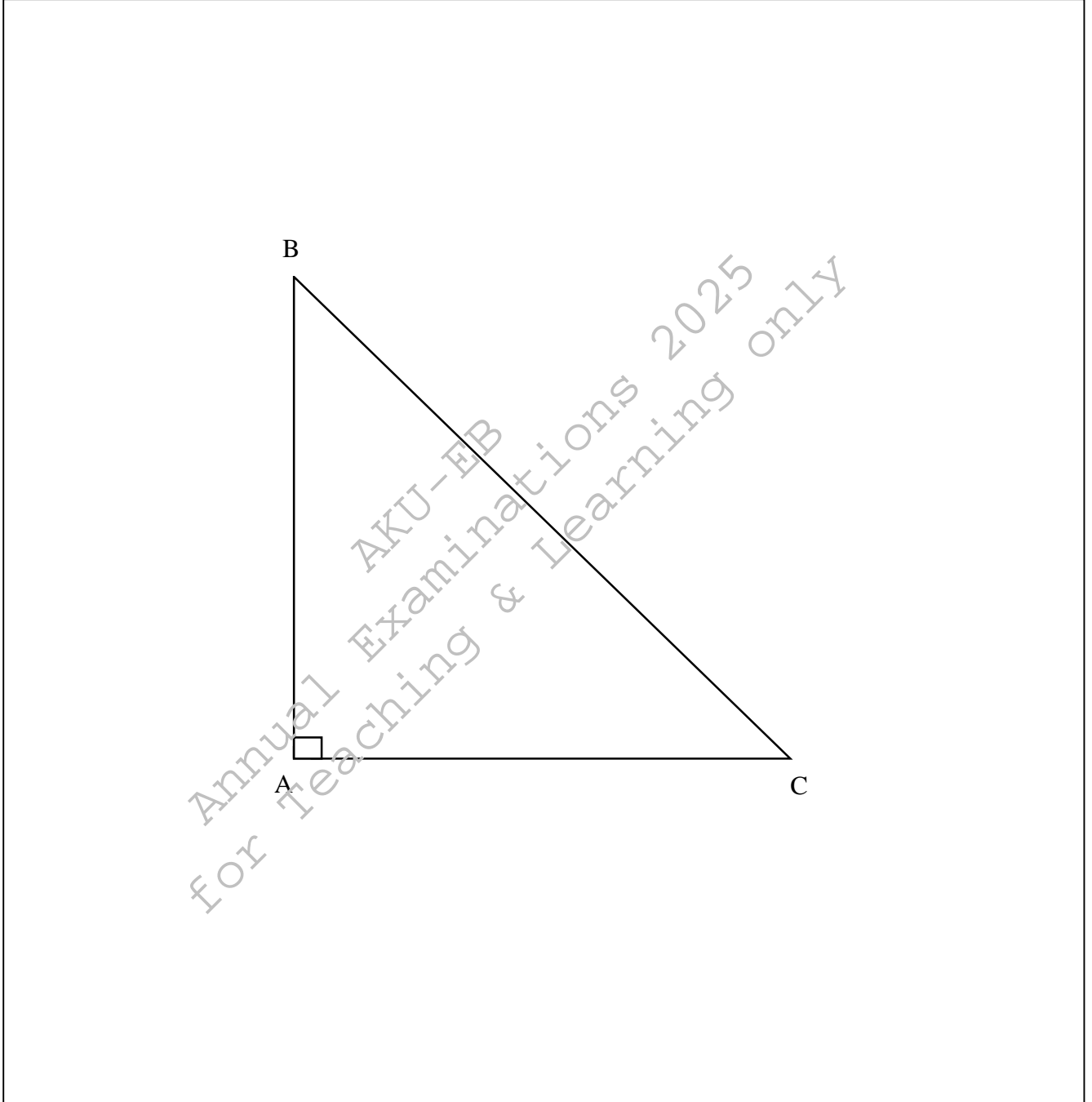
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Q.7.

