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# JUNE EXAMINATION GRADE 12

## 2026

### MATHEMATICS

### (PAPER 2)

<b>SURNAME:</b>										
<b>NAME:</b>										
<b>NAME OF SCHOOL:</b>										
<b>DATE:</b>	2	0	2	6						D

ANSWER ALL THE QUESTIONS IN THE QUESTION PAPER.

QUESTION	MARKER			MODERATOR		
	MARKS	MARKER'S INITIALS		MARKS	MODERATOR'S INITIALS	
1	0			0		
2	0			0		
3	0			0		
4	0			0		
5	0			0		
6	0			0		
7	0			0		
8	0			0		
9	0			0		
			<b>TOTAL</b>			

**TIME: 3 hours**

**MARKS: 150**

26 pages + an information sheet



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## INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 questions. Answer ALL questions in the spaces provided.
2. Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your answers.
3. Answers only will NOT necessarily be awarded full marks.
4. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
5. If necessary, round-off answers correct to TWO decimal places, unless stated otherwise.
6. Diagrams are NOT necessarily drawn to scale.
7. An INFORMATION SHEET with formulae is included at the end of the question paper.
8. No pages may be torn from this question paper.
9. Candidates may not retain a question paper or remove it from the examination room. Question papers must be returned to the invigilator at the end of the examination session.
10. Answers must be written in black/blue ink as distinctly as possible. Do NOT write in the margins.
11. Draw a neat line through any work/rough work that must NOT be marked.
12. In the event that you use the additional space provided:
  - 12.1 Write down the number of the question.
  - 12.2 Leave a line and rule off after your answer.
13. Write neatly and legibly.

