MARKING SCHEME

Question 1 a

$\frac{M^2+mn}{n(m-n)}$ - $\frac{(m+n)(m+n)}{(m+n)(m-n)}$

M 1 for factorizing the numerator **and** denominator

$\frac{m^2+mn-mn-n^2}{n(m-n)}$

M1 for the correct denominator

$\frac{(m+n)(m-n)}{n\,(m-n)}$

M1 for simplifying the numerator

M1 for factorising the numerator

m^2+n^2

dividing with the common factor

(m-n)

$\frac{m+n}{n}$

A1 Accuracy

Question 1 b

$\frac{\sqrt{6}}{\sqrt{49}\ \sqrt{3}-\sqrt{25}\sqrt{3}}$

Simplifying the denominator **M1**

$\frac{\sqrt{6}}{7\sqrt{3}-5\sqrt{3}}$

$\frac{\sqrt{6}}{2\sqrt{3}}$ x $\frac{\sqrt{3}}{\sqrt{3}}$

Multiplying by $\frac{\sqrt{3}}{\sqrt{3}}$ **M1**

$\frac{\sqrt{18}}{2\ x2}$

Rationalising the denominator **M1**

$\frac{\sqrt{18}\sqrt{2}}{6}$

$\frac{\sqrt{2}}{2}$

Accuracy **A1**

(4marks)

Question 2

a.

$32^{2a} = 4^{2a-1}$

convert logarithmic equation to exponential equation

$2^{5(2a)} = 2^{2(2a-1)}$

M1 expresing bases in index form

$2^{10a} = 2^{4a-2}$

$10a = 4a - 2$ **M1 equating power for equal bases**

$6a = -2$ **M1 Simplifcation**

$a = -\frac{1}{3}$ **A1 correct answer**

b.

$\underset{AB}{\rightarrow} = B - A$ C **M1** attempting to find vector $\overrightarrow{AB}, \overrightarrow{BC}$

$= \begin{pmatrix}1\\1\end{pmatrix} - \begin{pmatrix}-3\\3\end{pmatrix}$ **M1** simplification of vectors

$= \begin{pmatrix}4\\-2\end{pmatrix}$ **M1** writing one vector as a multiple of the other and identifying Common point

$\underset{BC}{\rightarrow} = C - B$

$= \begin{pmatrix}3\\0\end{pmatrix} - \begin{pmatrix}1\\1\end{pmatrix}$

$= \begin{pmatrix}2\\-1\end{pmatrix}$

$\underset{AB}{\rightarrow} = 2\begin{pmatrix}2\\-1\end{pmatrix}$

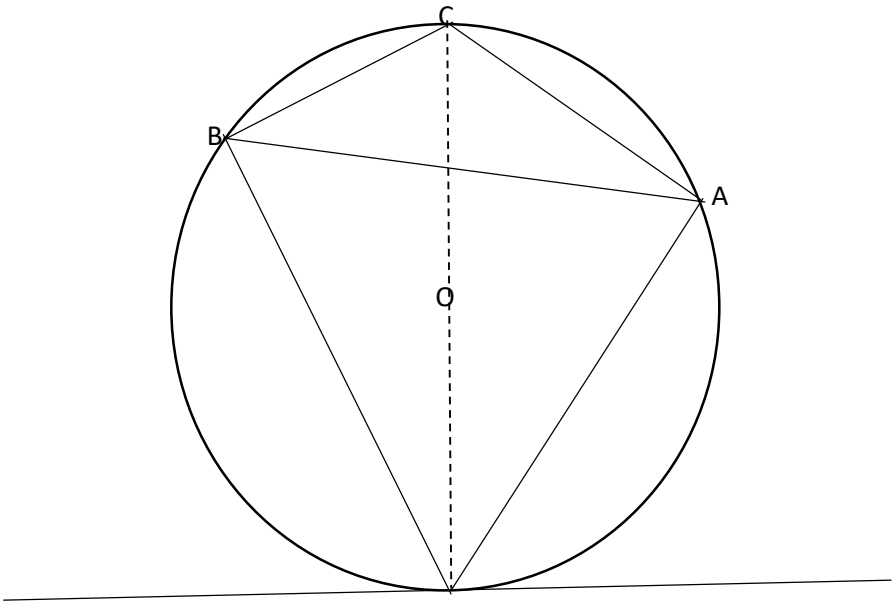
$= 2\underset{BC}{\rightarrow}$ **A1** accuracy **4Marks**

Therefore Vector BC || Vector CB and B is a common point

Therefore A, B and C are collinear

Question 3

a.