(Total 3 Marks)

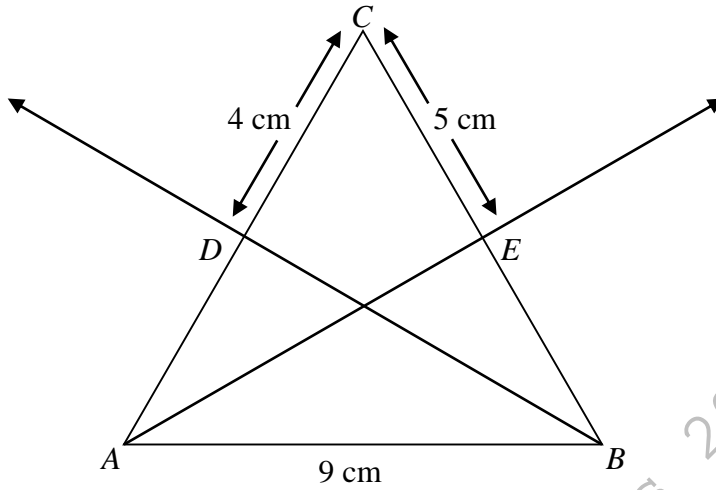
A right angled triangle ABC having right angle at A is given. Hence, draw an altitude from A to BC .



PLEASE TURN OVER THE PAGE

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

- b. In the given triangle ABC , BD and AE are the medians of the triangle. (3 Marks)



NOT TO SCALE

- i. Find $m\overline{DE}$ and $m\overline{BC}$. (2 Marks)

- ii. Is \overline{DE} parallel to \overline{AB} ? Give a reason to justify your answer. (1 Mark)

PLEASE TURN OVER THE PAGE

AGA KHAN UNIVERSITY EXAMINATION BOARD
SECONDARY SCHOOL CERTIFICATE
CLASS IX
MODEL EXAMINATION PAPER 2026 AND ONWARDS

Mathematics (Science Group) Paper II

Time: 1 hour 40 minutes Marks: 30

INSTRUCTIONS:

1. Check your name and school information above. Sign if the information is correct.

I agree that this is my name and school.
Candidate's Signature

2. Read each question carefully.
3. There are NINE questions in this exam. Answer ALL questions. Questions 4, 5 and 7 each offer TWO choices. For each of these questions, attempt ONE choice only. Question 9 offers THREE choices. For this question, attempt ANY TWO only.
4. When answering the questions:
 - Use a black pen/ pointer to write your answers. DO NOT write your answers in pencil.
 - Use a black pencil for diagrams and drawings. DO NOT use coloured pencils, markers or highlighters.
 - DO NOT use staples, paper clips, glue, correcting fluid, or ink erasers.
If you make a mistake, cross it out neatly and write the correct answer beside it.
 - Write your answers only in the allocated space provided for each question.
 - DO NOT write outside the answer space. Answers written outside the allocated space will not be marked.
5. The marks for each question are shown in brackets () next to the question number. Use this information to manage your time efficiently.
6. DO NOT mention your name or school name anywhere inside the paper.
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:

- The symbols used in the formulae have their usual meaning.
- The same formulae will be provided in the annual and september examinations.

Real Numbers			
$x^m \times x^n = x^{m+n}$	$(x \times y)^n = x^n \times y^n$	$(x^m)^n = x^{mn}$	
$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$, where $y \neq 0$	$\frac{x^m}{x^n} = x^{m-n}$		
Logarithms			
$\log_a(m \times n) = \log_a m + \log_a n$	$\log_a\left(\frac{m}{n}\right) = \log_a m - \log_a n$	$\log_a b = n \Leftrightarrow a^n = b$	
$\log_a(m)^n = n \log_a m$	$\log_m n = \frac{\log_a n}{\log_a m}$		
Sets Theory			
$A \Delta B = (A \cup B) - (A \cap B)$	$(A \cup B)^c = A^c \cap B^c$	$(A \cap B)^c = A^c \cup B^c$	
Factorisation			
$(a+b)^2 = a^2 + 2ab + b^2$	$(a-b)^2 = a^2 - 2ab + b^2$		
$(a+b)^2 + (a-b)^2 = 2(a^2 + b^2)$	$(a+b)^2 - (a-b)^2 = 4ab$		
$(a+b)(a-b) = a^2 - b^2$	$(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$		
$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$	$(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$		
$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$	$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$		
Introduction to Coordinate Geometry			
$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$		
$y = mx + c$	$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$		
Similar Figures			
$\frac{1}{2}h \times b$	$l \times b$	l^2	$6l^2$
l^3	πr^2	$l \times b \times h$	$2(l \times b + b \times h + l \times h)$
Introduction to Trigonometry			
$1^\circ = \frac{\pi}{180} \text{ rad}$	$1 \text{ rad} = \left(\frac{180}{\pi}\right)^\circ$	$H^2 = P^2 + B^2$	
$\sin^2 \theta + \cos^2 \theta = 1$	$1 + \tan^2 \theta = \sec^2 \theta$	$1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$	

