



OR TAMBO COASTAL DISTRICT

**NATIONAL
SENIOR CERTIFICATE**

Stanmorephysics.com
GRADE 12

MATHEMATICS MARCH TEST 2026

Stanmorephysics.com

MARKS: 100

TIME: 2 HOURS

This question paper consists of 11 pages

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

- 1 This question paper consists of 8 questions three diagram sheets and formular sheet.
- 2 Answer ALL the questions.
- 3 Clearly show ALL calculations, diagrams, graphs, et cetera, that you have used in determining your answers.
- 4 An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
- 5 If necessary, ALL answers should be rounded off to TWO decimal places, unless stated otherwise.
- 6 Number the answers correctly according to the numbering system used in this question paper.
- 7 Diagrams are NOT necessarily drawn to scale.
- 8 Write neatly and legibly.

QUESTION 1

Given the quadratic pattern: 5;12;21; 32;...

- 1.1 Determine the general term T_n of the pattern. (4)
- 1.2 Calculate the value of the 25th term. (2)
- 1.3 Which term of the sequence has the value of 1152? (4)
- 1.4 Show that the difference between any two consecutive terms will always be an odd number (3)

[13]

QUESTION 2

2.1 The sum of the first n terms of an arithmetic series is $S_n = \frac{3n^2 - 5n}{2}$

- 2.1.1 Determine the first three terms of the sequence. (3)
- 2.1.2 Calculate the 20th term (T_{20}) using the S_n formula. (3)

2.2 For which value(s) of k will $\sum_{i=1}^{\infty} 4(k-1)^i$ converges. (3)

2.3 Given a geometric series with first term a and common ratio r . (5)
 Let S_n be the sum of the first n terms and S_{2n} be the sum of the first $2n$ terms.
 Prove that the sum of the terms from T_{n+1} to T_{2n} is given by $S_n \cdot r^n$

[14]

QUESTION 3

Given $f(x) = \frac{2}{x-1} + 3$

3.1 Write down the equation:

3.1.1 Vertical asymptote (1)

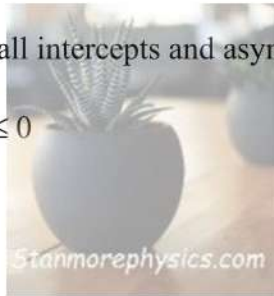
3.1.2 Horizontal asymptote (1)

3.2 Calculate the x and y intercepts of f . (3)

3.3 Sketch the graph of f , showing all intercepts and asymptotes. (4)

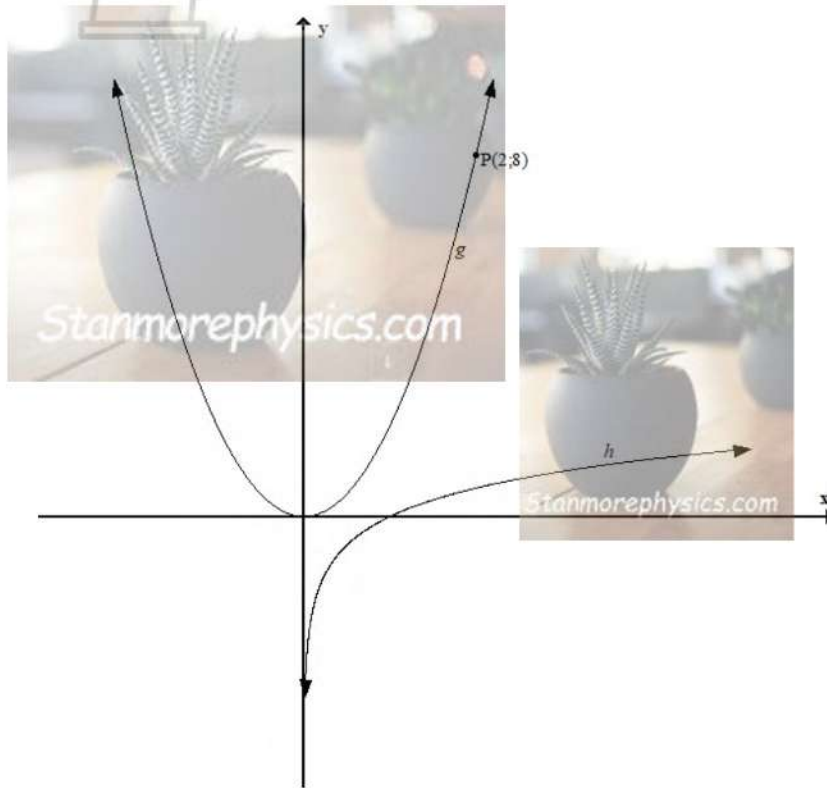
3.4 For which values of x is $f(x) \leq 0$ (2)

