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Department:  
Education  
PROVINCE OF KWAZULU-NATAL

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**MATHEMATICS**

**COMMON TEST**

**MARCH 2020**

**MARKS: 100**

**TIME: 2 hours**

**N.B. This question paper consists of 8 pages and an information sheet.**

## INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 8 questions.
2. Answer **ALL** 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. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
6. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Number the answers correctly according to the numbering system used in this question paper. Write neatly and legibly.

**QUESTION 1**

Given the quadratic sequence:  $p; 5; q; 19; \dots$

- 1.1 Calculate the value(s)  $p$  and  $q$  if the second constant difference is 2. (4)
  - 1.2 Determine the  $n^{\text{th}}$  term of the quadratic sequence. (4)
  - 1.3 Determine the first term of the sequence that will have a value greater than 10301. (4)
- [12]**

**QUESTION 2**

The sum to  $n$  terms of an arithmetic sequence is 36. The first and last terms are 1 and 11 respectively. Determine the number of terms  $n$  and its common difference  $d$ .

**[5]**

**QUESTION 3**

- 3.1 In a geometric sequence the first term is “ $a$ ” and its common ratio is “ $r$ ”. Prove that the sum to  $n$  terms of the sequence is

$$S_n = \frac{a(1 - r^n)}{1 - r} \tag{4}$$

- 3.2 Given:

$$\sum_{k=1}^m 3 \cdot 2^{1-k}$$

- 3.2.1 Write down the first TWO terms of the geometric sequence. (2)

- 3.2.2 Calculate the value of  $m$  if

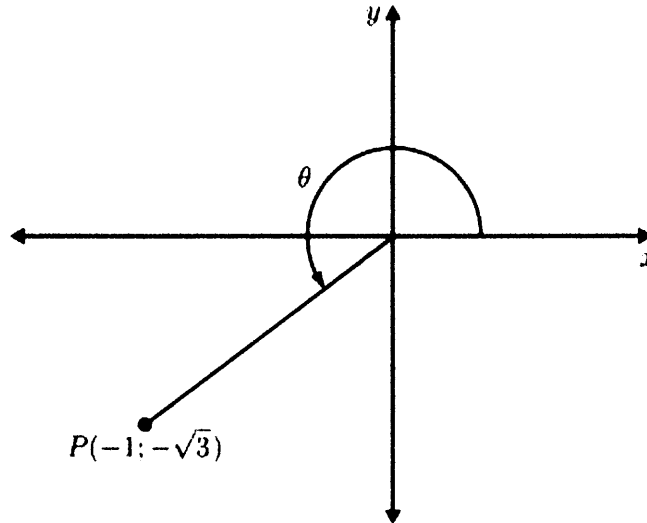
$$\sum_{k=1}^m 3 \cdot 2^{1-k} = \frac{3069}{512} \tag{5}$$

- 3.3 A ball is dropped from a height of 24 metres. Every time the ball hits the ground, it rises  $\frac{3}{4}$  of its original height. Calculate the sum of the total vertical heights reached by the ball after the first bounce until it comes to rest. (3)

**[14]**

**QUESTION 4**

4.1 Use the diagram below to calculate, **without the use of a calculator**, the value of each of the following:



4.1.1  $\sin(-\theta)$  (3)

4.1.2  $\cos 2\theta$  (4)

4.2 **Without using a calculator**, determine the value of the following expressions.

4.2.1  $\sin 75^\circ \cos 45^\circ - \sin 15^\circ \cos 45^\circ$  (5)

4.2.2  $\frac{\cos 100^\circ}{\sin(-10^\circ)} \times \tan^2 120^\circ$  (6)

4.3

4.3.1 Prove that, for angles  $\alpha$  and  $\beta$ .

$$\frac{\sin \alpha}{\sin \beta} - \frac{\cos \alpha}{\cos \beta} = \frac{2 \sin(\alpha - \beta)}{\sin 2\beta}$$
 (4)

4.3.2 Hence, or otherwise, show that:

$$\frac{\sin 5\beta}{\sin \beta} - \frac{\cos 5\beta}{\cos \beta} = 4 \cos 2\beta$$
 (3)