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

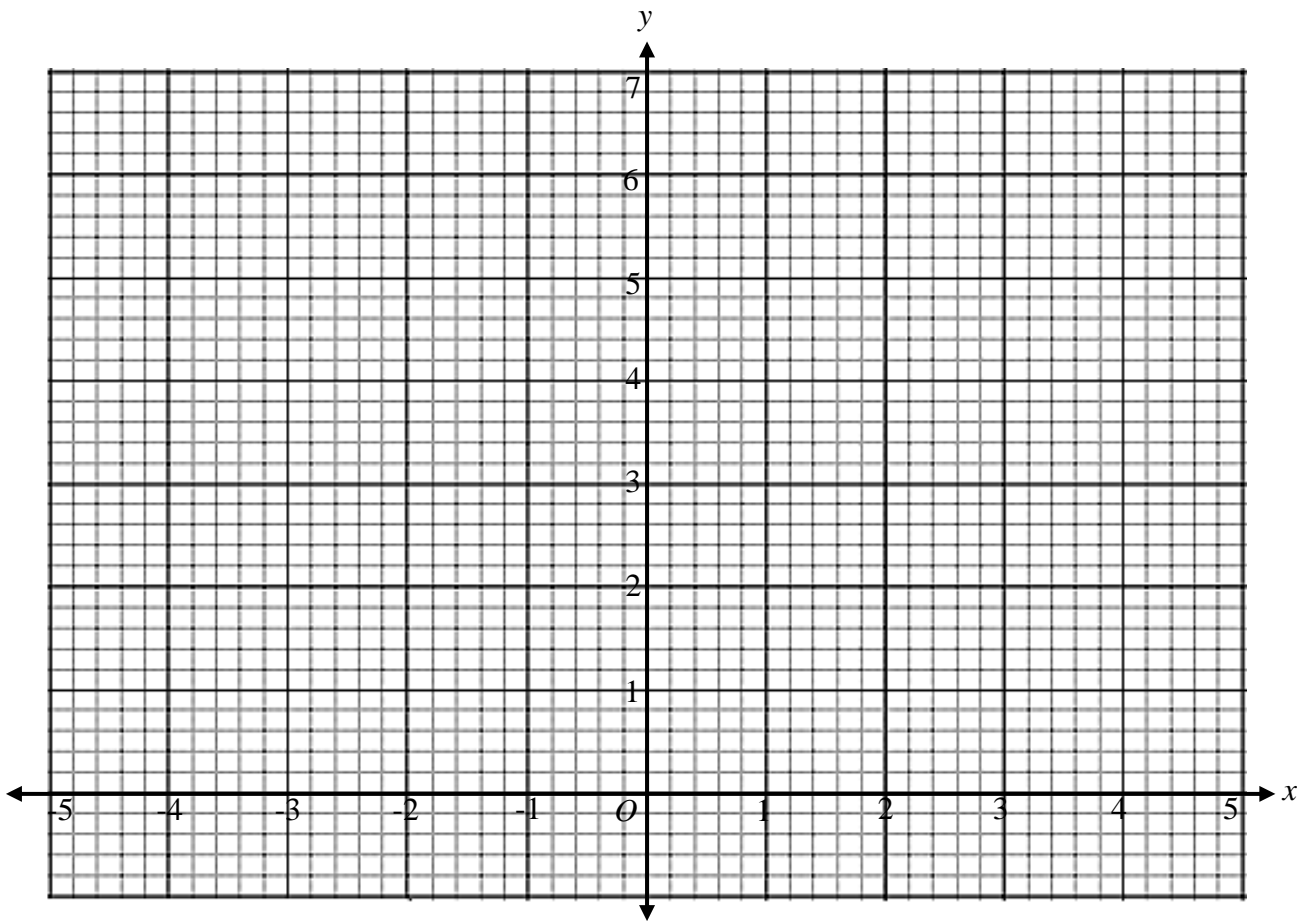
Q.4.