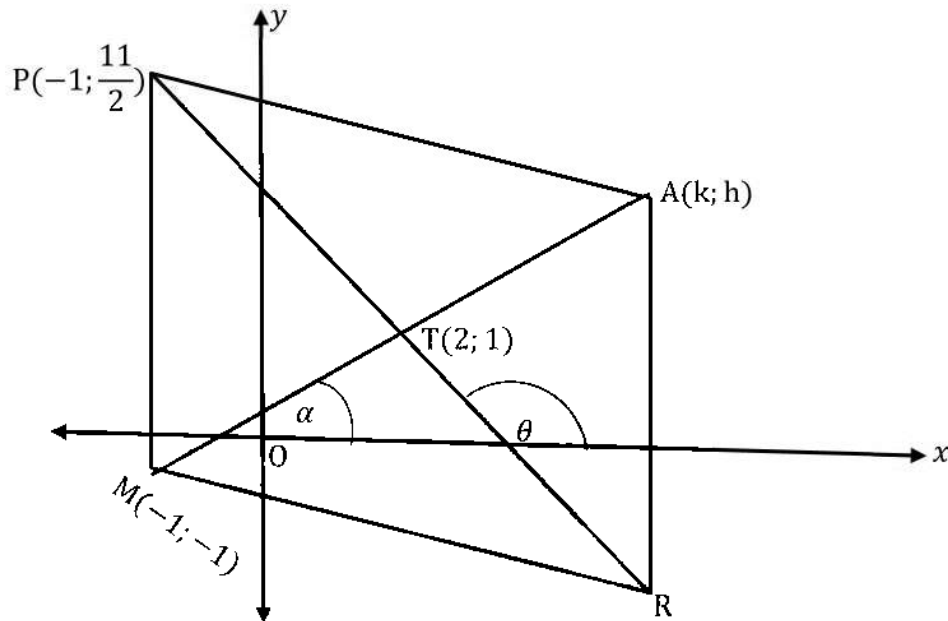


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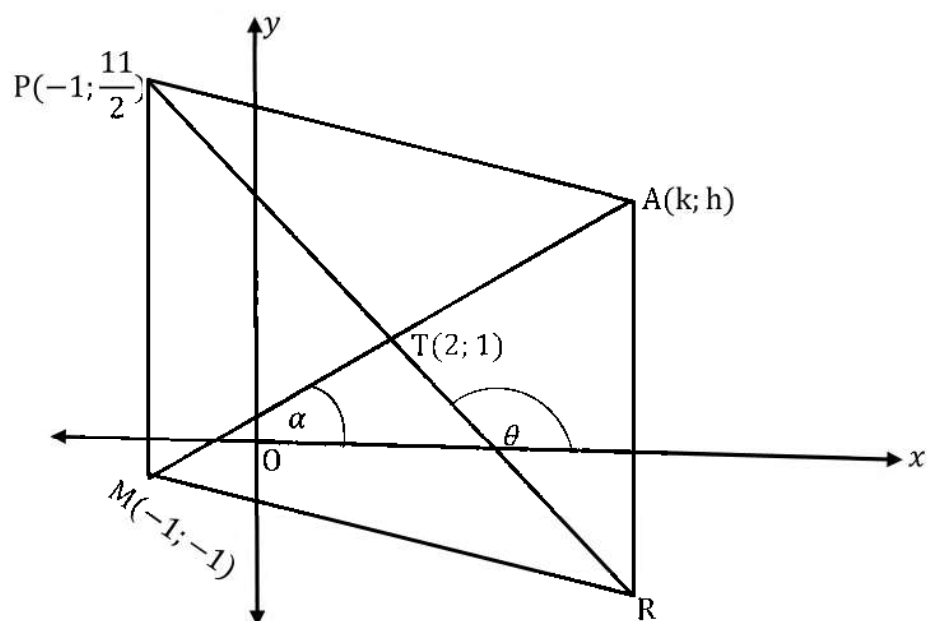
**QUESTION 1**

In the diagram below, ARMP is a quadrilateral with vertices  $P\left(-1; \frac{11}{2}\right)$ ,  $A(k; h)$ ,  $R$  and  $M(-1; -1)$ . The diagonals of ARMP intersect at  $T(2; 1)$ .  $\alpha$  and  $\theta$  are angles of inclination of  $AM$  and  $PR$ , respectively.



1.1	Calculate the gradient of $MT$ .	(2)
<hr/> <hr/> <hr/> <hr/>		
1.2	Determine the equation of the line that is parallel to $AM$ and passes through $P$ , in the form $y = mx + c$ .	(3)
<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>		





1.3	If T is the midpoint of AM, calculate the values of $k$ and $h$ .	(3)
1.4	Calculate the length of AM, leaving your answer <b>in surd form</b> .	(2)
1.5	If it is given that $AP \parallel RM$ and $AR \parallel PM$ , determine the coordinates of R.	(3)