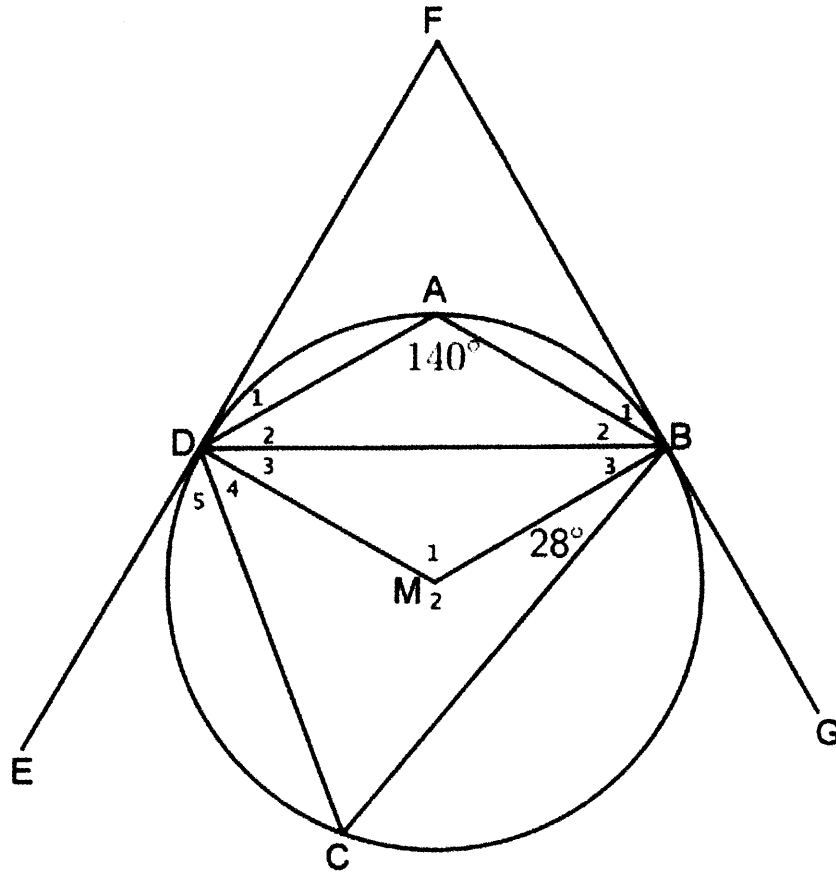
4.4 Determine the general solution of:

$$2 \sin^2 x - \sin x - 1 = 0$$
 (5)

**[30]**

**QUESTION 5**

In the diagram below, M is the centre of the circle DABC. EDF is a tangent to the circle at D and FBG is another tangent to the circle at B.



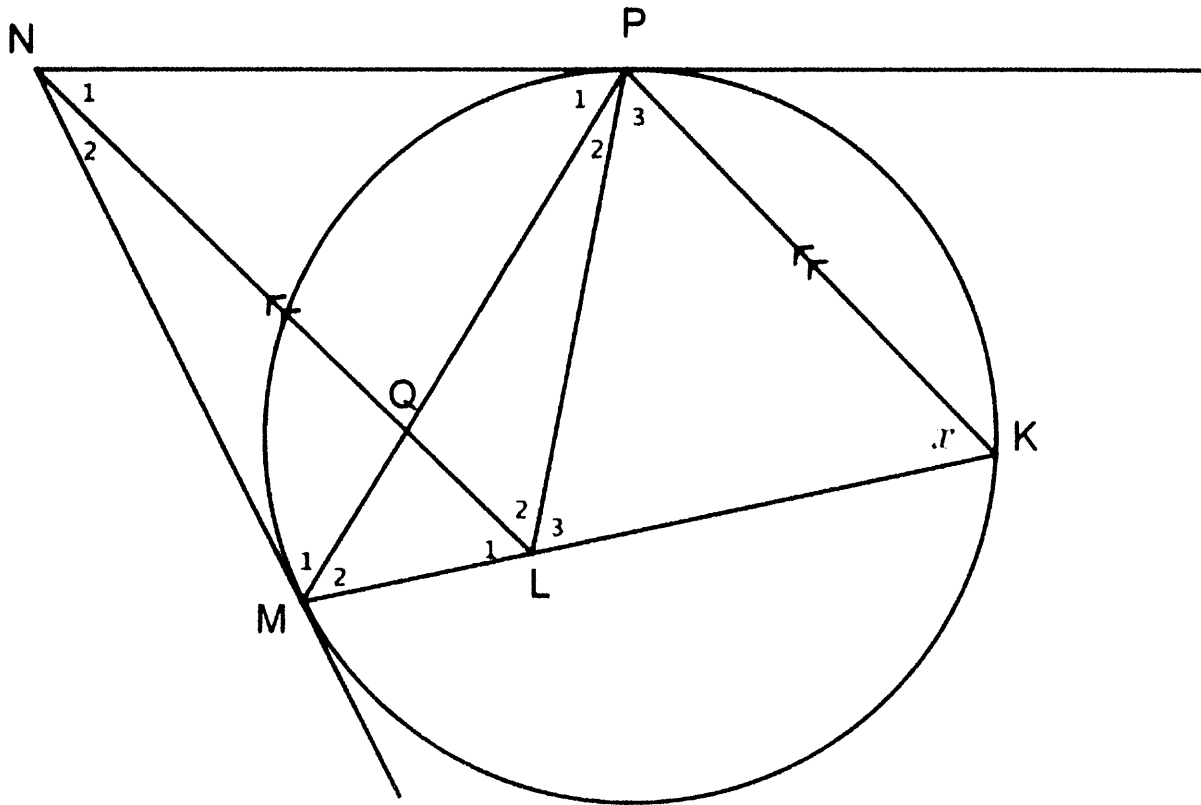
Calculate the following angles, with reasons:

- 5.1  $\hat{C}$  (2)
- 5.2  $\hat{M}_1$  (3)
- 5.3  $\hat{B}_3$  (3)
- 5.4  $\hat{D}_5$  (2)

[10]

**QUESTION 6**

In the diagram below, NP and NM are tangents to the circle at P and M. K is a point on the circle KP, KM and PM are chords so that  $\hat{K} = x$ . L is a point on KM so that  $KP \parallel LN$ , L and P are joined.