(Total 3 Marks)

a.

- i. By completing the given table, plot the function $f(x) = |x - 2| + 3$, on the given graph. (2 Marks)

x	0	2
$f(x)$	5	



- ii. Write the range of the function given in part i. (1 Mark)

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

b. Two sets are defined as $S = \{1, 2, 3, 4\}$ and $T = \{2, 6, 8\}$.

i. Find an into function from S to T .

(1 Mark)

ii. Is it possible to find a one-one and onto function (bijective function) from S to T ?

Justify your answer.

(2 Marks)

(ATTEMPT EITHER PART a OR PART b OF Q.5.)

Q.5. (Total 3 Marks)

a. The algebraic expression $x^3 + 3x^2 + ax - b$ is divided by $x + 2$ and the remainder is -12 .

Find the value of a when $b = -12$.

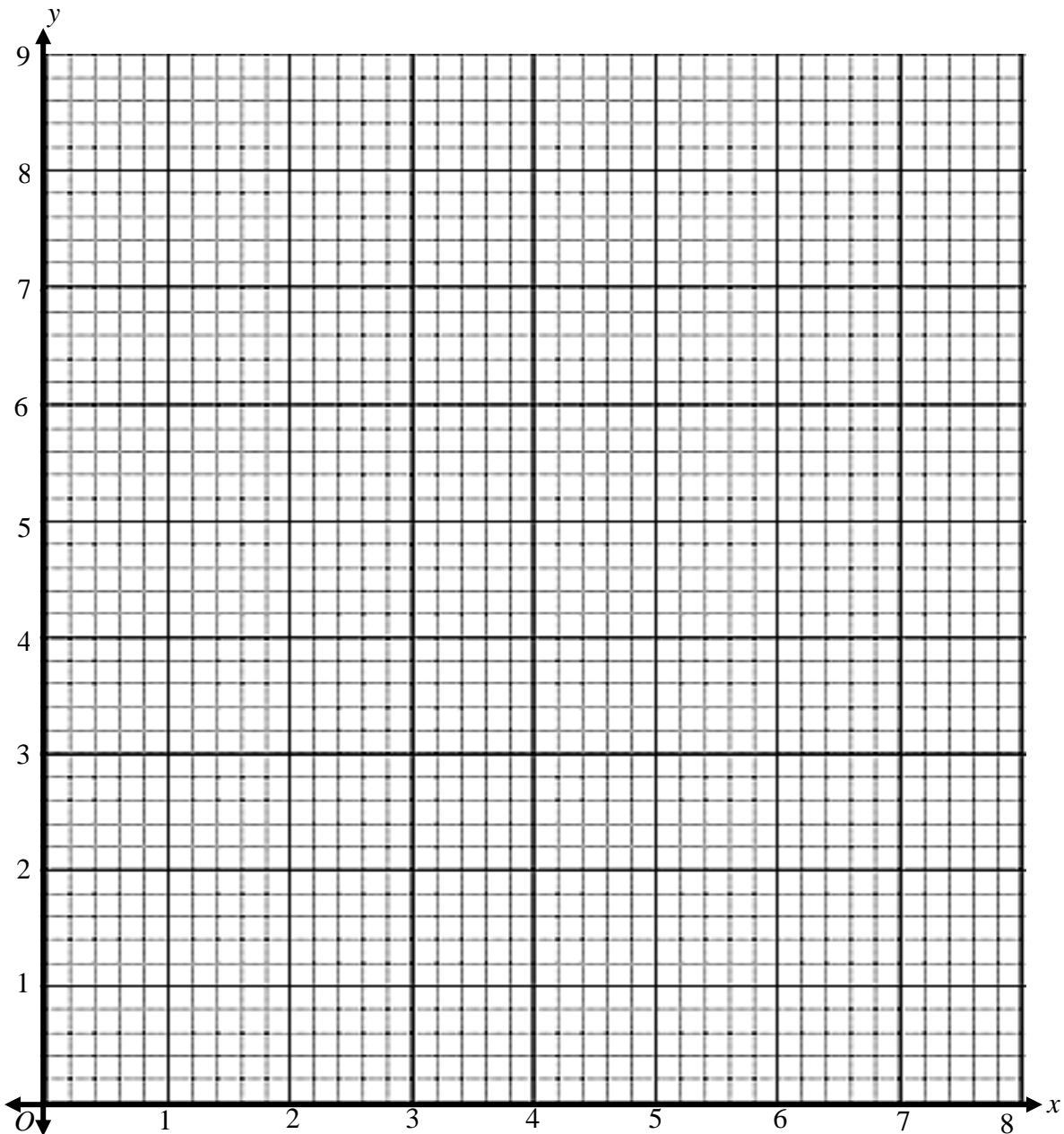
b. Factorise the expression $36a^4 + 12a^2b + b^2 - 9$.