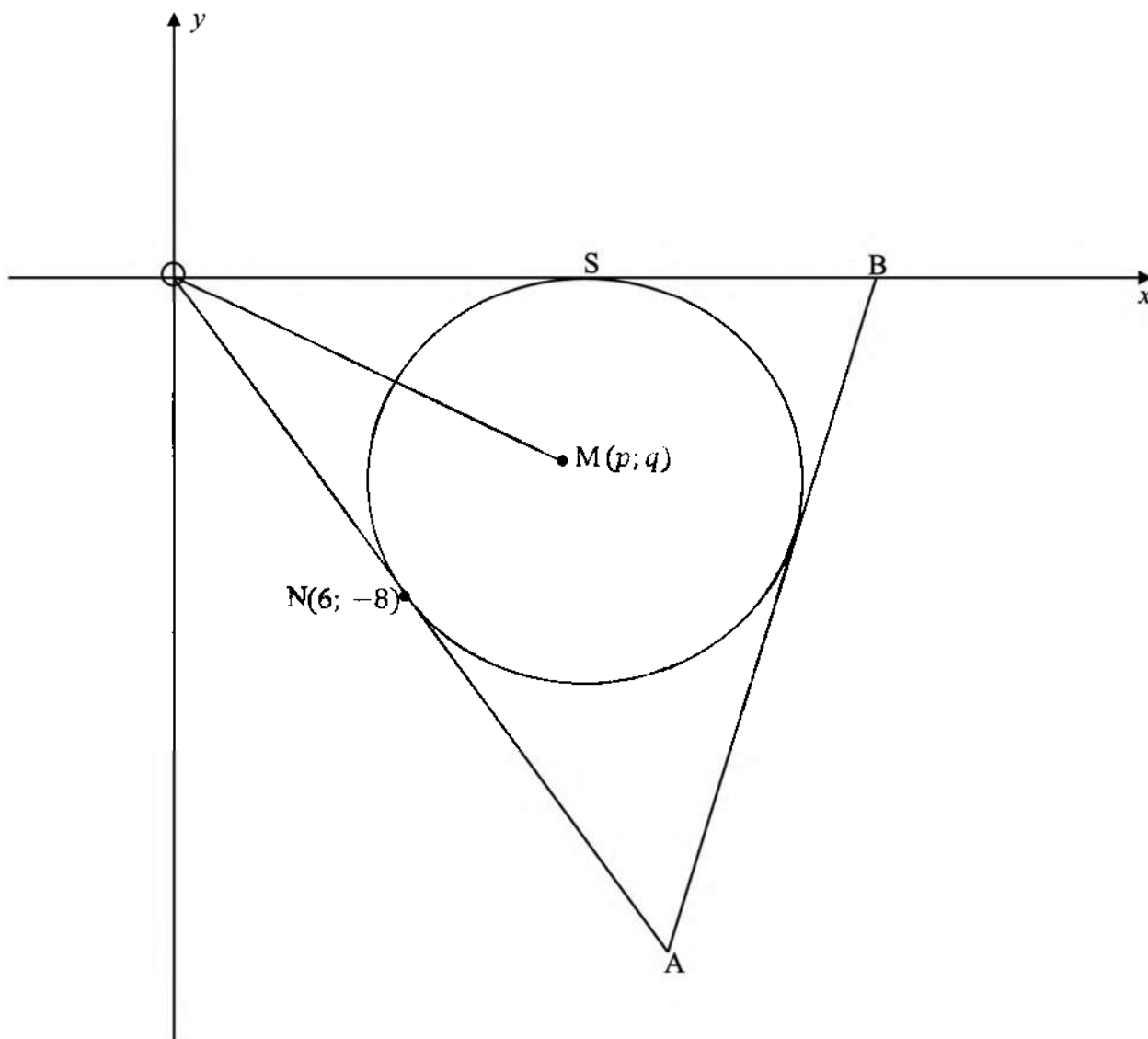


1.6	Calculate the size of $\widehat{PTA}$ .	(5)
1.7	Show that $\widehat{PAM} \neq 90^\circ$ .	(3)
1.8	Calculate the area of $\Delta MPT$ .	(4)
		[25]



**QUESTION 2**

In the diagram below, a circle, centred at  $M(p; q)$ , touches the  $x$ -axis at  $S$  and line  $OA$  is a tangent to the circle at  $N(6; -8)$ .



2.1	Calculate:	
2.1.1	The length of ON	

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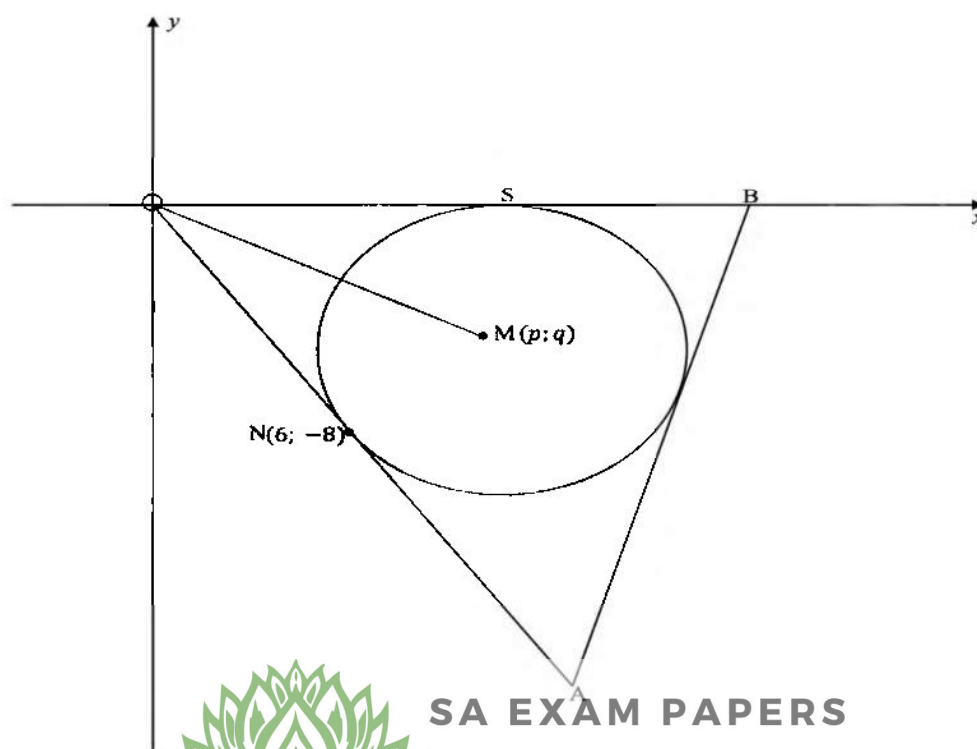
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(2)

