GRADE 12

MATHEMATICS P2

AUGUST 2025

MARKS: 150

TIME: 3 hours

This paper consists of 12 pages, 1 annexure and an information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 questions.

2. Answer ALL the questions.

3. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.

4. Answers only will not necessarily be awarded full marks.

5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.

6. If necessary, round answers off to TWO decimal places, unless stated otherwise.

7. Diagrams are NOT necessarily drawn to scale.
.
8. An information sheet, with formulae, is included at the end of the question paper.

9. Number the answers correctly according to the numbering system used in this question paper.

10. Write legibly and present your work neatly.

QUESTION 1

Mathematical Literacy teachers are always complaining about their learners' language and reading skills.
Below we have the June results for some matric learners in English and Mathematical Literacy.

Mathematical Literacy	25	38	40	46	47	12	49	49	54	55	59	64
English	34	53	62	40	44	20	50	55	61	63	54	59

1.1 Use the grid provided on **DIAGRAM SHEET 1** to draw a scatter plot for the data. (3)

1.2 Show that the equation of the least squares regression line between the English and Mathematical Literacy results is given by $\hat{y} = 17{,}32 + 0{,}72x$. (4)

1.3 Draw the least squares line for the data on the scatter plot diagram drawn in QUESTION 1.2 on **DIAGRAM SHEET 1**. (2)

1.4 Estimate the Mathematical Literacy results for a learner who gets 58% for English. (2)

1.5 Estimate the English results for a learner who gets 69% for Mathematical Literacy. (2)

1.6 Determine the correlation between the English and Mathematical Literacy results. (2)

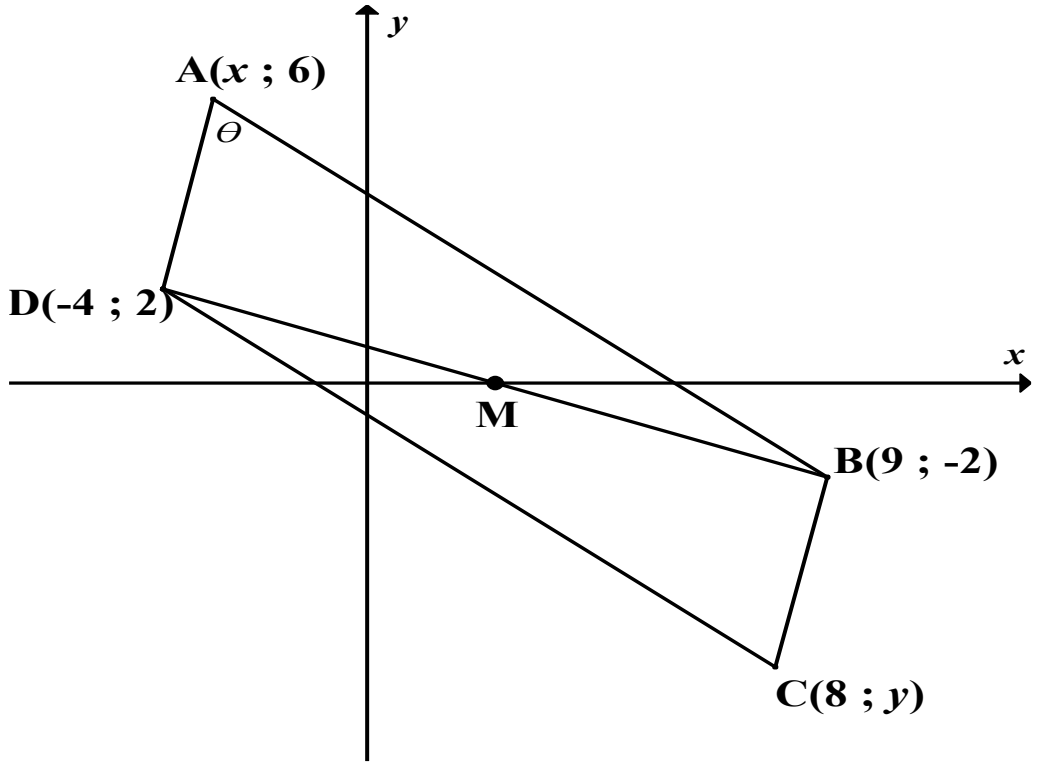
1.7 Use the correlation coefficient to comment on the relationship between the English and Mathematical Literacy results. (2)

