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| Other Names | |
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# MATHEMATICS

## AS LEVEL QUESTION COMPILATION

# CM

Questions on: Trigonometry

**Instructions to candidates:**

• In the boxes above, write your centre number, candidate number, your surname, other names and signature.

• Answer ALL of the questions.

• You must write your answer for each question in the spaces provided.

• You may use a calculator.

**Information to candidates:**

• Full marks may only be obtained for answers to ALL of the questions.

• The marks for individual questions and parts of the questions are shown in round brackets.

• There are 10 questions in this question paper. The total mark for this paper is 76.

**Advice to candidates:**

• You should ensure your answers to parts of the question are clearly labelled.

• You should show sufficient working to make your workings clear to the Examiner.

• Answers without working may not gain full credit.



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**1**

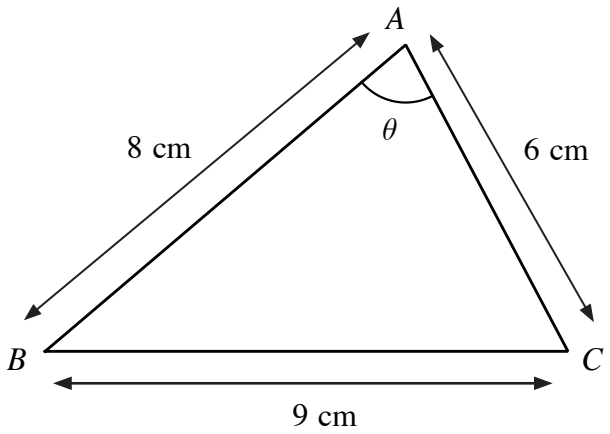


**Figure 1**

Figure 1 above shows the triangle $ABC$ with $AB = 8$ cm, $AC = 6$ cm and $BC = 9$ cm.
The angle $BAC$ is $\theta^{\circ}$.

(a) Find the exact value of $\cos\theta$. **(2)**

(b) Hence, find the exact value of $\sin\theta$. **(2)**

(c) Calculate the area of the triangle $ABC$, giving your answer to one decimal place. **(2)**

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**Question 1 continued**

**TOTAL 6 MARKS**

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**2**

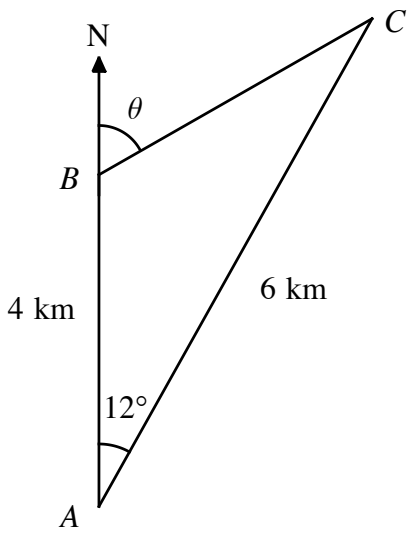


**Figure 2**

Figure 2 above shows the positions of planes $A$, $B$ and $C$ at a particular instant in time, which are assumed to be in the same horizontal plane. Plane $B$ is 4 km due north of plane $A$ and plane $C$ is 6 km from plane $A$.

(a) Calculate the distance between plane $B$ and plane $C$.
Give your answer to the nearest 0.5 km. **(2)**

The bearing of plane $C$ from plane $B$ is $\theta^{\circ}$, as shown in the figure.

(b) Find the value of $\theta$ to the nearest degree. **(3)**

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**Question 2 continued**

**TOTAL 5 MARKS**

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**3**

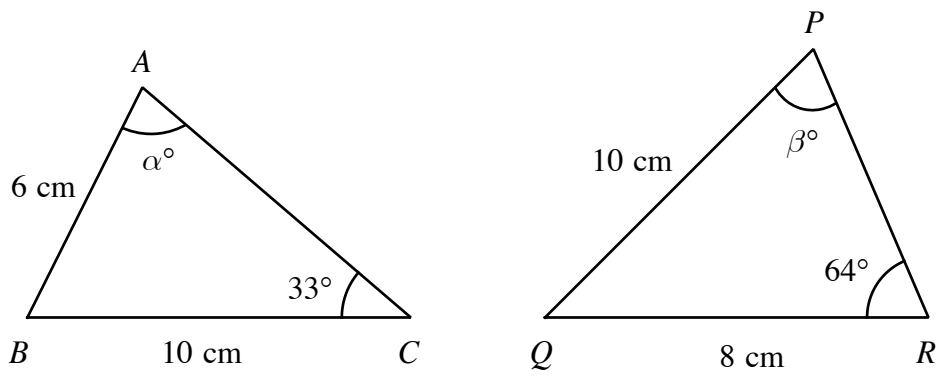


**Figure 3**

Triangle $ABC$ is such that $AB = 6$ cm, $BC = 10$ cm and the angle $ACB = 33°$.
Angle $BAC = \alpha°$.