6.1 Prove that NMLP is a cyclic quadrilateral. (4)

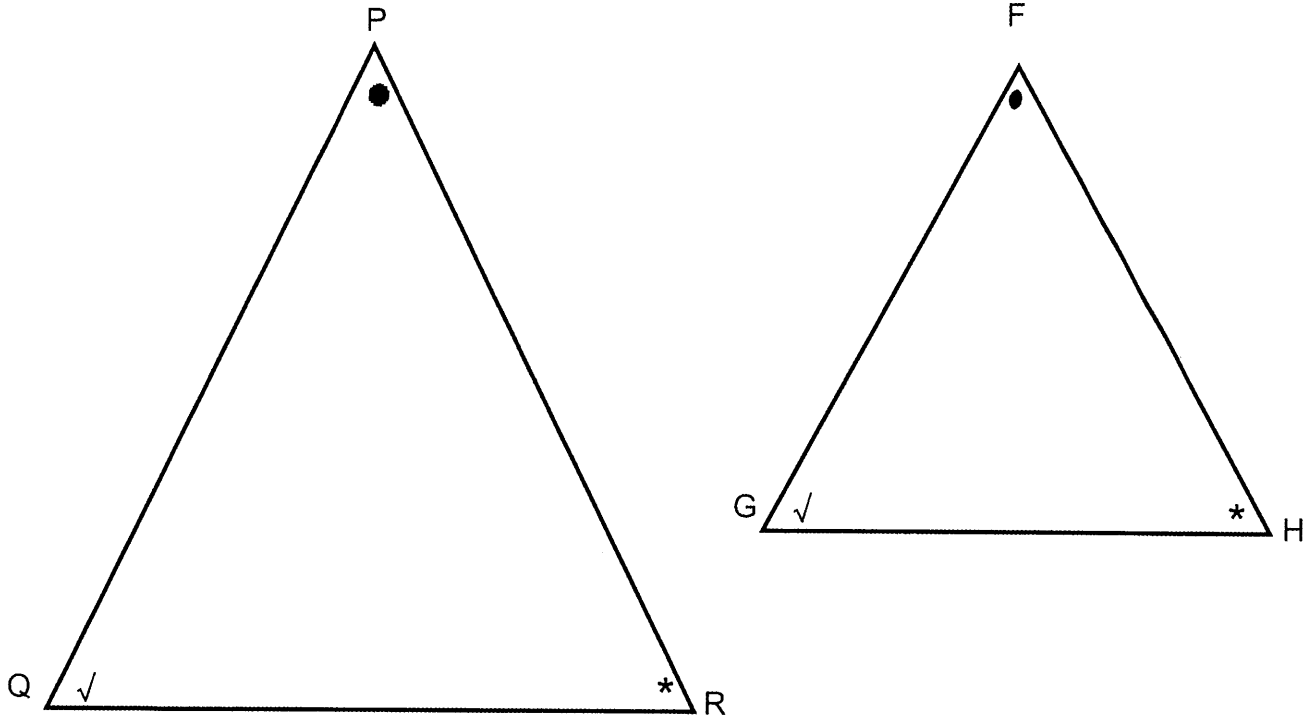
6.2 Prove that  $\Delta KLP$  is isosceles. (6)

**[10]**

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## QUESTION 7

$\triangle PQR$  and  $\triangle FGH$  are given,  $\hat{P} = \hat{F}$ ;  $\hat{Q} = \hat{G}$  and  $\hat{R} = \hat{H}$