1.8 Determine the standard deviation of the Mathematical Literacy results. (2)

[19]

QUESTION 2

In the diagram below ABCD is a parallelogram.



2.1 Calculate the coordinates of M, the midpoint of DB. (2)

2.2 Hence, or otherwise, calculate the values of x and y. (3)

2.3 Calculate the gradient of BC. (2)

2.4 Calculate the equation of the line AB in the form $y = \ldots$ (4)

2.5 Determine θ. (4)

2.6 Prove that Δ DBC is not a right-angled triangle. (3)

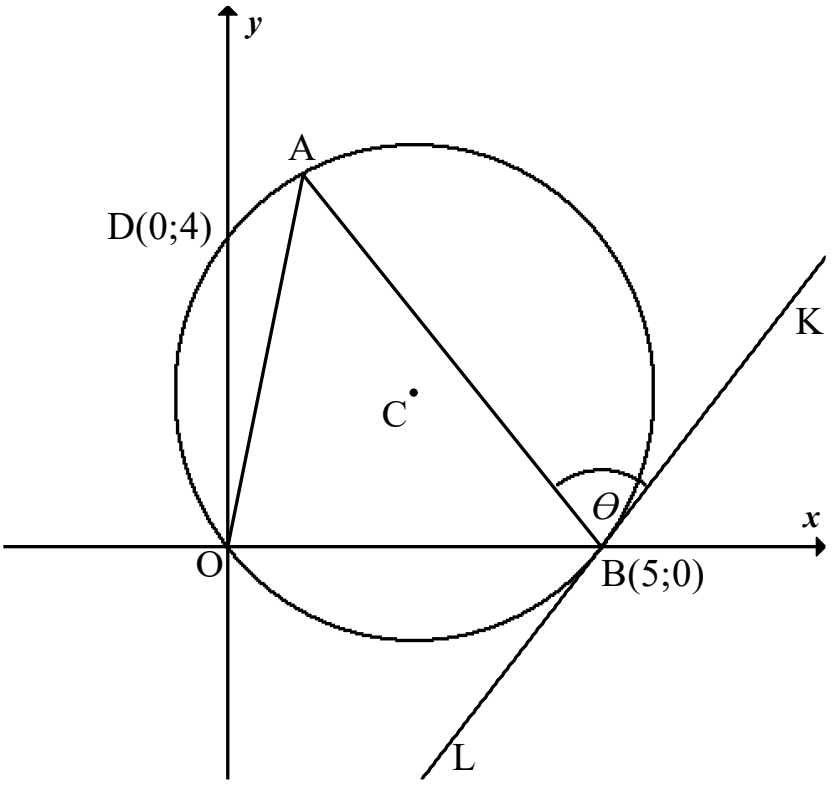
[18]

QUESTION 3

In the diagram below is the sketch of a circle with centre C$\left(\frac{5}{2};2\right)$.

The circle goes through the origin and cuts the *x*- and *y*-axis at B and D respectively.

LBK is tangent to the circle at B. $A\hat{B}K = \theta = 78{,}69^0$.