R T P

Given: Circle center O with tangent PR at T

To prove ∠ATP = ∠ABT or ∠BTA = ∠BAT

Construction: Draw diameter CT through O. **M1** construction

Join CA and CB

Proof

∠ABT = ∠ACT (angles in the same segment) **M1**

∠ATP + ∠ATC = 90^0 (radius perpendicular to tangent) **M1**

∠ACT + ∠ATC = 90^0 (angles in a semi-circle) **M1**

So ∠ATP = ∠ACT **M1** angles in alt segment

Therefore ∠ATP = ∠ABT Proved **A1** PROOF **6Marks**

b.

To prove PR = QR

∠QRS = ∠QPR (∠s in alternate segment) **M1**

∠QPR = ∠PRT (alternate ∠s) **M1**

∠PRT = ∠PQR (alternate segment)

Therefore ∠PQR = ∠QPR (base ∠s of △) **M1**

Therefore PR = QR (sides of isoc △) **A1** **4 Marks**

Question 4

4 (a) $n\ (P\ \cup Q\ ) = n\ (P\ \cap Q')\ + n\ (\text{P' U Q})\ + n\ (P\ \cap Q)$

48 = 5x + 4x + 3x **M1**

Substituting

$\frac{48}{12} = \frac{12x}{12}$ **M1** Equating

to 48

x = 4 **A 1** Accuracy

(4marks)

4(b) $q^2 = r^2 = p^2$ – 2rp Cos P Q R

$q^2 = 6^2 + 10^2$ – 2 x 6 x 10 x 0.600 **M 1** Substituting

q^2 = 64 **M1** Simplifying

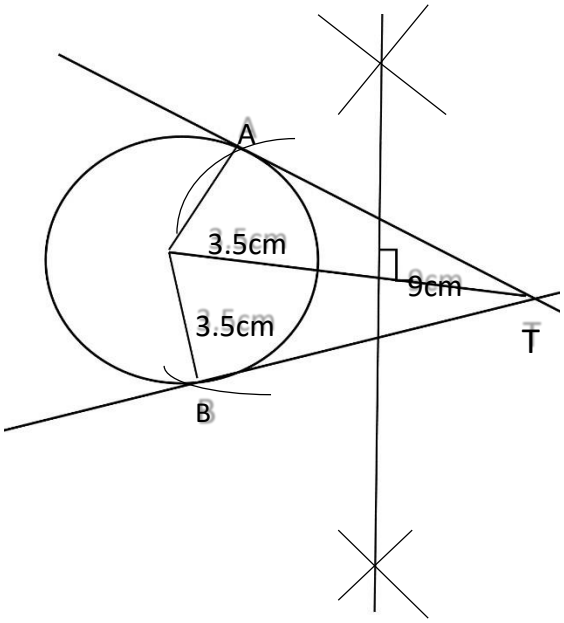
$q = \sqrt{64}$ **M 1** Square rooting to find PR

q = 8.0

PR = 8cm **A 1** Accuracy (5marks)

Question 5a)

5.(a)



ATB = 46°

M1 Radius 3.5cm

M1 correct circle with centre O

M1 construction of two tangents TA and TB

M1 Measuring angle ATB = 46°

M1 correct arcs

A 1 Accuracy

(6marks)

Question 5b

Centre coordinates = (1,1) **B1** correct scale factor Scale of enlargement = $\frac{S'T'}{ST}$ **M 1** Drawing angle RST and angle R'S'T'

$= \frac{12}{3}$ **M1** Finding coordinates of the centre of enlargement

M1 Scale factor of enlargement skill and Scale factor finding

= 4 **A1** Accuracy **4 Marks**

Question 6

a.

$\frac{XZ}{\sin 60^0} = \frac{2cm}{\sin 45^0}$ **M1 applying sin rule**

XZ = $\frac{2\sin 60^0}{\sin 45^0}$ **M1** Isolating XZ

XZ = $\frac{\frac{\sqrt{3}}{2}}{\frac{1}{\sqrt{2}}}$ **M1** Identifying special angles