[11]



QUESTION 4

The diagrams below show the graphs of $g(x) = ax^2$ and $h(x) = \log_b x$. The point P (2;8) lies on the graph of g .



- 4.1 Determine the value of a (2)
- 4.2 If h passes through (8;3), find the value of b . (2)
- 4.3 Write down the equation of $h^{-1}(x)$ in the form $y = \dots$ (2)
- 4.4 Determine the domain of h . (2)
- 4.5 Determine the value(s) of x for which
 - 4.5.1 $g(x).h(x) < 0$ (2)
 - 4.5.2 $x.h(x) \geq 0$ (2)

[12]

QUESTION 5

Given $f(x) = 2x^2 - 4x - 6$

5.1 Rewrite $f(x)$ in the form $f(x) = a(x - p)^2 + q$ by completing the square. (3)

5.2 Determine the coordinates of the:

5.2.1 turning point of f . (2)

5.2.2 x -intercepts of f . (3)

5.3 Sketch the graph of f (3)

5.4 Write down the y -intercepts of f^{-1} (2)

5.5 Write down the domain of f^{-1} (2)

5.6 If $f(x)$ is shifted 2 units to the right and 5 units up, write down the new equation (2)

[17]**QUESTION 6**

6.1 Simplify without using a calculator:

$$\frac{\sin(x - 180^\circ) \cdot \tan(x + 180^\circ) \cdot \cos(90 + x)}{\sin^2(180^\circ + x)}$$
 (6)

6.2 If $\cos 25^\circ = \sqrt{1 - k^2}$, determine the following in terms of k :

6.2.1 $\sin 25^\circ$ (2)

6.2.2 $\sin 50^\circ$ (3)

6.2.3 $\cos 70^\circ$ (5)

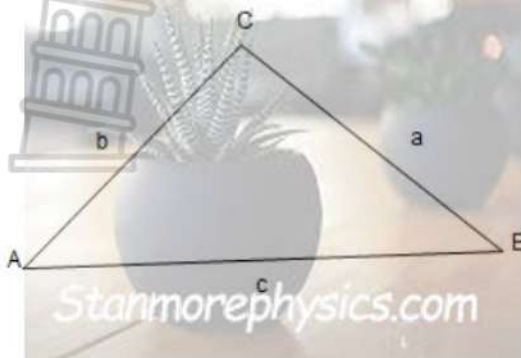
6.3 Prove that $\frac{\sin 3\theta}{\sin \theta} - \frac{\cos 3\theta}{\cos \theta} = 2$ (5)

6.4 If $\cos(A + B) = m$ and $\cos(A - B) = n$, prove that $\cos A \cos B = \frac{m + n}{2}$ (3)

[24]

QUESTION 7

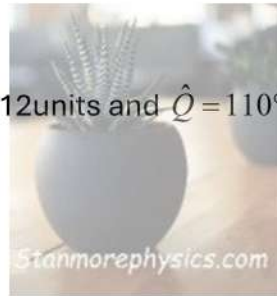
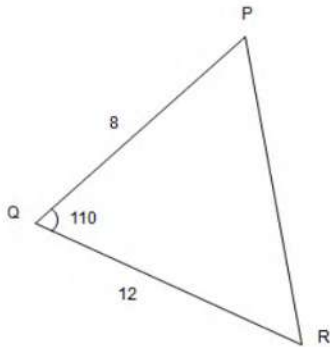
Given $\triangle ABC$, use the triangle to prove that $a^2 = b^2 + c^2 - 2bc \cos A$ (4)



[4]