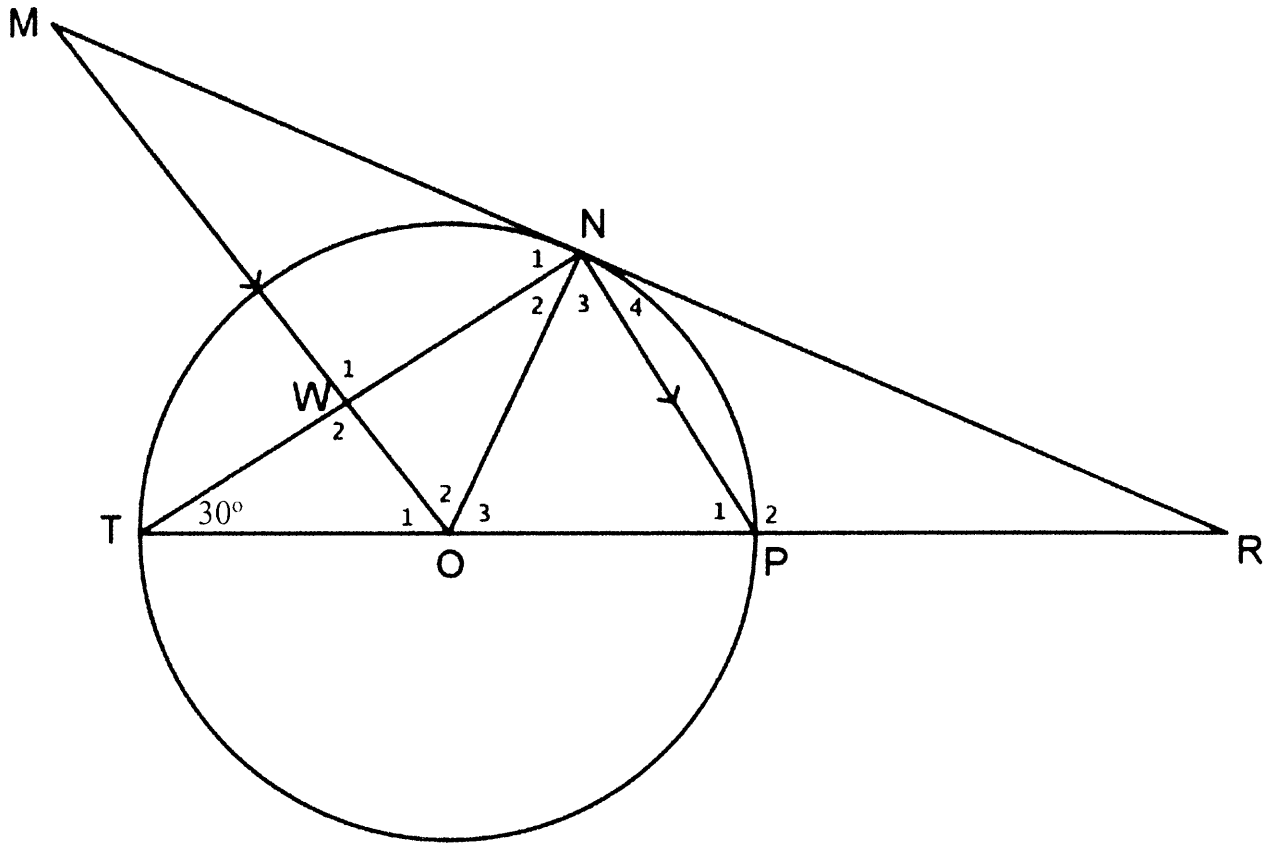
Prove theorem which states that if  $\triangle PQR$  and  $\triangle FGH$  are equiangular, then

$$\frac{PQ}{FG} = \frac{PR}{FH}$$

[6]

**QUESTION 8**

In the diagram below, TP is a diameter in the circle with centre O. TP is extended to R. RM is a tangent to the circle at N. MO intersects chord NT at W.  $NP \parallel MO$ .  $\widehat{WTO} = 30^\circ$



- 8.1 Give, with reasons, THREE other angles each equal to  $30^\circ$ . (3)
- 8.2 Determine  $\widehat{RNT}$  (2)
- 8.3 Prove that:
  - 8.3.1  $\triangle RNP \parallel \triangle RTN$  (3)
  - 8.3.2  $TW \cdot RN = \frac{1}{2} RT \cdot NP$  (5)

[13]

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TOTAL MARKS: 100



INFORMATION SHEET

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

$$A = P(1 + ni) \quad A = P(1 - ni)$$

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

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

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

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

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

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

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

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

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

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

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

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

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

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

$$m = \tan \theta$$

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

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

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

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

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

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

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

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

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

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

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

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

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) \quad \hat{y} = a + bx$$

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



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**This memorandum consists of 10 pages**

QUESTION 1

<p>1.1</p>	<p>1D</p> <p>2D</p> <p><math>24 - 2q = 2</math></p> <p><math>q = 11</math></p> <p><math>q + p - 10 = 2</math></p> <p><math>p = 1</math></p>	<p>A✓ <math>24 - 2q = 2</math></p> <p>CA✓ <math>q</math> value</p> <p>A✓ <math>q + p - 10 = 2</math></p> <p>CA✓ <math>p</math> value</p>	<p>(4)</p>
<p>1.2</p>	<p><math>2a = 2 \quad \therefore a = 1</math></p> <p><math>3a + b = 4 \quad \therefore b = 1</math></p> <p><math>a + b + c = 1 \quad \therefore c = -1</math></p> <p><math>T_n = n^2 + n - 1</math></p> <p><b>OR</b></p> <p><math>2a = 2 \quad \therefore a = 1</math></p> <p><math>3a + b = 4 \quad \therefore b = 1</math></p> <p><math>\therefore c = T_0 = -1</math></p> <p><math>T_n = n^2 + n - 1</math></p>	<p>A✓ <math>a</math> - value</p> <p>CA✓ <math>b</math> - value</p> <p>CA✓ <math>c</math> - value</p> <p>CA✓ <math>n^{\text{th}}</math> term</p> <p><b>OR</b></p> <p>A✓ <math>a</math> - value</p> <p>CA✓ <math>b</math> - value</p> <p>CA✓ <math>c</math> - value</p> <p>CA✓ <math>n^{\text{th}}</math> term</p>	<p>(4)</p> <p>(4)</p>
<p>1.3</p>	<p><math>T_n = n^2 + n - 1 = 10301</math></p> <p><math>n^2 + n - 10302 = 0</math></p> <p><math>(n + 102)(n - 101) = 0</math></p> <p><math>n = -102 \quad \text{or} \quad n = 101</math></p> <p><math>102^{\text{nd}}</math> term</p> <p><b>OR</b></p> <p><math>T_n = n^2 + n - 1 &gt; 10301</math></p> <p><math>n^2 + n - 10302 &gt; 0</math></p> <p><math>(n + 102)(n - 101) &gt; 0</math></p> <p><math>n &lt; -102 \quad \text{or} \quad n &gt; 101</math></p> <p><math>102^{\text{nd}}</math> term</p>	<p>CA✓ equating <math>n^{\text{th}}</math> term to 10301</p> <p>CA✓ factors/quadratic formula</p> <p>CA✓ values of <math>n</math></p> <p>CA✓ 102</p> <p><b>OR</b></p> <p>CA✓ setting up inequality</p> <p>CA✓ factors/quad. formula</p> <p>CA✓ interval and notation</p> <p>CA✓ 102</p>	<p>(4)</p> <p>(4)</p>
			<p>[12]</p>