2.1.2	The value of $p$	(2)
2.1.3	The gradient of MN	(2)
2.1.4	The value of $q$	(2)
2.2	Determine the equation of the circle in the form of $(x - a)^2 + (y - b)^2 = r^2$ .	(3)
2.3	$x = k$ is a tangent to the circle. Write down the value(s) of $k$ .	(2)



2.4	<p>The line <math>y = -\frac{4}{3}x + t</math> is perpendicular to OA, passes through M and cuts the circle at two different points.</p> <p>Determine the values of <math>t</math>.</p>	
2.5	<p>Another circle with equation <math>(x - 10)^2 + (y - 6)^2 = 25</math> is given.</p> <p>Will the two circles touch, cut or not? Give a reason for the answer.</p>	(5)

(2)  
[20]

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**QUESTION 3**

3.1	<p>Given: <math>\sin A = 2q</math> and <math>\cos A = q</math>, and <math>0^\circ &lt; A &lt; 90^\circ</math>.</p> <p>With the aid of a diagram and <b>without the use of a calculator</b>, calculate:</p>	
3.1.1	<p>The value of <math>\tan A</math></p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	(2)
3.1.2	<p>The value of <math>q</math></p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	(3)
3.2	<p>Given that <math>\sin 54^\circ = p</math>, express each of the following in terms of <math>p</math>, <b>without the use of a calculator</b>:</p>	
3.2.1	<p><math>\sin 594^\circ</math></p> <hr/> <hr/> <hr/> <hr/>	(2)



3.2.2	$\cos 36^\circ$	(2)
3.2.3	$\cos 18^\circ$	(4)
3.3	<p>Simplify the following <b>without the use of a calculator</b>:</p> $\frac{\cos 140^\circ - \sin(90^\circ - \theta)}{\sin 410^\circ + \cos(-\theta)}$	(6)

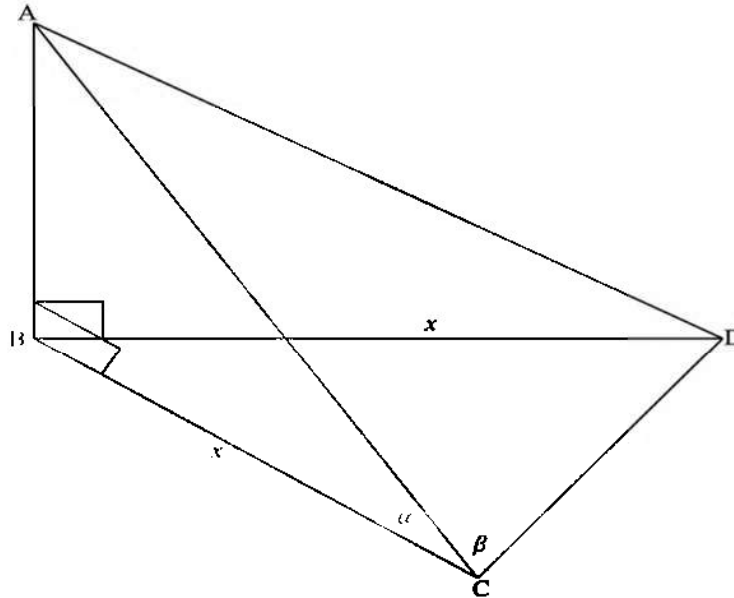






**QUESTION 4**

In the diagram below, B, C and D are points on the same horizontal plane. AB is a vertical tower with the angle of elevation from C to A equal to  $\alpha$  and  $\hat{A}CD = \beta$ .  $BD = BC = x$ .