QUESTION 8

Given $\triangle PQR$ with $PQ=8$ units, $QR=12$ units and $\hat{Q} = 110^\circ$



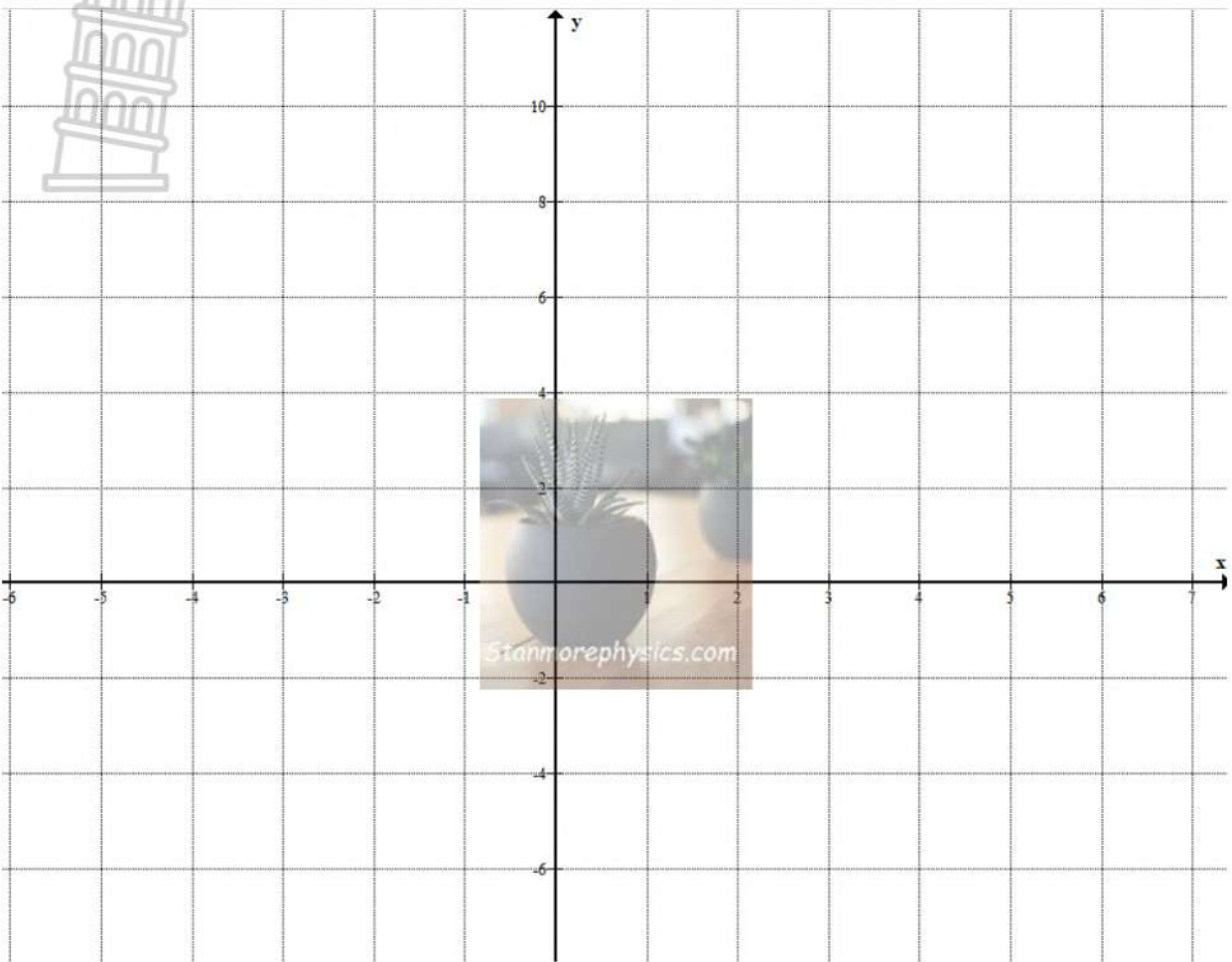
8.1 Calculate the area of $\triangle PQR$ (2)