3.1 Show by calculation that the equation of the circle is

$$x^2 + y^2 - 5x - 4y = 0.$$ (4)

3.2 Determine the equation of LBK in the form $y = mx + c$. (5)

3.3 Determine the gradient of OA correct to the nearest integer and hence the equation of OA. (3)

3.4 Calculate the coordinates of A. (5)

3.5 If there is another circle

$$\left(x + \frac{5}{2}\right)^2 + (y-3)^2 = \frac{61}{4}$$

3.5.1 Show that the two circles intersect at two distinct points. (3)

3.5.2 Show by substitution that the two circles in fact intersect at O and A. (2)

[22]

QUESTION 4

4.1 Given: $\sin\alpha = \frac{3}{5}$ and $90^o < \alpha < 270^o$

With the aid of a sketch and **without using a calculator**, determine:

4.1.1 $\tan\alpha$ (3)

4.1.2 $\cos(90+\alpha)$ (2)

4.1.3 $\cos 2\alpha$ (3)

4.2 Given: $\sin 38^o = p$, determine the following in terms of *p*.
(Without using a calculator.)

4.2.1 $\cos(-38^o)$ (3)

4.2.2 $\sin 76^o$ (2)

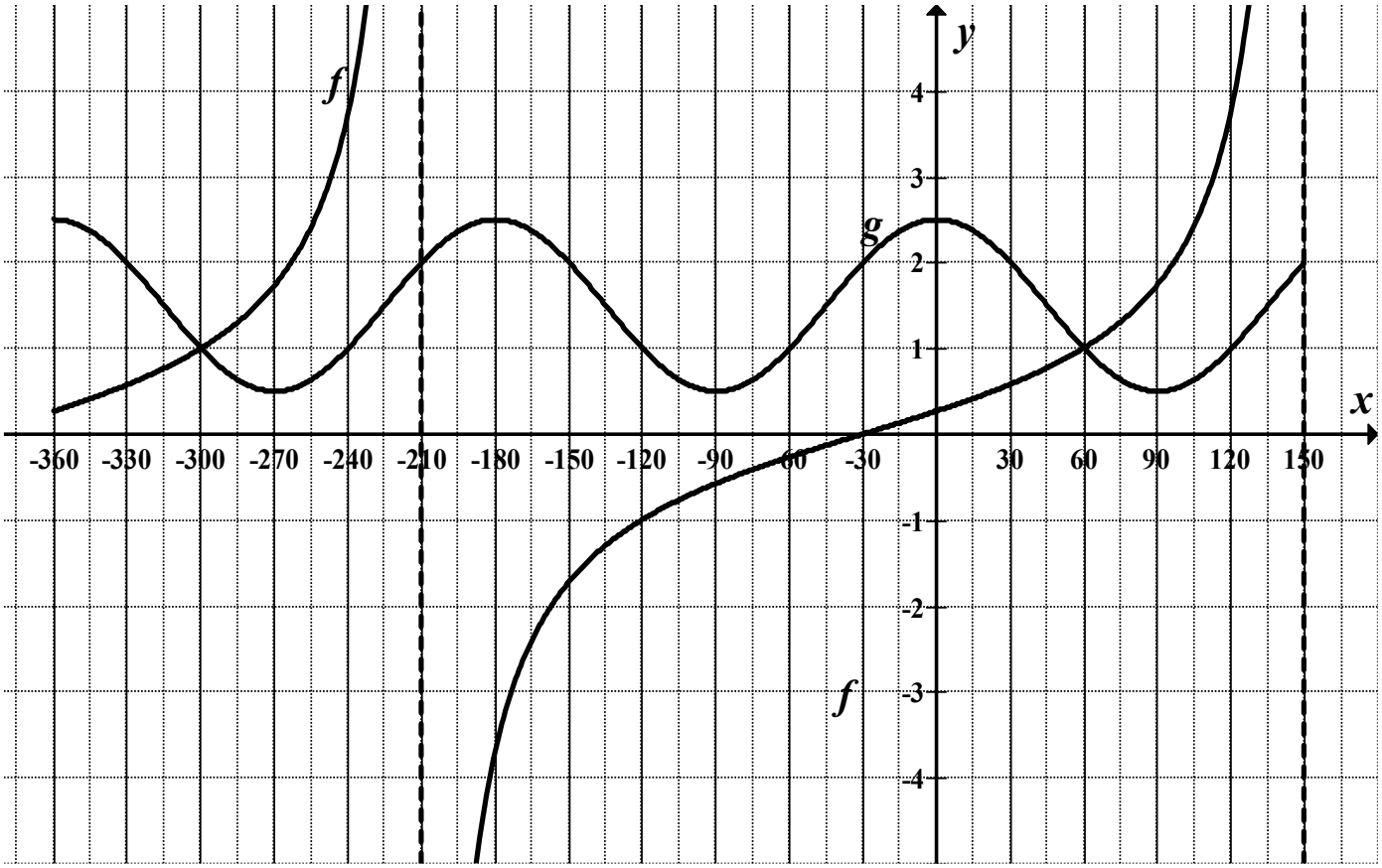
4.3	Simplify the following without using a calculator: $\frac{\sin 150^o . \tan 225^o}{\sin(-30^o).\sin 420^o}$		(6)
			[19]