XZ = $\frac{\sqrt{3}}{1} \times \frac{\sqrt{2}}{1}$ **M1** Simplification

XZ = $\sqrt{6}$ **A1** Accuracy **5marks**

Question 6b

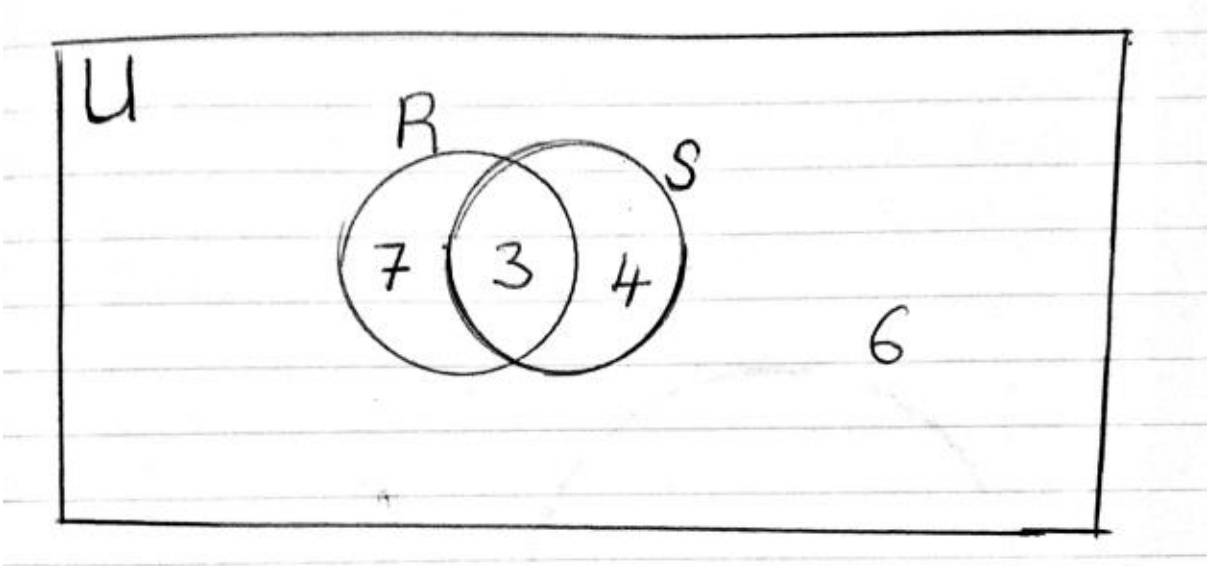
Join EC **M1** for construction C = OE radii **M1** For the reason AEF = A C E 56° 24 **M1** Angle of alternate segments

OCE = OEC = $\frac{48}{2}$ = base angles of ISO triangle **M1**

ACO = 56 – 24 = 32 **A1** accuracy

(5marks)

Question 7a



P(a car had no Sunroof) $= \frac{7+6}{20}$ **M4** For finding no of Red cars only,cars with sunroofs only, cars without sunroofs and those which are not Red

M1 Showing information in a venn diagram

$= \frac{13}{20}$ **A1** accuracy

Question 7b.

Deviation from the mean	Square deviation
-2	4
-3	9
4	16
1	1
	30

M1 Finding square deviations

M1 Finding sum of square devaluation

Variance $= \frac{30}{4} = 7.5$ **M1** Finding variance

SD $= \sqrt{\frac{30}{7}}$

SD = 2.73861279

SD = 2.7386 **A1** Accuracy

Question 8a

10, + 15, 20, ... +85 **M1** coming up with A.P. series

a_n = a + (n – 1) = d **M1** Finding common difference

a = 10 Substituting in **nth** term.

d = 15 – 10 =5

$a_n = 10 + (n-1)5 = 85$ **M1** Equating to 85 to find number of rows

10 + 5n – 5 = 85 **M1** Finding number of rows

$\frac{5n}{5} = \frac{80}{5}$ **A1** Accuracy

=16 Rows **(6 marks)**

Question 8b

$S_n = \frac{n(a+l}{2}$ **M1** Substituting in the formula

$= \frac{16}{2}$ (10 + 85) **M1** Finding total number of seats

= 8 x 95 **M1** multiply by K150

= 760 seats x K 150

= K114000 **(4marks)**

Question 9

(i)

$y = ax + \frac{K}{X}$ **M1** Finding relationship/Law

y = 11 & x = 1

$11 = a(1) + \frac{K}{1}$ **M1** Substitution

11 = a + K ……. (i) **M1** formulating equation i

y = 10 & x = $\frac{1}{2}$

$10 = a(\frac{1}{2}) + \frac{K}{\frac{1}{2}}$

$10 = \frac{a}{2} + 2K$

20 = a + 4K ……. (ii) **M1** equation ii

$-\begin{pmatrix} a + 4K = 20 \\ a + K = 11 \end{pmatrix}$ **M1** Solving silmutaneous equation