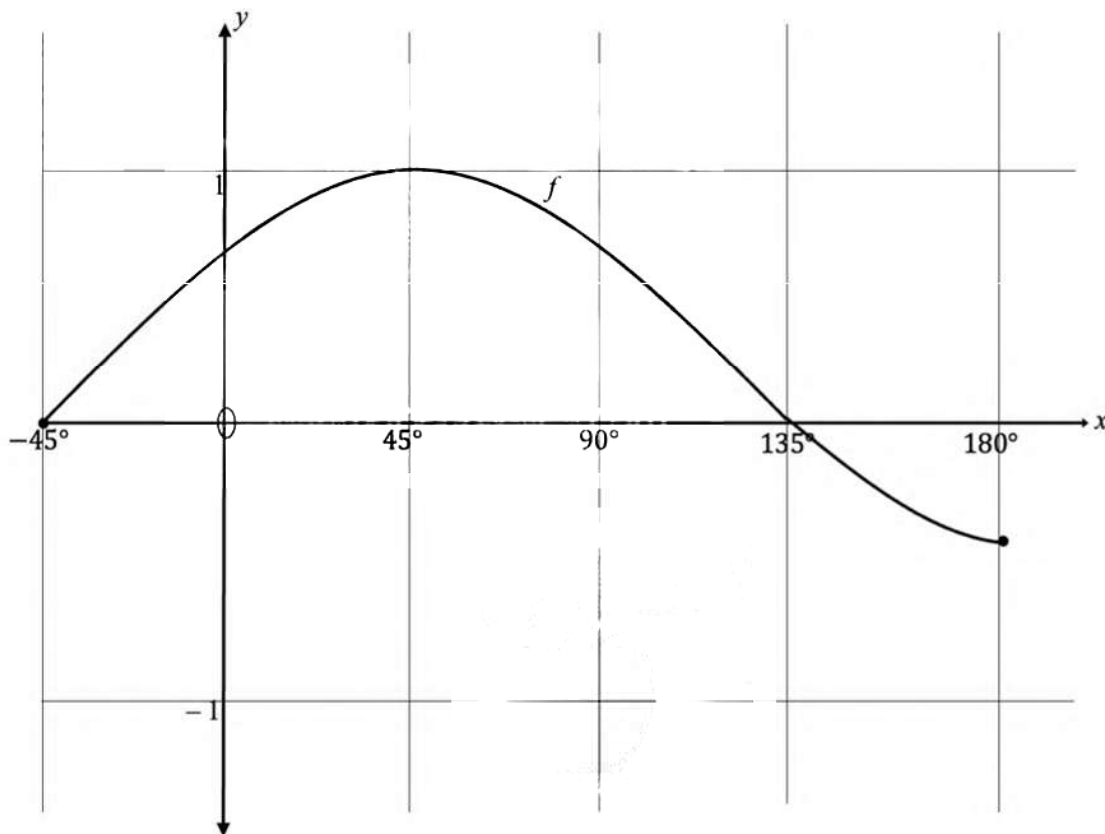


4.1	Give a reason why $AC = AD$ .	
		(1)
4.2	Write AC in terms of $x$ and $\alpha$ .	
		(2)
4.3	Show that $CD = \frac{2x \cos \beta}{\cos \alpha}$ .	
		(4)
4.4	Hence, or otherwise, determine the length of CD if $x = 25 \text{ cm}$ , $\alpha = 30^\circ$ and $\beta = 65,62^\circ$ .	
		(2)



**QUESTION 5**

Sketched below is the graph of  $f(x) = \cos(x - 45^\circ)$  for  $-45^\circ \leq x \leq 180^\circ$ .



Use the graph above to answer the questions that follow.