QUESTION 5			

5.1	Prove: $\frac{2\sin^2 x}{2\tan x - \sin 2x} = \frac{1}{\tan x}$		(6)
5.2	Simplify $\frac{\sin 3x + \sin x}{\cos 2x + 1}$ to a single trig ratio		(6)
			[12]

QUESTION 6

The graphs of the functions $f(x)=\tan\left(\frac{x}{2}+15\right)$ and $g(x)=\cos(2x)+\frac{3}{2}$ on the interval $-360^{o} \le x \le 150^{o}$ are shown in the diagram below.



6.1 By using the graphs drawn above:

6.1.1 Write down the x-values of the points of intersection for $f(x) = g(x)$ for $-360^{o} \le x \le 150^{o}$ (2)

6.1.2 Hence, give the general solution for $f(x) = g(x)$. (3)

6.2 Determine the value(s) of x for which:

6.2.1 $g(x)-f(x)=2$ for $x \in \left[-210^{o};0^{o}\right]$ (2)

6.2.2 $f(x).g(x) \ge 0$ for $x \in \left[-360^{o};150^{o}\right]$ (2)

[9]

QUESTION 7

In the diagram alongside, MT is a vertical structure.

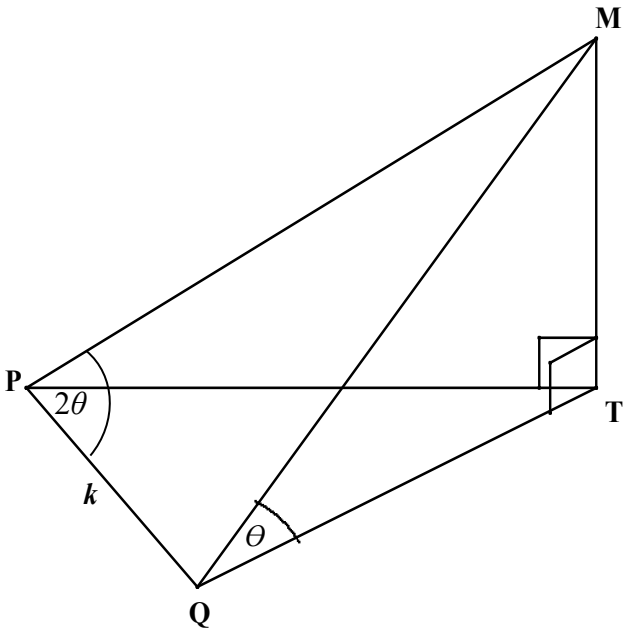
P, Q and T are three points in the same horizontal plane.

The angle of elevation of M from Q is θ.

PQ = k metres.