## QUESTION 2

$S_n = \frac{n}{2}[a + T_n]$ $36 = \frac{n}{2}[1 + 11]$ $36 = 6n$ $6 = n$ $11 = a + (n - 1)d$ $11 = 1 + (6 - 1)d$ $2 = d$ <p><b>OR</b></p> $S_n = \frac{n}{2}[2a + (n - 1)d]$ $36 = \frac{n}{2}[2(1) + (n - 1)d] \quad \rightarrow \quad (1)$ $11 = a + (n - 1)d$ $11 = 1 + (n - 1)d$ $10 = (n - 1)d \quad \rightarrow \quad (2)$ $36 = \frac{n}{2}[2(1) + 10]$ $72 = 12n$ $n = 6$ $10 = (6 - 1)d$ $2 = d$	<p>A✓ substituting into sum formula CA✓ <math>36 = 6n</math> CA✓ <math>n</math> – value</p> <p>CA✓ substituting into general term formula CA✓ <math>d</math> – value</p> <p><b>OR</b></p> <p>A✓ substituting into sum formula and forming equation (1) A✓ substituting into general term formula and forming equation (2)</p> <p>CA✓ <math>72 = 12n</math> CA✓ <math>n</math> – value CA✓ <math>d</math> – value</p>	<p>(5)</p> <p>(5)</p>
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**QUESTION 3**

3.1	$S_n = a + ar + \dots + ar^{n-1} \rightarrow (1)$ $rS_n = ar + ar^2 + \dots + ar^{n-1} + ar^n \rightarrow (2)$ <p>(2) – (1):</p> $rS_n - S_n = ar^n - a$ $S_n(r^n - 1) = a(r^n - 1)$ $S_n = \frac{a(r^n - 1)}{r - 1}$	<p>A✓ writing equation</p> <p>A✓ multiplying all terms by <math>r</math></p> <p>A✓ subtracting: LHS and RHS</p> <p>A✓ factorizing</p>	(4)
3.2.1	3; $\frac{3}{2}$	AA✓✓ each value	(2)
3.2.2	$S_m = \frac{3 \left[ 1 - \left( \frac{1}{2} \right)^m \right]}{1 - \frac{1}{2}} = \frac{3069}{512}$ $6 \left[ 1 - \left( \frac{1}{2} \right)^m \right] = \frac{3069}{512}$ $\left[ 1 - \left( \frac{1}{2} \right)^m \right] = \frac{1023}{1024}$ $\left( \frac{1}{2} \right)^m = \frac{1}{1024}$ $\left( \frac{1}{2} \right)^m = \left( \frac{1}{2} \right)^{10}$ $m = 10$	<p>CA✓ substituting into sum formula</p> <p>CA✓ <math>\left[ 1 - \left( \frac{1}{2} \right)^m \right] = \frac{1023}{1024}</math></p> <p>CA✓ <math>\left( \frac{1}{2} \right)^m = \frac{1}{1024}</math></p> <p>CA✓ expressing 1024 as a power of 2</p> <p>CA✓ <math>m</math> – value</p> <p>N.B. Can be solved using logs.</p>	(5)
3.3	$a = 24 \left( \frac{3}{4} \right) = 18 \quad \text{and} \quad r = \frac{3}{4}$ $S_\infty = \frac{a}{1 - r}$ $= \frac{24 \left( \frac{3}{4} \right)}{1 - \frac{3}{4}}$ $= 72 m$	<p>A✓ <math>r</math> – value</p> <p>CA✓ substituting into sum to infinity formula</p> <p>CA✓ answer</p>	(3)
			<b>[14]</b>