3K = 9

K = 3 **M1** Finding constant k or a

a + K = 11

a + 3 = 11 **M1** Substitution

a = 11 – 3

a = 8

Therefore expression for y in terms of x is

$y = 8x + \frac{3}{x}$

(ii)

x = 3

$y = 8(3) + \frac{3}{3}$ **M1** Substitution

y = 24 + 1

y = 25 **A1** Accuracy

(iii)

y = 14

$14 = 8x + \frac{3}{x}$ **M1** substitution

$14x = 8x^2 + 3$

$8x^2 – 14x + 3 = 0$

$8x^2 – 2x – 12x + 3 = 0$

$2x(4x – 1) -3(4x – 1) = 0$

$(2x – 3)(4x – 1) = 0$

$X = \frac{1}{4}$ or $\frac{3}{2}$ **A1** Accuracy

Question 11.

$f(x) = 2x^3 + x^2 – 13x + 6$, if x = 2

$f(2) = 2(2)^3 + (2)^2 – 13(2) + 6$ **M1** Attempting to find factor of a polynomial

$= 16 + 4 - 26 + 6$

$= 26 - 26$

$= 0$

Therefore $(x - 2)$ is a factor of $f(x)$

$$\begin{array}{r|l} & 2x^2 + 5x - 3 \\ \hline x - 2 & 2x^3 + x^2 - 13x + 6 \\ & -2x^3 + 4x \\ \hline & 5x^2 - 13x \\ & -5x^2 + 10x \\ \hline & -3x + 6 \\ & 3x - 6 \\ \hline & 0 \end{array}$$

M1 finding quotient

M1 Subtracting terms

M1 Subtracting terms

M1M1 simplification and finding factors of quadratic equation

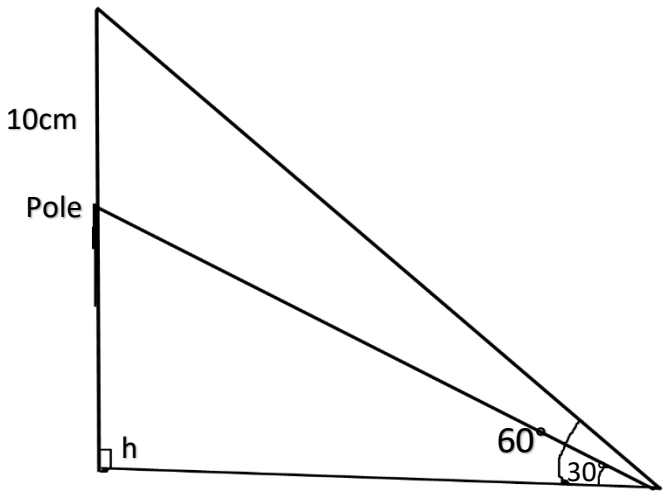
$2x^2 + 5x - 3 = (x + 3)(2x - 1)$

Therefore $2x^3 + x^2 - 13x + 6 = (x - 2)(x + 3)(2x - 1)$

$\Longmapsto (x - 2)(x + 3)(2x - 1) = 0$

$x = 2$ or $x = -3$ or $x = \frac{1}{2}$ **A1 A1 A1** Accuracy

Question 10



M1 Sketching the diagram correctly

M1 labelling Notations x and h

$\tan 30 = \frac{h}{x}$ **M1** using tan ratio

$x = \frac{h}{\sin 30}$ **M1** using tan ratio

$\tan \frac{h+10}{x}$ **M1** Equating x

$x = \frac{h+10}{x}$ **M1** Substituting

standard ratios

$\frac{h+10}{\tan 60} = \frac{h}{\tan 30}$ **M 1**

$\frac{1}{\sqrt{3}}h + 10\frac{1}{\sqrt{3}} = \sqrt{3}$ h **M1** Crossing Multiplying

h + 10 = 30 h **M1** Simplifying

h + 10 = 3h **M1** Finding the value of h

$\frac{10}{2} = \frac{2h}{2}$

h = 5m **M1** Adding h to find the height of the pole

5m + 10m = 15m **A1** Accuracy **(10marks)**

Question 12.