8.2 Calculate the length of PR (3)

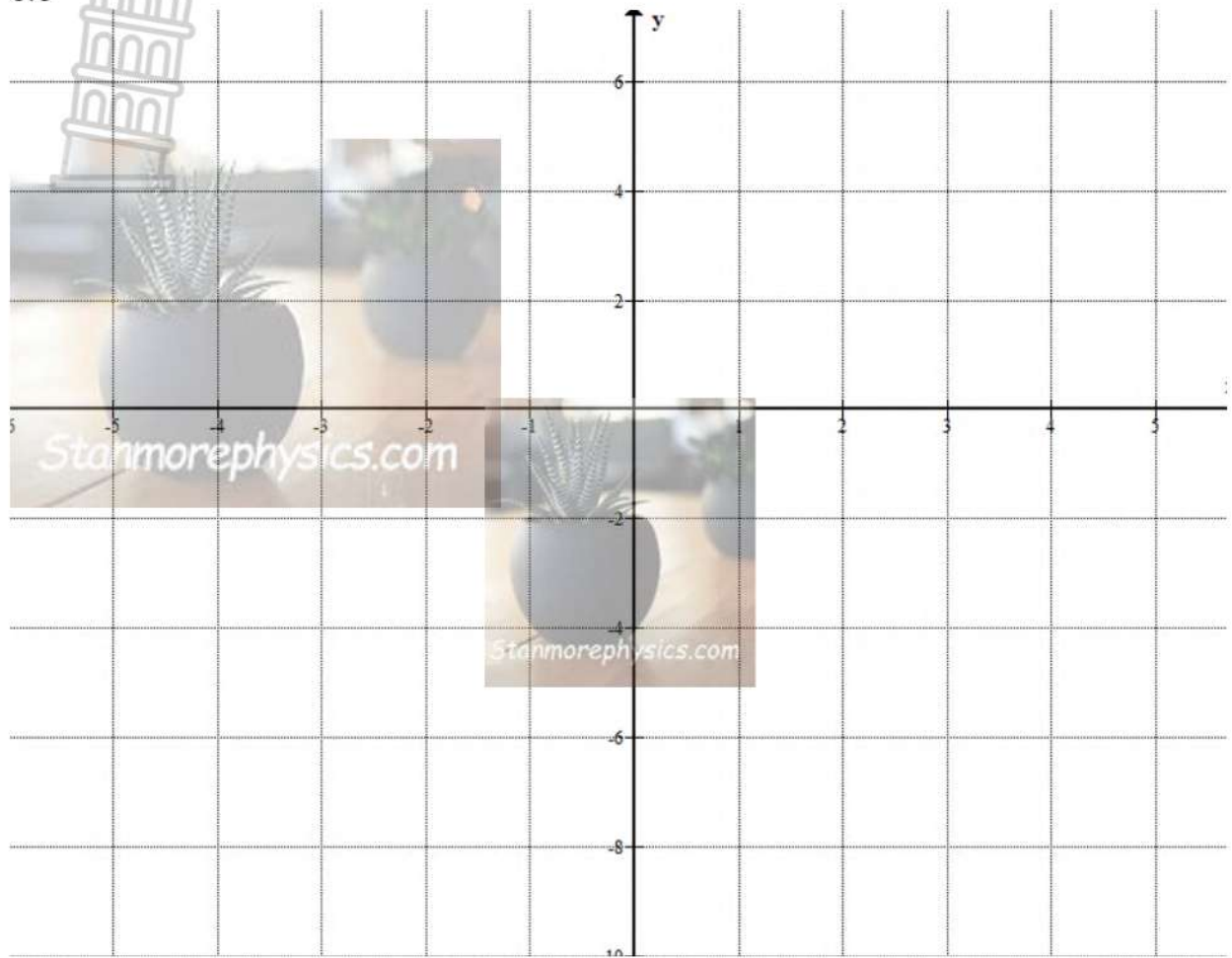
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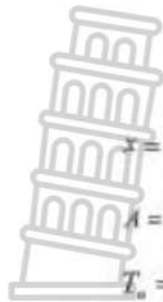
TOTAL 100

3.3



5.3





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

$$A = P(1 + ni)$$

$$T_n = a + (n-1)d$$

$$T_n = ar^{n-1}$$

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

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

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$y = mx + c$$

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

$$\text{In } \triangle ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$\text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