Triangle $PQR$ is such that $PQ = 10$ cm, $QR = 8$ cm and the angle $PRQ = 64°$.
Angle $QPR = \beta°$.

Figure 3 above shows a possible diagram for the triangle $ABC$ and for the triangle $PQR$.

(a) Find the two possible values of $\alpha$. **(4)**

(b) Show that there is only one possible value of $\beta$. **(3)**

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**Question 3 continued**

**TOTAL 7 MARKS**

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**4** (a) Sketch the curve with equation $y = \sin(x - 30°)$ for $0 \leqslant x \leqslant 360°$.

On your sketch, show clearly the coordinates of any points where the curve crosses or meets the coordinate axes. **(3)**

(b) Hence solve the equation

$$\sin(x - 30°) = \frac{1}{3}$$

for $0 \leqslant x \leqslant 360°$. Give your answers to one decimal place. **(3)**

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**Question 4 continued**

**TOTAL 6 MARKS**

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**5** Solve the following trigonometric equations in the given intervals.

(i) $5\tan x = 3$, $0 \leqslant x \leqslant 360°$ **(3)**

(ii) $5\cos x - 1 = 0$, $-360° \leqslant x \leqslant 360°$ **(3)**

(iii) $4\sin^2(2x) = 3$, $0 \leqslant x \leqslant 360°$ **(5)**

(iv) $3\tan(x + 50°)$, $360° \leqslant x \leqslant 720°$ **(4)**

*(Solutions based entirely on graphical or numerical methods are not acceptable.)*

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**Question 5 continued**

**TOTAL 15 MARKS**

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**6** (a) Show that the equation

$$3\cos^2\theta - 2\sin x - 2 = 0$$

can be written in the form

$$a\sin^2\theta + b\sin\theta + c = 0$$

where $a$, $b$ and $c$ are integers to be found. **(2)**

(b) Hence, solve the equation

$$3\cos^2\theta - 2\sin x - 2 = 0$$

for $-360° \leqslant x \leqslant 360°$. **(5)**

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**Question 6 continued**

**TOTAL 7 MARKS**

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**7** Given that $\sin A = \frac{3}{5}$, where $A$ is obtuse,

(a) find the value of $\cos A$. **(2)**

(b) Determine the value of $\tan A$. **(2)**

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**Question 7 continued**

**TOTAL 4 MARKS**

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**8** (a) Prove that

$$\sin\theta\tan\theta \equiv \frac{1}{\cos\theta} - \cos\theta, \quad \theta \neq n(90°), n \in \mathbb{Z}$$

**(3)**

(b) For $0 < x < 240°$, solve the equation

$$\frac{1}{\cos 3x} - \cos 3x = \frac{1}{3}$$

giving your answers to two decimal places where appropriate. **(6)**

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**Question 8 continued**

**TOTAL 9 MARKS**

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**9** (a) Find all the solutions to the equation

$$3\sin(x + 40°) = -2$$

where $0 \leq x \leq 360°$. Give your answers to one decimal place. **(4)**

(b) Solve the equation

$$2\tan\theta - 3\sin\theta = 0$$

where $-180° \leq \theta \leq 180°$. Give your answers to one decimal place. **(5)**

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**Question 9 continued**

**TOTAL 9 MARKS**

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**10** (a) Prove that

$$\frac{\tan^2 x - 1}{\tan^2 x + 1} \equiv 1 - 2\cos^2 x$$

**(3)**

(b) Hence, show that the equation

$$3\sin^2\theta - \frac{\tan^2\theta - 1}{\tan^2\theta + 1} = 1$$

can be written in the form $\cos^2\theta = k$, where $k$ is a constant to be found. **(3)**

(c) Solve, for $0 \leqslant \theta \leqslant 120°$, the equation

$$3\sin^2(3\theta) - \frac{\tan^2(3\theta) - 1}{\tan^2(3\theta) + 1} = 1$$

**(2)**

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**Question 10 continued**

**TOTAL 8 MARKS**