**QUESTION 4**

**4.1**

<p>4.1.1</p>	$r^2 = x^2 + y^2$ $= (-1)^2 + (-\sqrt{3})^2$ $= 1 + 3$ $= 4$ $\therefore r = 2$ $\sin(-\theta) = -\sin\theta$ $= -\left(\frac{-\sqrt{3}}{2}\right)$ $= \frac{\sqrt{3}}{2}$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>If  <math>\sin(-\theta) = \sin\theta</math>  <math>= -\frac{\sqrt{3}}{2}</math>                      Max. 2/3</p> </div>	<p>A✓ <math>r = 2</math></p> <p>CA✓ substitution</p> <p>CA✓ answer</p>	<p>(3)</p>
<p>4.1.2</p>	$\cos 2\theta = 1 - 2\sin^2\theta$ $= 1 - 2\left(\frac{-\sqrt{3}}{2}\right)^2$ $= 1 - 2\left(\frac{3}{4}\right)$ $= \left(1 - \frac{3}{2}\right) = -\frac{1}{2}$ <p><b>OR</b></p> $\cos 2\theta = 2\cos^2\theta - 1$ $= 2\left(\frac{-1}{2}\right)^2 - 1$ $= 2\left(\frac{1}{4}\right) - 1$ $= \frac{1}{2} - 1 = -\frac{1}{2}$ <p><b>OR</b></p> $\cos 2\theta = \cos^2\theta - \sin^2\theta$ $= \left(\frac{-1}{2}\right)^2 - \left(\frac{-\sqrt{3}}{2}\right)^2$ $= \frac{1}{4} - \frac{3}{4}$ $= -\frac{1}{2}$	<p>A✓ <math>1 - 2\sin^2\theta</math></p> <p>CA✓ substitution into the correct expression</p> <p>CA✓ simplification</p> <p>CA✓ answer</p> <p><b>OR</b></p> <p>A✓ <math>\cos 2\theta = 2\cos^2\theta - 1</math></p> <p>CA✓ substitution into the correct expression</p> <p>CA✓ simplification</p> <p>CA✓ answer</p> <p><b>OR</b></p> <p>A✓ <math>\cos 2\theta = \cos^2\theta - \sin^2\theta</math></p> <p>CA✓ substitution into the correct expression</p> <p>CA✓ simplification</p> <p>CA✓ answer</p>	<p>(4)</p> <p>(4)</p> <p>(4)</p>

4.2			
4.2.1	$\sin 75^\circ \cos 45^\circ - \sin 15^\circ \cos 45^\circ$ $= \sin(90^\circ - 15^\circ) \cdot \cos 45^\circ - \sin 15^\circ \sin 45^\circ$ $= \cos 15^\circ \cos 45^\circ - \sin 15^\circ \sin 45^\circ$ $= \cos(45^\circ + 15^\circ)$ $= \cos 60^\circ$ $= \frac{1}{2}$ <p><b>OR</b></p> $\sin 75^\circ \cos 45^\circ - \sin 15^\circ \cos 45^\circ$ $\cos 45^\circ (\sin 75^\circ - \sin 15^\circ)$ <p>Now</p> $\sin 75^\circ - \sin 15^\circ$ $= \sin(45^\circ + 30^\circ) - \sin(45^\circ - 30^\circ)$ $= 2 \cos 45^\circ \sin 30^\circ$ $\cos 45^\circ (\sin 75^\circ - \sin 15^\circ)$ $= \cos 45^\circ \cdot 2 \cos 45^\circ \sin 30^\circ$ $= \frac{\sqrt{2}}{2} \cdot 2 \cdot \frac{\sqrt{2}}{2} \cdot \frac{1}{2}$ $= \frac{1}{2}$	$A \checkmark \sin 75^\circ = \cos 15^\circ$ $A \checkmark \cos 45^\circ = \sin 45^\circ$ $CA \checkmark \cos(45^\circ + 15^\circ)$ $CA \checkmark \cos 60^\circ$ $CA \checkmark \frac{1}{2} \text{ (ACCEPT 0,5)}$ <p><b>OR</b></p> $\checkmark \text{ removing common factor}$ $\checkmark \sin 75^\circ - \sin 15^\circ = 2 \cos 45^\circ \sin 30^\circ$ $\checkmark \cos 45^\circ = \frac{\sqrt{2}}{2}$ $\checkmark \sin 30^\circ = \frac{1}{2}$ <p><math>\checkmark</math> answer</p>	(5)
4.2.2	$\frac{\cos 100^\circ}{\sin(-10^\circ)} \times \tan^2 120^\circ$ $= \frac{\cos(90^\circ + 10^\circ)}{-\sin 10^\circ} \times \tan^2 60^\circ$ $= \frac{-\sin 10^\circ}{-\sin 10^\circ} \times (\sqrt{3})^2$ $= 3$ <p><b>OR</b></p> $\frac{\cos 100^\circ \times \tan^2 120^\circ}{\sin(-10^\circ)}$ $= \frac{(-\cos 80^\circ) \times (-\tan 60^\circ)^2}{(-\sin 10^\circ)}$ $= \frac{(-\sin 10^\circ) \times (-\sqrt{3})^2}{-\sin 10^\circ}$ $= 3$	$\checkmark \cos(90^\circ + 10^\circ)$ $\checkmark -\sin 10^\circ$ $\checkmark \tan^2 60^\circ$ $\checkmark -\sin 10^\circ$ $\checkmark \sqrt{3}$ $\checkmark 3$ <p><b>OR</b></p> $\checkmark -\cos 80^\circ; \checkmark -\sin 10^\circ; \checkmark \tan^2 60^\circ$ $\checkmark -\cos 80^\circ = -\sin 10^\circ; \checkmark -\sqrt{3}$ $\checkmark 3$	(6)
			(6)