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

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

$$\bar{x} = \frac{\sum x}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$\hat{y} = a + bx$$

INFORMATION SHEET

$$A = P(1 - ni)$$

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

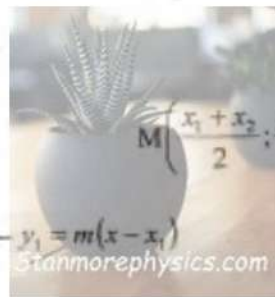
$$A = P(1 + i)^n$$

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$S_n = \frac{a(r^n - 1)}{r - 1} ; r \neq 1$$

$$S_n = \frac{a}{1 - r} ; -1 < r < 1$$

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



$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

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

$$\sin 2\alpha = 2 \sin \alpha \cdot \cos \alpha$$

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

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

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



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GRADE 12

TERM 1 CONTROLLED TEST 2026

MATHEMATICS

MARKING GUIDELINES

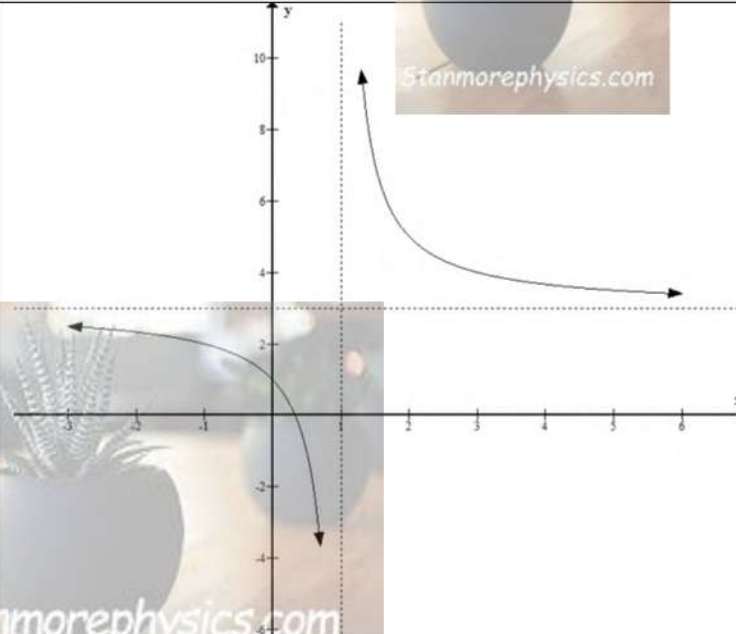
This marking guidelines consist of 8 pages.

NOTE

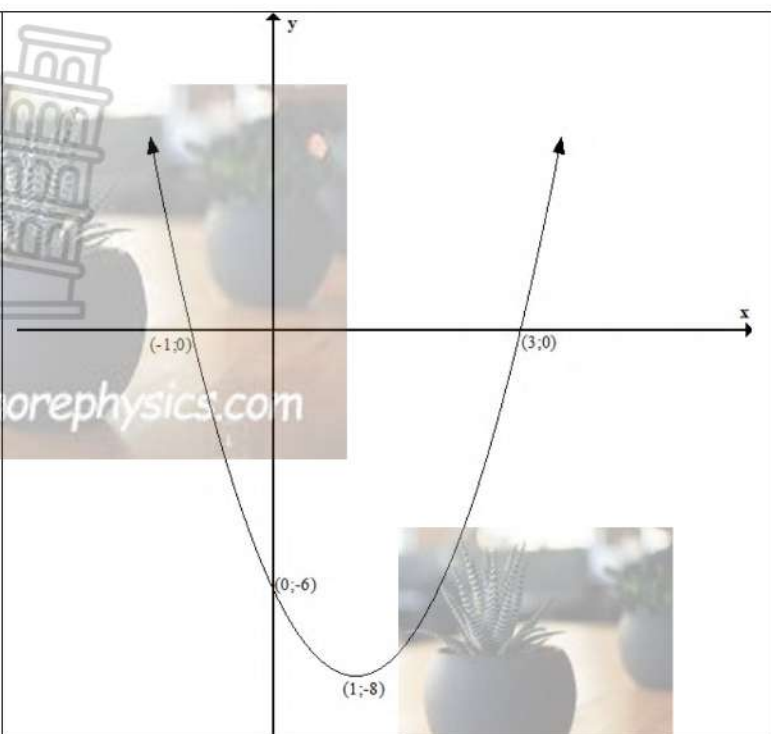

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of the Marking Guidelines. Stop marking at the calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