PM = 2 PQ , $M\hat{P}Q = 2\theta$

$\frac{1}{2}$ area Δ MPQ $= k^2 \cdot \sin\theta \cdot \cos\theta$



7.1 Hence, or otherwise, prove that

$$MQ = k.\sqrt{1+8\sin^2\theta}$$ (5)

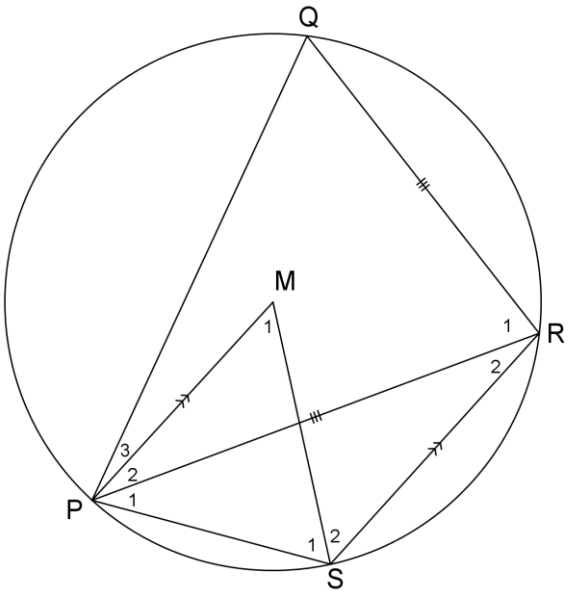
7.2 Find the value of MQ, rounded off to the nearest metre if $k = 139{,}5$ m and $\theta = 42^o$. (2)

[7]

QUESTION 8

8.1	Complete the statements below by filling in the missing word(s) so that the statements are CORRECT:			
	8.1.1	The angle between the tangent and a chord is … .		(1)

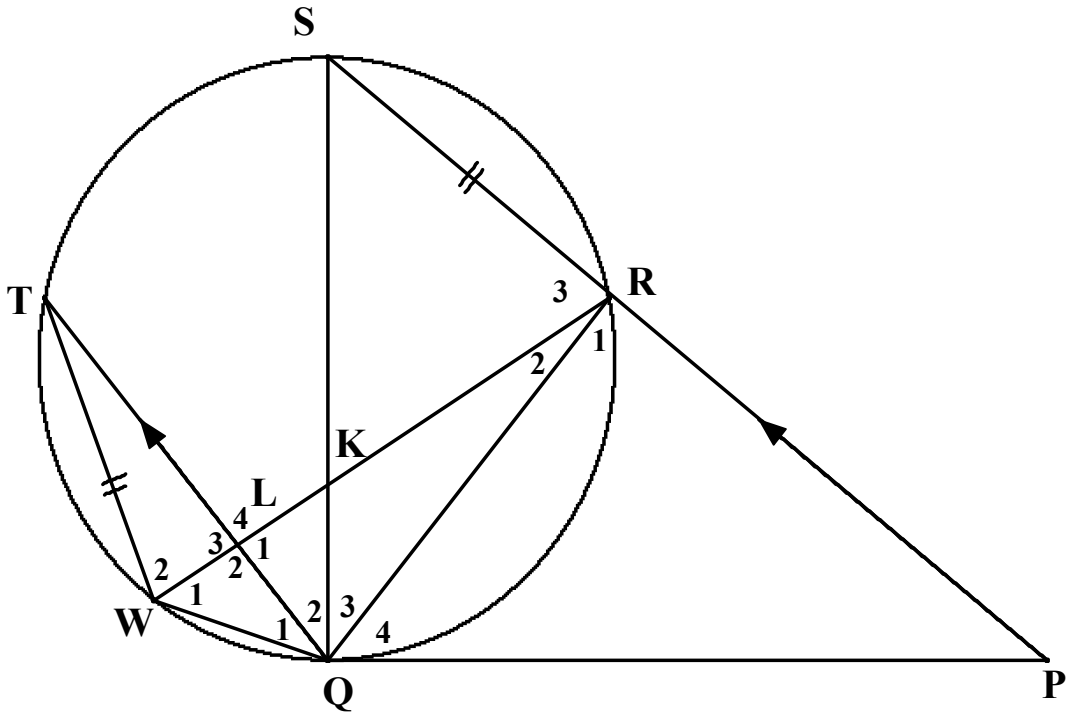
	8.1.2	The opposite angles of a cyclic quadrilateral are … .		(1)