5.1 Write down the range of  $f$  for the given interval.

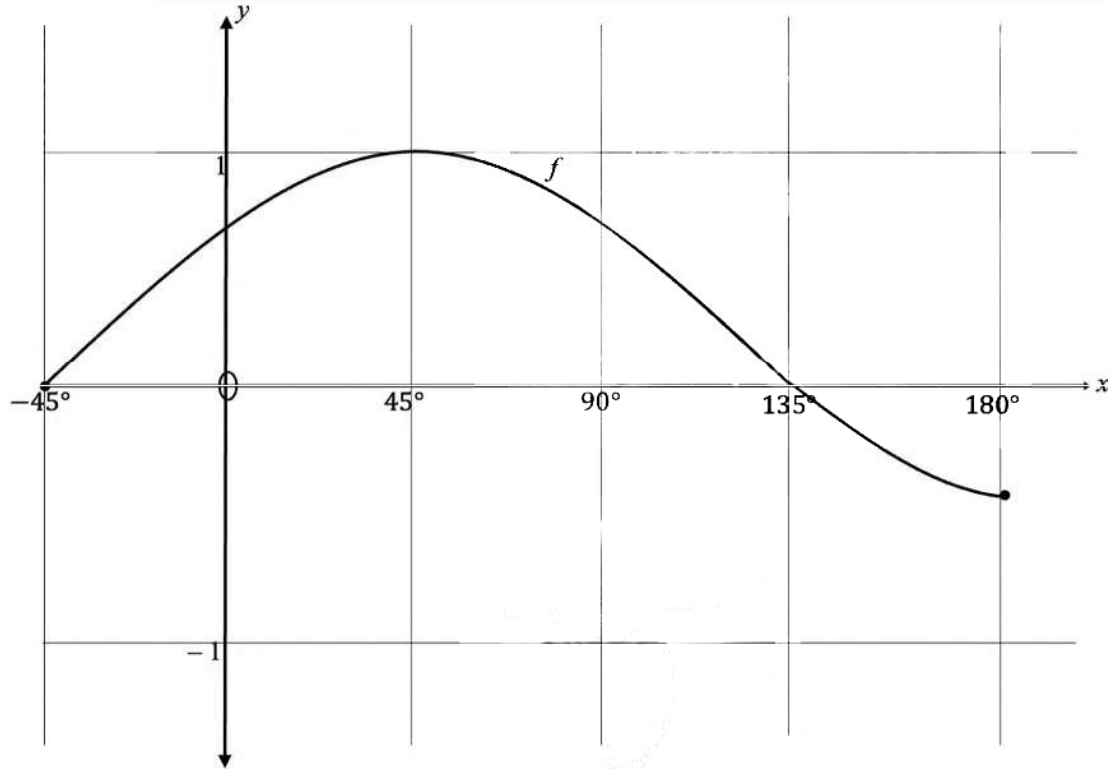

(2)



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- 5.2 Draw the graph of  $h(x) = \sin 2x$ , for  $x \in [-45^\circ; 180^\circ]$  on the same set of axes as the sketch of  $f$  below. Indicate all the intercepts with the axes as well as the turning points.



(3)

- 5.3 State the period of  $h$ .

(1)

- 5.4 Use your graph to determine the values of  $x$  for which  $f$  and  $h$  are both increasing.

(2)

- 5.5 Determine the values of  $x$  for which  $f(x) - h(x) = 1$ .

(2)

- 5.6 The graph of  $f$  is translated  $60^\circ$  to the left to form the graph of  $g$ .  
Write down the equation of  $g$  in the form  $g(x) = \dots$

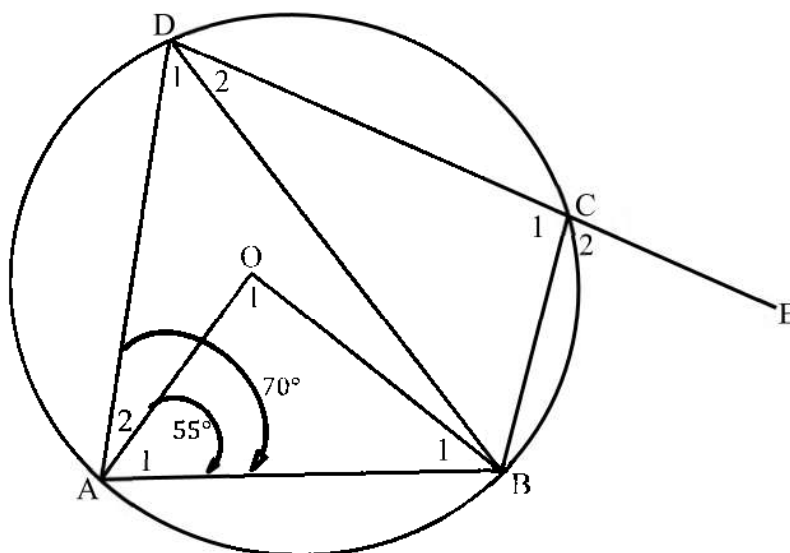
(1)

[11]



## QUESTION 6

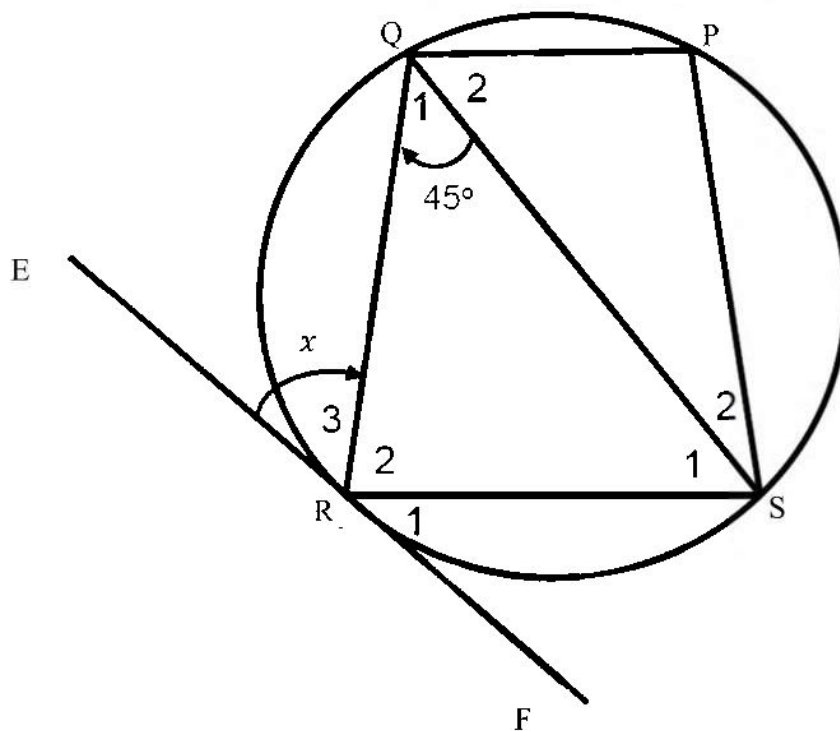
6.1 A, B, C and D are points on a circle with centre O. DE is a straight line,  $\widehat{BAD} = 70^\circ$  and  $\widehat{OAB} = 55^\circ$ .