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

- b. Draw the graph for the inequalities $2x + y < 8$ and $x + y < 6$.

Hence, find the region bounded by the inequalities.

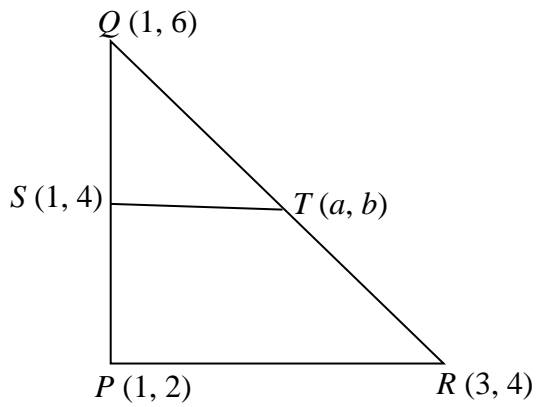
(Note: $x > 0$ and $y > 0$)



Q.8.

(Total 3 Marks)

The coordinates of the vertices of a triangle PQR are $P(1, 2)$, $Q(1, 6)$ and $R(3, 4)$. The midpoints of PQ and QR are $S(1, 4)$ and $T(a, b)$ respectively.



NOT TO SCALE

Find the coordinates of point T and distance between S and T .

PLEASE TURN OVER THE PAGE

(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.9.)

Q.9. (Total 6 Marks)

a. A man stands on a flat surface at a distance of 50 metres from a vertical x metre high electric pole. The angle of elevation of the top of electric pole from the man on the flat surface is θ .

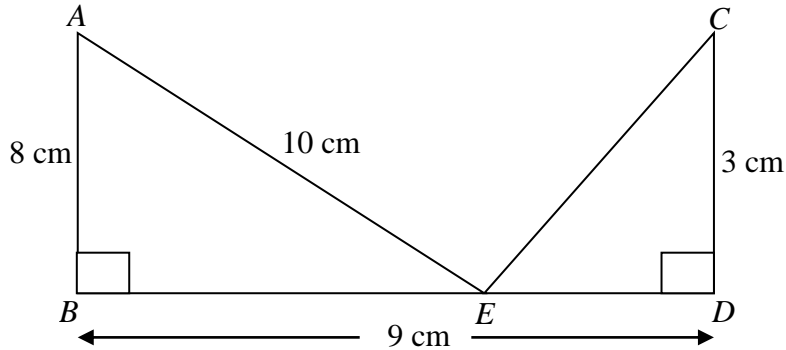
i. Show that $\theta = \tan^{-1}\left(\frac{x}{50}\right)$. (1 Mark)

ii. Hence, find the height of electric pole when the angle of elevation is 45° . (2 Marks)

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(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.9.)

b. In the given diagram, ABE and CDE are two right angled triangles.



NOT TO SCALE

Calculate the length of CE .

(3 Marks)

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