(i) Inequalities

a. $x \geq 0 \Longmapsto x = 0$

b. $y \geq 0 \Longmapsto y = 0$

c. $5000x + 2000y \leq 200000$

$\Longmapsto 5x + 2y \leq 200$ $\Longmapsto 5x + 2y = 200$ **M1 M1** Finding inequality iand table of value

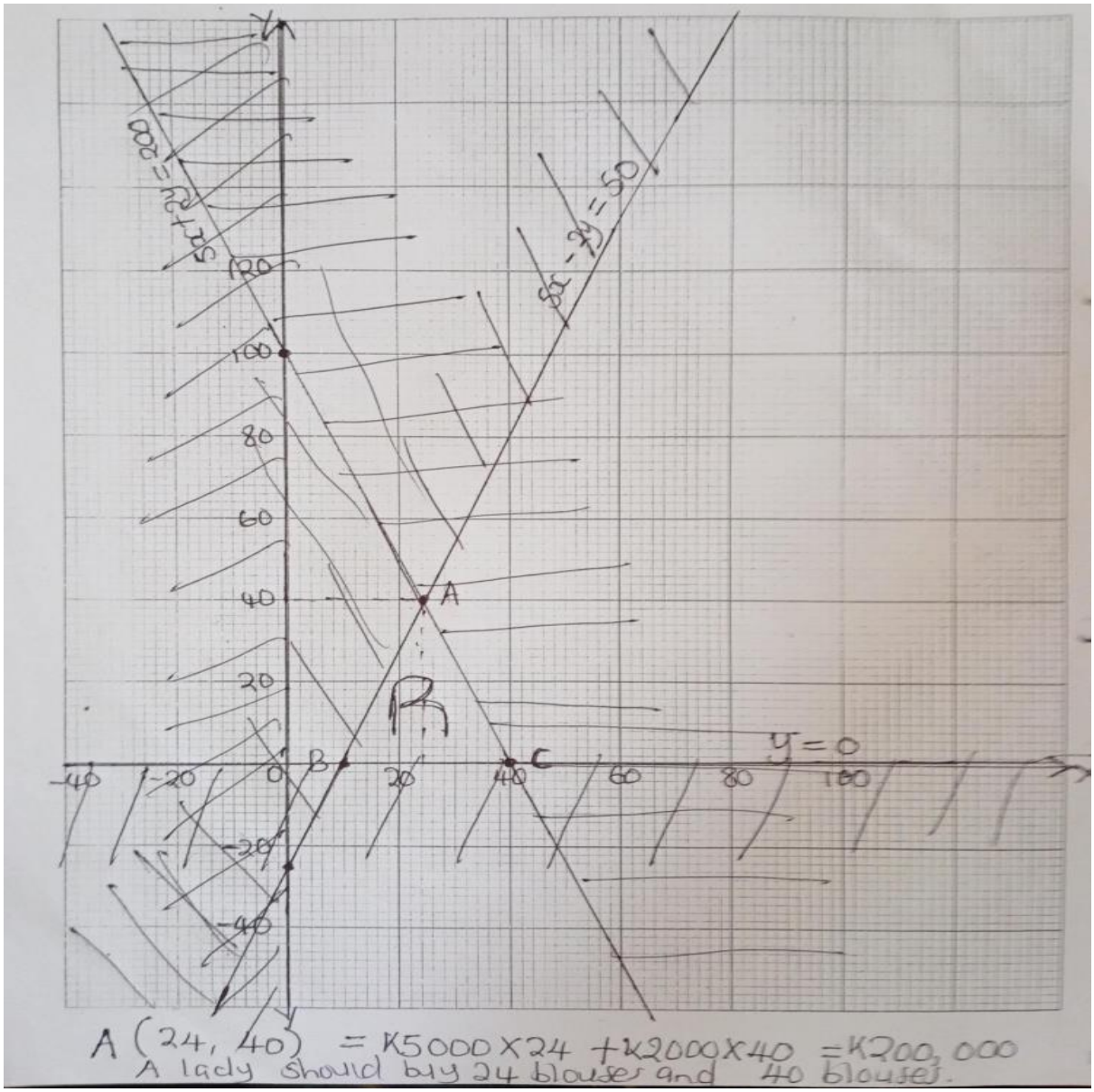
X	0	40
Y	100	0

d. $5000x \geq 50000 + 2000y$

$5x - 2y \geq 50 \Longmapsto 5x - 2y = 50$

X	0	10
y	-25	0

M1 M1Finding inequality ii and table of values



a lady should buy 24 blouses and 40 shirts with K200, 000. (10 marks)