Determine, giving reasons, the sizes of the following angles:		
6.1.1	$\widehat{B}_1$	(2)
6.1.2	$\widehat{O}_1$	(2)
6.1.3	$\widehat{D}_1$	(2)
6.1.4	$\widehat{C}_2$	(2)



- 6.2 In the diagram below, P, Q, R and S are points on the circumference of a circle. ERF is a tangent to the circle at R.  $\widehat{Q}_1 = 45^\circ$  and  $\widehat{R}_3 = x$ .



Answer the following questions, giving reasons for your answers.		
6.2.1	Determine the size of $\widehat{S}_1$ in terms of $x$ .	
		(2)
6.2.2	Prove that $\widehat{P} = x + 45^\circ$ .	
		(4)

[14]

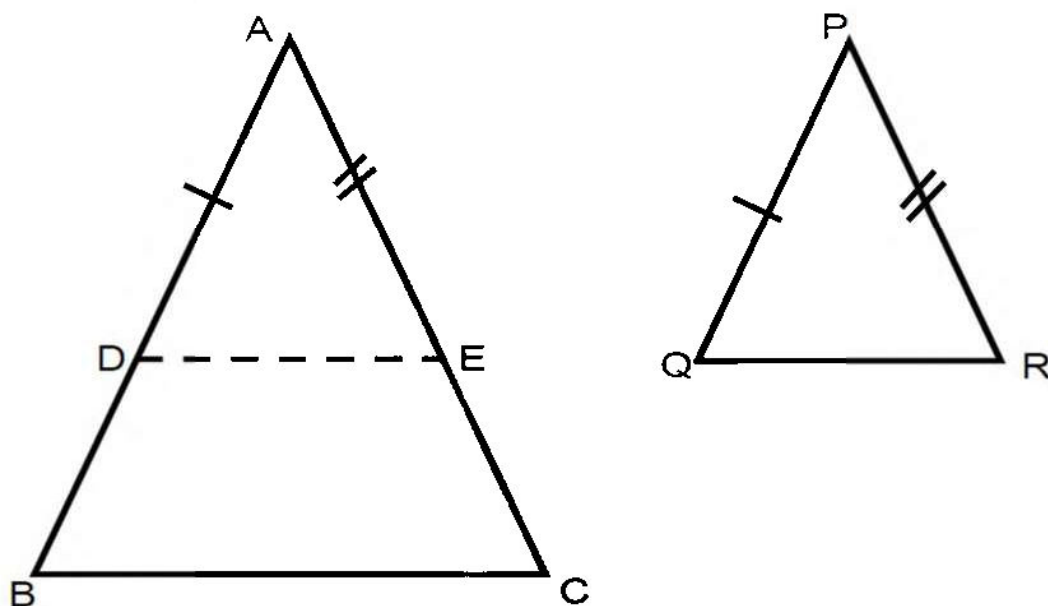


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## QUESTION 7

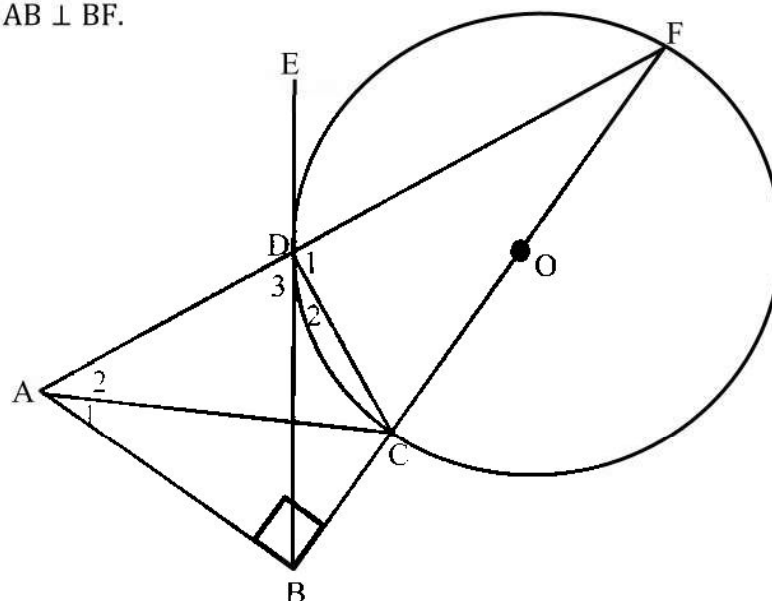
- 7.1 In the diagram below,  $\triangle ABC$  and  $\triangle PQR$  are drawn such that  $\hat{A} = \hat{P}$ ,  $\hat{B} = \hat{Q}$ , and  $\hat{C} = \hat{R}$ .  
DE is drawn such that  $AD = PQ$  and  $AE = PR$ .



7.1.1	Give a reason why $\triangle ADE \equiv \triangle PQR$ .	(1)
7.1.2	Hence, prove that $\frac{AB}{PQ} = \frac{AC}{PR}$ .	
		(5)



7.2 C, D and F are points on a circle with centre O. ADF is a straight line and BE is a tangent to the circle at point D.  $AB \perp BF$ .



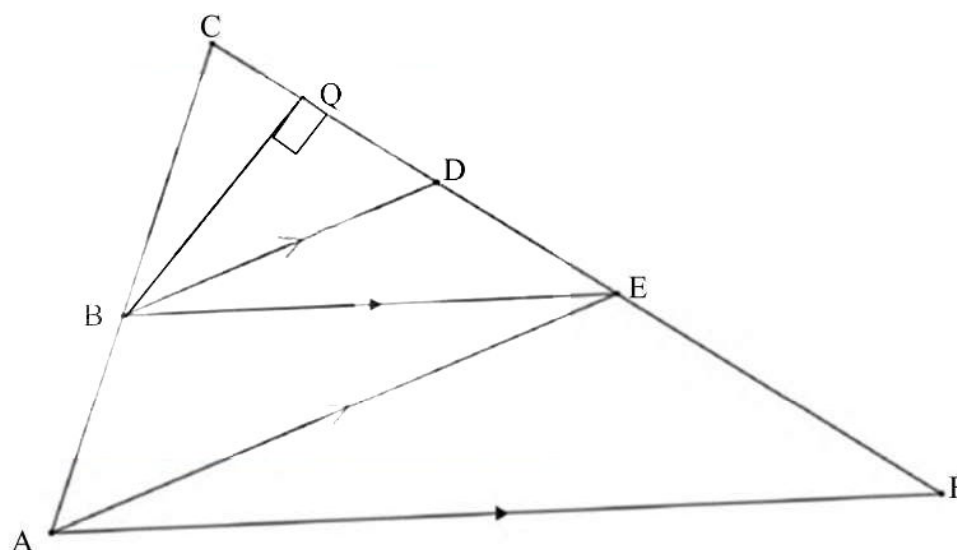
7.2.1	Prove that ABCD is a cyclic quadrilateral.          	(3)
7.2.2	Prove that AB is a tangent to the circle passing through A, C and F.          	(4)

[13]





- 8.2 In  $\triangle CAF$  below, B is a point on AC while Q, D and E are points on FC.  $BD \parallel AE$  and  $BE \parallel AF$ .  
 $AC : BC = 9 : 5$ .  $BQ \perp CD$ .



8.2.1	Determine the ratio $AB : BC$ .	
		(1)
8.2.2	Calculate the length of AC if it is given that $AB = 6$ units.	
		(2)
8.2.3	Determine, with reason(s), the value of $\frac{\text{Area of } \triangle BDC}{\text{Area of } \triangle BED}$ .	
		(2)
8.2.4	If it is given that $FC = 15$ units calculate, giving reasons, the length of DE.	
		(4)













### INFORMATION SHEET

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

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

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}$$

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

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

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

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

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

$$\text{Area of } \Delta ABC = \frac{1}{2} ab \cdot \sin C$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\sum_{i=1}^n 1 = n$$

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

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

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

$$y = mx + c$$

$$m = \tan \theta$$

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



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