<p>4.3.1</p>	<p>LHS</p> $= \frac{\sin \alpha}{\sin \beta} - \frac{\cos \alpha}{\cos \beta}$ $\frac{\sin \alpha \cos \beta - \cos \alpha \sin \beta}{\sin \beta \cos \beta}$ $= \frac{\sin(\alpha - \beta)}{\sin \beta \cos \beta}$ $= \frac{2}{2} \times \frac{\sin(\alpha - \beta)}{\sin \beta \cos \beta}$ $= \frac{2 \sin(\alpha - \beta)}{2 \sin \beta \cos \beta}$ $= \frac{2 \sin(\alpha - \beta)}{\sin 2\beta}$ <p>= RHS</p>	<p>A✓ writing as a single fraction</p> <p>A✓ <math>\sin(\alpha - \beta)</math></p> <p>A✓ <math>\frac{2}{2}</math></p> <p>A✓ simplification</p>	<p>(4)</p>
<p>4.3.2</p>	$\frac{\sin 5\beta}{\sin \beta} - \frac{\cos 5\beta}{\cos \beta} = 4 \cos 2\beta$ <p>LHS</p> $= \frac{\sin 5\beta}{\sin \beta} - \frac{\cos 5\beta}{\cos \beta}$ $= \frac{\sin 5\beta \cos \beta - \cos 5\beta \sin \beta}{\sin \beta \cos \beta}$ $= \frac{\sin(5\beta - \beta)}{\sin \beta \cos \beta}$ $= \frac{\sin 4\beta}{\sin \beta \cos \beta}$ $= \frac{\frac{1}{2} \cdot 2 \sin \beta \cos \beta}{2 \sin \beta \cos \beta}$ $= \frac{\frac{1}{2} \sin 2\beta}{\frac{1}{2} \sin 2\beta}$ <p>= <math>4 \cos 2\beta</math></p> <p>= RHS</p> <p><b>OR</b></p> <p>Replace <math>\alpha = 5\beta</math> in 4.3.1</p> $RHS = \frac{2 \sin(5\beta - \beta)}{\sin 2\beta}$ $= \frac{2 \sin 4\beta}{\sin 2\beta}$ $= \frac{2 \cdot 2 \sin 2\beta \cos 2\beta}{\sin 2\beta}$ <p>= <math>4 \cos 2\beta</math></p>	<p>A✓ writing as a single fraction</p> <p>A✓ <math>\sin 4\beta = 2 \sin 2\beta \cos 2\beta</math></p> <p>A✓ <math>\frac{1}{2} \sin 2\beta</math></p> <p><b>OR</b></p> <p>✓ <math>\alpha = 5\beta</math></p> <p>✓ <math>\sin 4\beta</math></p> <p>✓ expansion <math>\sin 4\beta</math></p>	<p>(3)</p> <p>(3)</p>



4.4	$2\sin^2 x - \sin x - 1 = 0$ $(2\sin x + 1)(\sin x - 1) = 0$ $\sin x = -\frac{1}{2}$ or $\sin x = 1$ $\sin x = -\frac{1}{2}$ $x = 210^\circ + k.360^\circ$ or $x = 330^\circ + k.360^\circ; k \in \mathbb{Z}$ . <b>OR</b> $\sin x = 1$ $x = 90^\circ + k.360^\circ; k \in \mathbb{Z}$	A✓ factorization CA✓ $\sin x = -\frac{1}{2}; \sin x = 1$ CA✓ $x = 210^\circ + k.360^\circ; k \in \mathbb{Z}$ CA✓ $x = 330^\circ + k.360^\circ; k \in \mathbb{Z}$ CA✓ $x = 90^\circ + k.360^\circ; k \in \mathbb{Z}$	<b>[5]</b>
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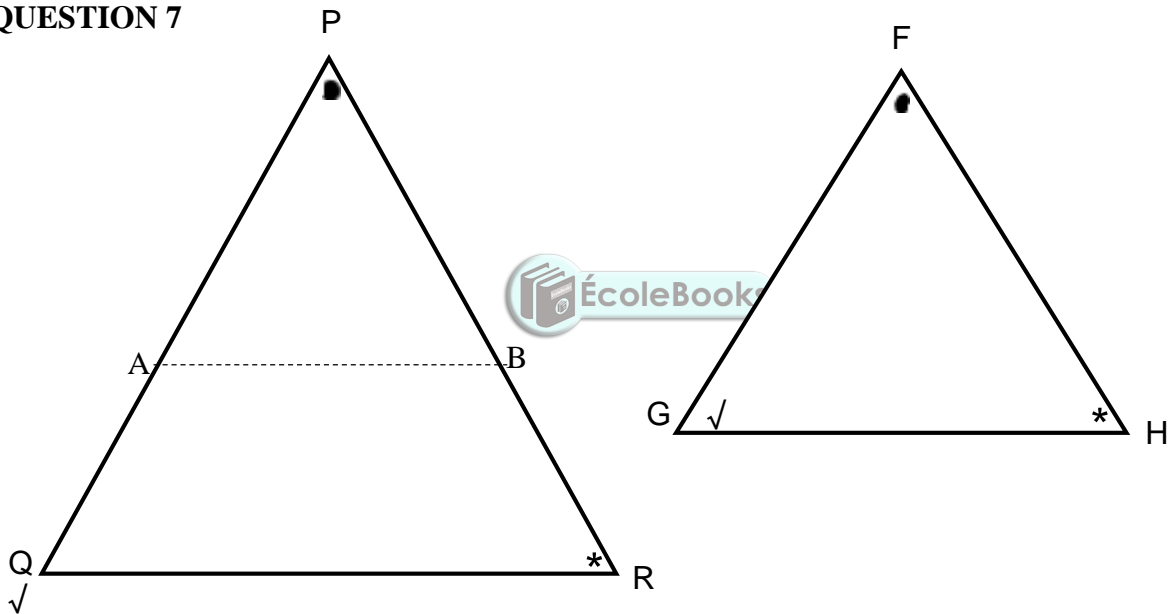
**QUESTION 5**