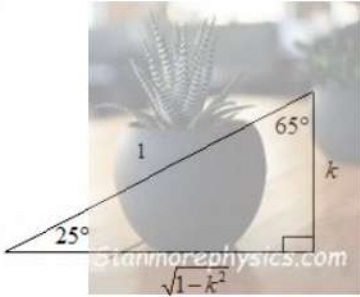
QUESTION 1			
1.1	<p> $2a = 2$ $3a + b = 7$ $a + b + c = 5$ $a = 1$ $3(1) + b = 7$ $1 + 4 + c = 5$ $b = 4$ $c = 0$ </p> <p> $T_n = 1.n^2 + 4.n + 0$ $T_n = n^2 + 4n$ </p>	<ul style="list-style-type: none"> ✓ value of a ✓ value of b ✓ value of c ✓ equation 	(4)
1.2	<p> $T_{25} = (25)^2 + 4(25)$ $T_{25} = 725$ </p>	<ul style="list-style-type: none"> ✓ substitution ✓ answer 	(2)
1.3	<p> $T_n = n^2 + 4n = 1152$ $n^2 + 4n - 1152 = 0$ $(n - 32)(n + 36) = 0$ $n \neq -36$ $n = 32$ $T_{32} = 1152$ </p>	<ul style="list-style-type: none"> ✓ substitution ✓ factosation ✓ $n \neq -36$ ✓ answer 	(4)
1.4	<p> $T_{n+1} - T_n = (n+1)^2 + 4(n+1) - (n^2 + 4n)$ $T_{n+1} - T_n = n^2 + 2n + 1 + 4n + 4 - n^2 - 4n$ $T_{n+1} - T_n = 2n + 5$ $2n$ is always an even number adding 5 to any even number gives odd number $T_{n+1} - T_n = 2n + 5$ is always an odd number </p>	<ul style="list-style-type: none"> ✓ substitution ✓ simplification ✓ answer 	(3)
			[13]

QUESTION 2			
2.1.1	$T_1 = S_1 = \frac{3(1)^2 - 5(1)}{2} = -1$ $T_2 = S_2 - S_1 = \frac{3(2)^2 - 5(2)}{2} - \frac{3(1)^2 - 5(1)}{2} = 2$ $T_3 = S_3 - S_2 = \frac{3(3)^2 - 5(3)}{2} - \frac{3(2)^2 - 5(2)}{2} = 5$ <p>-1; 2; 5; ...</p>	<ul style="list-style-type: none"> ✓ first term ✓ second term ✓ third term 	(3)
2.1.2	$T_{20} = S_{20} - S_{19} = \frac{3(20)^2 - 5(20)}{2} - \frac{3(19)^2 - 5(19)}{2} = 56$	<ul style="list-style-type: none"> ✓ S_{20} ✓ S_{19} ✓ answer 	(3)
2.2	$-1 < k - 1 < 1$ $-1 + 1 < k < 1 + 1$ $-1 < k < 2$	<ul style="list-style-type: none"> ✓ $-1 < k - 1 < 1$ ✓ $-1 + 1 < k < 1 + 1$ ✓ $-1 < k < 2$ 	(3)
2.3	$S_n = \frac{a(r^n - 1)}{r - 1}; S_{2n} = \frac{a(r^{2n} - 1)}{r - 1}$ $\sum_{T_{n+1}}^{T_{2n}} = S_{2n} - S_n = \frac{a(r^{2n} - 1)}{r - 1} - \frac{a(r^n - 1)}{r - 1}$ $= \frac{a}{r - 1} [(r^{2n} - 1) - (r^n - 1)]$ $= \frac{a}{r - 1} (r^{2n} - 1 - r^n + 1) = \frac{a}{r - 1} (r^{2n} - r^n)$ $= \frac{a}{r - 1} r^n (r^n - 1) = r^n \cdot \frac{a(r^n - 1)}{r - 1}$ $= S_n \cdot r^n$	<ul style="list-style-type: none"> ✓ S_{2n} ✓ $S_{2n} - S_n$ ✓ factor $\frac{a}{r - 1}$ ✓ factor r^n ✓ simplification 	(5)
			[14]