8.2	In the diagram alongside, M is the centre of circle PQRS. PM ∥ RS , QR = PR and $\hat{R}_2 = 28^0$  Determine, giving reasons, the size of the following angles:			
	8.2.1	$\hat{S}_2$		(3)
	8.2.2	$P\hat{S}R$		(3)
	8.2.3	$\hat{Q}_3$		(2)
	8.2.4	$\hat{P}_3$		(3)
				[13]

QUESTION 9

In the diagram below, PQ is a tangent to circle SRQWT at Q.
PRS is a straight line.
RW cuts SQ and QT at K and L respectively.

PS || QT , RS = TW and $\hat{Q}_2 = x$.



9.1 Determine , with reasons, three other angles equal to *x*. (5)

9.2 Prove that :

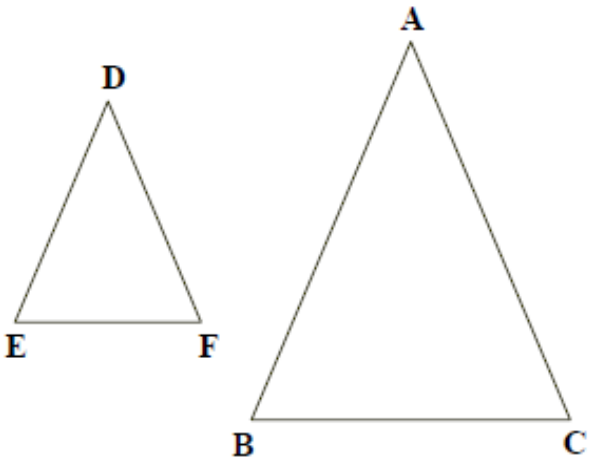
9.2.1	$\hat{R}_1 = \hat{L}_3$		(5)
9.2.2	PRKQ is a cyclic quadrilateral.		(6)

[16]

QUESTION 10

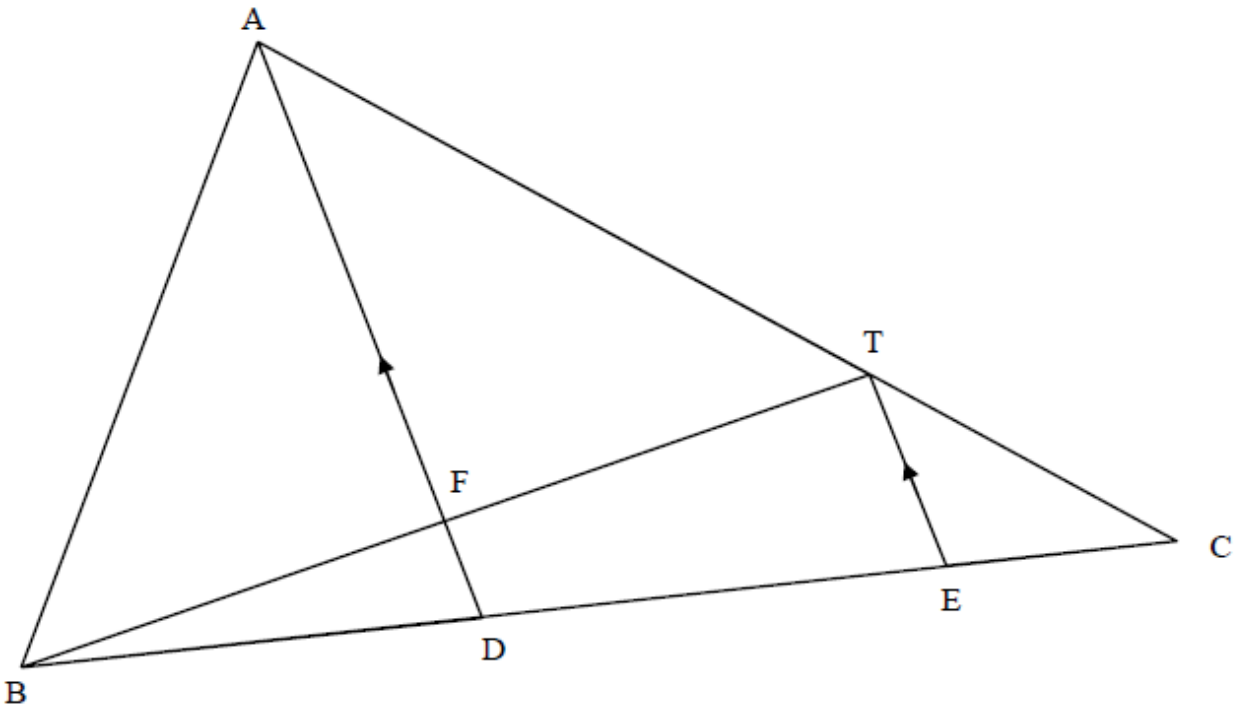
10.1 Use the triangles on **DIAGRAM SHEET 5** to prove the theorem which states that:

If $\hat{A} = \hat{D}$, $\hat{B} = \hat{E}$ and $\hat{C} = \hat{F}$ then $\frac{AB}{DE} = \frac{AC}{DF}$



(6)

10.2 In the figure below, Δ ABC has D and E on BC. BD = 6 cm and DC = 9 cm. AT : TC = 2 : 1 and AD || TE.



10.2.1 Determine the numerical value of $\frac{CE}{ED}$. (2)

10.2.2 Show that D is the midpoint of BE. (2)

10.2.3 If FD = 2 cm, calculate the length of TE. (2)

10.2.4 Calculate the numerical value of:

$$\frac{\text{Area of } \Delta TEC}{\text{Area of } \Delta ABC}$$ (3)

[15]

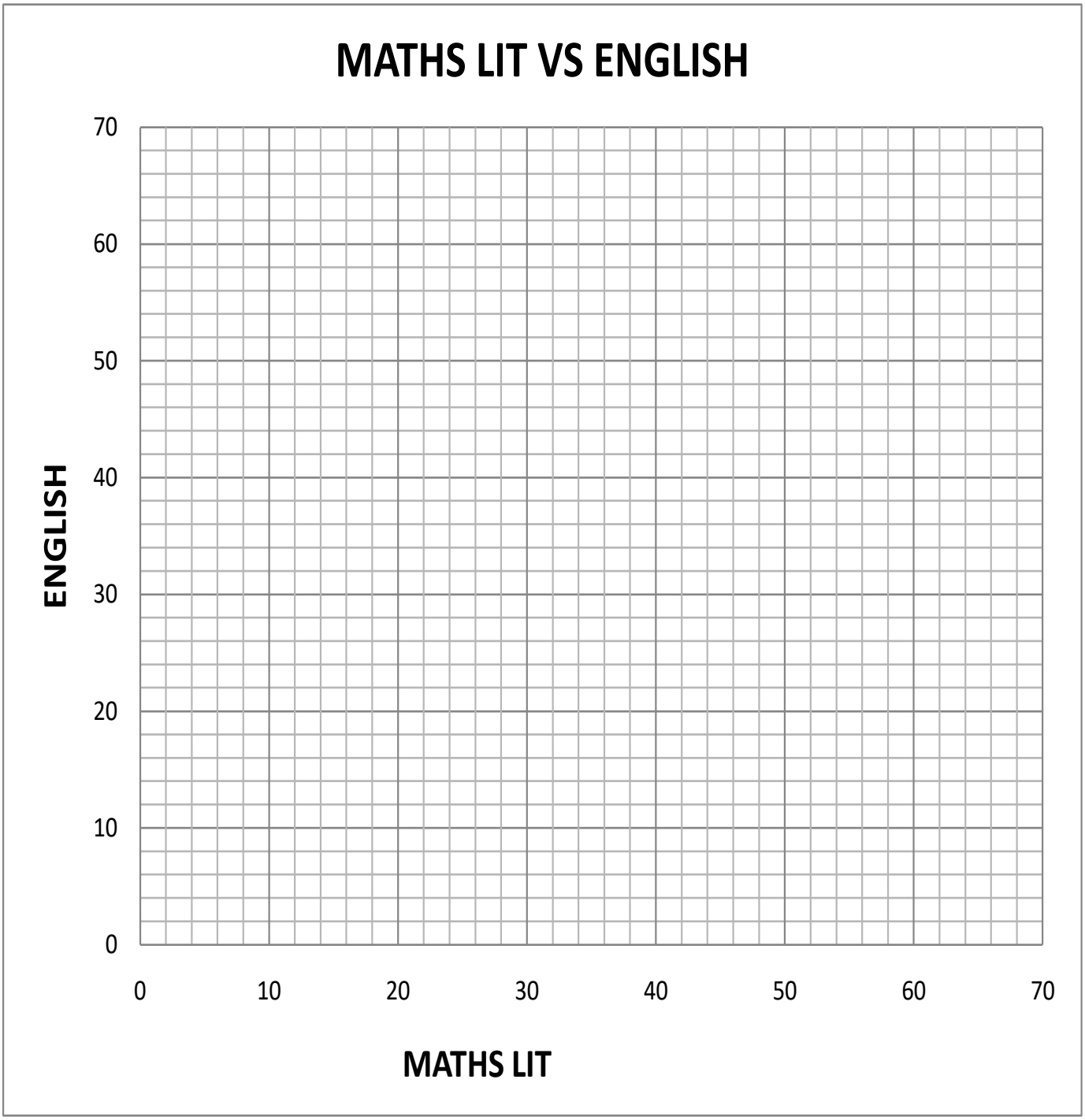
TOTAL: 150

SURNAME:

NAME:

DIAGRAM SHEET 1

QUESTION 1.1 and 1.3



INFORMATION SHEET: MATHEMATICS

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

$A = P(1+ni)$ $A = P(1-ni)$ $A = P(1-i)^n$ $A = P(1+i)^n$

$\sum_{i=1}^{n} 1 = n$ $\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$ $T_n = a + (n-1)d$ $S_n = \frac{n}{2}\left(2a + (n-1)d\right)$

$T_n = ar^{n-1}$ $S_n = \frac{a\left(r^n - 1\right)}{r-1}$; $r \neq 1$ $S_\infty = \frac{a}{1-r}$; $-1 < r < 1$

$F = \frac{x\left[(1+i)^n - 1\right]}{i}$ $P = \frac{x[1-(1+i)^{-n}]}{i}$

$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$

$y = mx + c$ $y - y_1 = m(x - x_1)$ $m = \frac{y_2 - y_1}{x_2 - x_1}$ $m = \tan\theta$

$(x-a)^2 + (y-b)^2 = r^2$

In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $a^2 = b^2 + c^2 - 2bc.\cos A$ *area* $\Delta ABC = \frac{1}{2}ab.\sin C$

$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta$ $\sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$

$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta$ $\cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases}$$

$\sin 2\alpha = 2\sin\alpha.\cos\alpha$

$\bar{x} = \frac{\sum fx}{n}$ $\sigma^2 = \frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n}$

$P(A) = \frac{n(A)}{n(S)}$ $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$\hat{y} = a + bx$ $b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$