5.1	$\hat{C} + 140^\circ = 180^\circ$ opp $\angle$ s of cyclic quad $\therefore \hat{C} = 40^\circ$	✓ S/R ✓ A Answer only with reason 2/2	(2)
5.2	$\hat{M}_1 = 2\hat{C}$ $\angle$ at centre is twice $\angle$ at circum. $= 2(40^\circ)$ $= 80^\circ$	✓ S✓R ✓ CA Answer only with reason 3/3	(3)
5.3	$\hat{B}_3 = \frac{1}{2}(180^\circ - 80^\circ)$ $\angle$ s opp = sides $= 50^\circ$	✓ S✓R ✓ A Answer only with reason 3/3	(3)
5.4	$\hat{D}_5 = \hat{B}_3 + 28^\circ$ tan – chord theorem $= 50^\circ + 28^\circ$ $= 78^\circ$	✓ S/R ✓ CA Answer Answer only with reason 2/2	(2)
			<b>[10]</b>

**QUESTION 6**

6.1	$\hat{L}_1 = x$ corr s ; KP// LN $\hat{P}_1 = x$ Tan-chord theorem $\hat{L}_1 = \hat{P}_1$ NMLP is a cyclic quad (Converse s in the same segment)	$\checkmark$ S/ $\checkmark$ R $\checkmark$ S/ $\checkmark$ R $\checkmark$ R	(4)
6.2	$\hat{M}_1 = x$ Tan-chord theorem $\hat{L}_2 = \hat{M}_1 = x$ s in same segment $\hat{P}_3 = \hat{L}_2 = x$ alt s KP//MN $\hat{K} = \hat{P}_3$ $\therefore \Delta KLP$ is isosceles (Sides opp equal angles)	$\checkmark$ S/ $\checkmark$ R $\checkmark$ S/ $\checkmark$ R $\checkmark$ S/ $\checkmark$ R $\checkmark$ R	(6)
			<b>[10]</b>

**QUESTION 7**



Construction: Mark off PA = FG and PB = FH and join AB.  $\Delta PAB \equiv \Delta FGH$ Congruency s s $P\hat{A}B = \hat{G}$ $\hat{G} = \hat{Q}$ given $\therefore P\hat{A}B = \hat{Q}$ $\therefore AB // QR$ corresp. s equal  $\frac{PQ}{PA} = \frac{PR}{PB}$ line // to one side of $\Delta$ $\therefore \frac{PQ}{FG} = \frac{PR}{FH}$	$\checkmark$ construction $\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ R $\checkmark$ S/R	<b>[6]</b>
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**QUESTION 8**

8.1	$\hat{N}_2 = 30^\circ$ $\angle$ s opp = sides $\hat{N}_4 = 30^\circ$ tan-chord theorem $\hat{M} = 30^\circ$ corresponding $\angle$ s NP//MO	✓S/R ✓S/R ✓S/R	(3)
8.2	$\hat{N}_2 + \hat{N}_3 = 90^\circ$ ( $\angle$ in the semi-circle) $\therefore R\hat{N}T = 90^\circ + 30^\circ$ $= 120^\circ$	✓S/R ✓CA	(2)
8.3.1	<i>In</i> $\triangle RNP$ and $\triangle RTN$ $\hat{R} = \hat{R}$ common $\hat{N}_4 = \hat{T} = 30^\circ$ proven $\hat{P}_2 = R\hat{N}T$ rem $\angle$ $\therefore \triangle RNP \text{ /// } \triangle RTN$ (AAA)	✓S/R ✓S/R ✓R	(3)
8.3.2	$\frac{RN}{RT} = \frac{NP}{TN}$ (/// triangles) RN.TN = RT.NP $\hat{W}_2 = 90^\circ = T\hat{N}P$ corr $\angle$ ; NP//MO NW = WT    line from centre $\perp$ chord $\therefore NT = 2WT$ $\therefore 2WT.RN = RT.NP$ $TW.RN = \frac{1}{2}RT.NP$	✓S✓R ✓S/R ✓S/R ✓ substituting $NT = 2WT$	
			<b>[13]</b>



		<b>TOTAL MARKS:</b>	<b>100</b>
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