QUESTION 3			
3.1.1	$x = 1$	✓ $x = 1$	(1)
3.1.2	$y = 3$	✓ $y = 3$	(1)
3.2	$f(x) = \frac{2}{x-1} + 3$ for x -int let $y = 0$ $0 = \frac{2}{x-1} + 3$ $-3(x-1) = 2$ $x = \frac{1}{3}$ $\left(\frac{1}{3}; 0\right)$	✓ substitution for x -intercepts ✓ simplify ✓ answer	(3)
3.3		✓ asymptotes ✓ y -intercepts ✓ point fixing graph ✓ shape	(4)
3.4	$0 \leq x < 1$	✓✓ answer	(2)
			[11]

QUESTION 4			
4.1	$g(x) = ax^2$ $8 = a(2)^2 = 4a$ $a = 2$ $g(x) = 2x^2$	✓ substitution ✓ answer	(2)
4.2	$h(x) = \log_b x$ $3 = \log_b 8$ $b^3 = 8 = 2^3$ $b = 3$ $h(x) = \log_3 x$	✓ substitution ✓ answer	(2)
4.3	$y = \log_b x$ $x = \log_b y$ $y = b^x$ $y = 3^x$	✓ interchange variable. ✓ answer	(2)
4.4	Domain $= x/x > 0$	✓✓ answer	(2)
4.5.1	$0 < x < 1$	✓✓ answer	(2)
4.5.2	$x \geq 1$	✓✓ answer	(2)
			[12]
QUESTION 5			
5.1	$f(x) = 2(x^2 - 2x - 3)$ $f(x) = 2[(x-1)^2 - 4]$ $f(x) = 2(x-1)^2 - 8$	✓ factor 2 ✓ complete square ✓ answer	(3)
5.2.1	TP(1;8)	✓ x-value ✓ y-value	(2)
5.2.2	$f(x) = 2x^2 - 4x - 6$ x-int let $y = 0$ $2x^2 - 4x - 6$ $x^2 - 2x - 3 = 0$ $(x-3)(x+1) = 0$ $x = 3$ or $x = -1$ $(3;0), (-1;0)$	✓ y=0 ✓ factorisation ✓ Values of x	(3)

<p>5.3</p> 	<ul style="list-style-type: none"> ✓ intercepts with axis ✓ indication of y-intercepts ✓ shape 	<p>(3)</p>	
<p>5.4</p>	<p>y-int (0;3), (0;-1)</p> 	<ul style="list-style-type: none"> ✓ (0;3) ✓ (0;-1) 	<p>(2)</p>
<p>4.5</p>	<p>Domain=$x / x \geq -8$</p>	<ul style="list-style-type: none"> ✓ value ✓ notation 	<p>(2)</p>
<p>5.6</p>	$f'(x) = f(x-2) + 5$ $f'(x) = 2(x-2)^2 - 6 + 5$ $f'(x) = 2x^2 - 8x + 8 - 1$ $f'(x) = 2x^2 - 8x + 7$	<ul style="list-style-type: none"> ✓ substitution ✓ answer 	<p>(2)</p>
			<p>[17]</p>

QUESTION 6			
6.1	$\frac{\sin(x-180^\circ) \cdot \tan(x+180^\circ) \cdot \cos(90+x)}{\sin^2(180^\circ+x)}$ $= \frac{(-\sin x) \cdot (\tan x) \cdot (-\sin x)}{(-\sin x)^2}$ $= \frac{(-\sin x)^2 (\tan x)}{(-\sin x)^2}$ $= \tan x$	<ul style="list-style-type: none"> ✓ -sinx ✓ tanx ✓ -sinx ✓ -sinx ✓ simplification ✓ answer 	(6)
6.2	$\cos 25^\circ = \frac{\sqrt{1-k^2}}{1} = \frac{adj}{hyp}$ $opp = ?$ $(hyp)^2 = (opp)^2 + (adj)^2$ $(1)^2 = opp^2 + (\sqrt{1-k^2})^2$ $opp^2 = k^2$ $opp = k$ 		
6.2.1	$\sin 25^\circ = \frac{opp}{hyp} = \frac{k}{1}$ $\sin 25^\circ = k$	<ul style="list-style-type: none"> ✓ substitution ✓ answer 	(2)
6.2.2	$\sin 50^\circ = \sin 2(25^\circ) = 2 \sin 25^\circ \cos 25^\circ$ $\sin 50^\circ = k \cdot \sqrt{1-k^2}$	<ul style="list-style-type: none"> ✓ sin2(25) ✓ double angle ✓ Answer 	(3)
6.2.3	$\cos 70^\circ = \cos(45^\circ + 25^\circ)$ $= \cos 45^\circ \cos 25^\circ - \sin 25^\circ \sin 45^\circ$ $= \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{1-k^2}}{1} - \frac{k}{1} \cdot \frac{\sqrt{2}}{2}$ $= \frac{\sqrt{2} \cdot \sqrt{1-k^2} - \sqrt{2}k}{2}$	<ul style="list-style-type: none"> ✓ cos(45° + 25°) ✓ compound angle formular ✓ substitute first term ✓ substitution in second term ✓ Simplification 	(5)

6.3	$\frac{\sin 3\theta}{\sin \theta} - \frac{\cos 3\theta}{\cos \theta} = \frac{\sin 3\theta \cos \theta - \cos 3\theta \sin \theta}{\sin \theta \cos \theta}$ $= \frac{\sin(3\theta - \theta)}{\sin \theta \cos \theta}$ $= \frac{1}{2} (2 \sin \theta \cos \theta)$ $= 2 \cdot \frac{\sin 2\theta}{\sin 2\theta} = 2$ <p>LHS = RHS</p>	<ul style="list-style-type: none"> ✓ sinxcosx ✓ numerator ✓ simplification ✓ express denominator as double angle ✓ simplification 	(5)
6.4	$\cos(A + B) = \cos A \cos B - \sin A \sin B = m \dots (1)$ $\cos(A - B) = \cos A \cos B + \sin A \sin B = n \dots (2)$ <p>(1) + (2)</p> $2 \cos A \cos B = m + n$ $\cos A \cos B = \frac{m + n}{2}$	<ul style="list-style-type: none"> ✓ equation 1 ✓ equation 2 ✓ simplification 	(3)
			[24]



QUESTION 7			
Given $\triangle ABC$ with $AC=b$, $AB=c$ and $BC=a$	✓ construction	(4)	

	<p>RTP: $a^2 = b^2 + c^2 - 2bc \cos A$ Construction: draw perpendicular height h from vertex C perpendicular to B. Proof $\Delta ACD: b^2 = h^2 + AD^2$ $\Delta BCD: a^2 = h^2 + DB^2 = h^2 + (c - AD)^2$ $a^2 = h^2 + c^2 - 2c \cdot AD + AD^2$ $a^2 = h^2 + AD^2 + c^2 - 2cAD$ $a^2 = b^2 + c^2 - 2cAD$ $\cos A = \frac{\text{adj}}{\text{hyp}} = \frac{AD}{b}$ $AD = b \cos A$ $a^2 = b^2 + c^2 - 2bc \cos A$</p>	<p>✓Pythagoras theorem for both triangles ✓substitute by $BD=c-AD$ ✓cosA</p>	
QUESTION 8			
8.1	<p>Area of $\Delta PQR = \frac{1}{2}(8)(12)\sin 110^\circ$ Area of $\Delta PQR = 45.11$ square units</p>	<p>✓substitution ✓answer</p>	(2)
8.2	<p>$PR^2 = (8)^2 + (12)^2 - 2(8)(12)\cos 110^\circ$ $PQ^2 = 273.67$ $PQ = 16.54$</p>	<p>✓substitution ✓simplification ✓answer</p>	(3)
			[5]

TOTAL 100