Edexcel GCSE
Mathematics (Linear) – 1MA0

TRIGONOMETRY

Materials required for examination
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.
Tracing paper may be used.

Items included with question papers
Nil

Instructions
Use black ink or ball-point pen.
Fill in the boxes at the top of this page with your name, centre number and candidate number.
Answer all questions.
Answer the questions in the spaces provided – there may be more space than you need.
Calculators may be used.

Information
The marks for each question are shown in brackets – use this as a guide as to how much time to spend on each question.
Questions labelled with an asterisk (*) are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

Advice
Read each question carefully before you start to answer it.
Keep an eye on the time.
Try to answer every question.
Check your answers if you have time at the end.
1. 

Diagram NOT accurately drawn

$ABC$ is a right-angled triangle.

Angle $B = 90^\circ$.
Angle $A = 36^\circ$.
$AB = 8.7$ cm.

Work out the length of $BC$.
Give your answer correct to 3 significant figures.

\[
\tan 36 = \frac{BC}{8.7}
\]

\[
BC = 8.7 \times \tan 36
\]

\[
= 6.32091 \ldots
\]

\[
= 6.32\text{ cm (3sf)}
\]

2.

Diagram NOT accurately drawn

Calculate the value of $x$.
Give your answer correct to 3 significant figures.

\[
\sin 60 = \frac{x}{32}
\]

\[
x = 32 \sin 60
\]

\[
= 27.7128 \ldots
\]

\[
= 27.7\text{ cm (3sf)}
\]
3.

\[ \text{Diagram NOT accurately drawn} \]

\[ PQR \text{ is a triangle.} \]
\[ \text{Angle } Q = 90^\circ. \]
\[ \text{Angle } R = 43^\circ. \]
\[ PR = 5.8 \text{ m.} \]

Calculate the length of \( QR \).
Give your answer correct to 3 significant figures.

\[
\cos \theta = \frac{\text{adj}}{\text{hyp}} \\
\cos 43^\circ = \frac{QR}{5.8} \\
QR = 5.8 \times \cos 43^\circ \\
= 4.24185 \ldots = 4.24 \text{ m (3sf)}
\]

4.

\[ \text{Diagram NOT accurately drawn} \]

\[ PQR \text{ is a triangle.} \]
\[ \text{Angle } PQR = 90^\circ. \]
\[ PQ = 12.5 \text{ cm.} \]
\[ QR = 5 \text{ cm.} \]

Calculate the value of \( x \).
Give your answer correct to 1 decimal place.

\[
\tan \theta = \frac{\text{opp}}{\text{adj}} \\
\tan x = \frac{5}{12.5} \\
x = \tan^{-1} \left( \frac{5}{12.5} \right) \\
= 21.8014 \ldots \\
= 21.8^\circ \text{ (1dp)}
\]

(3 marks)
5. \( LMN \) is a right-angled triangle.
\( MN = 9.6 \) cm.
\( LM = 6.4 \) cm.

Calculate the size of the angle marked \( x^\circ \).
Give your answer correct to 1 decimal place.

\[
\cos x = \frac{6.4}{9.6} \]
\[
x = \cos^{-1}\left(\frac{6.4}{9.6}\right) \]
\[
= 48.2^\circ \text{ (1 dp)} \]

\( x = 48.2^\circ \) (3 marks)

6. Work out the value of \( x \).
Give your answer correct to 1 decimal place.

\[
\cos x = \frac{3.9}{4.7} \]
\[
x = \cos^{-1}\left(\frac{3.9}{4.7}\right) \]
\[
= 33.9^\circ \text{ (1 dp)} \]

\( x = 33.9^\circ \) (1 dp)
7. Diagram NOT accurately drawn

\[ \text{\(PQR\) is a right-angled triangle.} \]
\[ \text{\(PR = 12 \text{ cm.}\)} \]
\[ \text{\(QR = 4.5 \text{ cm.}\)} \]
\[ \text{\(\text{Angle } PRQ = 90^\circ.\)} \]

Work out the value of \(x\).
Give your answer correct to one decimal place.

\[ \tan \theta = \frac{\text{Opp}}{\text{Adj}} \]
\[ \tan x = \frac{4.5}{12}. \]
\[ x = \tan^{-1} \left( \frac{4.5}{12} \right) \]
\[ x = 20.6^\circ \text{ (1dp)} \]

8. Calculate the size of angle \(a\) in this right-angled triangle.
Give your answer correct to 3 significant figures.

\[ \tan \theta = \frac{\text{Opp}}{\text{Adj}} \]
\[ \tan a = \frac{5}{6} \]
\[ a = \tan^{-1} \left( \frac{5}{6} \right) \]
\[ = 39.8^\circ \text{ (3sf)} \]

(3 marks)
9. \( PQR \) is a right-angled triangle.

\[ PR = 8 \text{ cm.} \]
\[ QR = 12 \text{ cm.} \]

(a) Find the size of the angle marked \( x \).
Give your answer correct to 1 decimal place.

\[ \tan \theta = \frac{\text{Opp}}{\text{Adj}} \]
\[ \tan x = \frac{8}{12} \]
\[ x = \tan^{-1} \left( \frac{8}{12} \right) \]
\[ = 38.7^\circ \text{ (1dp)} \]

\( XYZ \) is a different right-angled triangle.

\[ XY = 5 \text{ cm.} \]
\[ \text{Angle } Z = 32^\circ \text{.} \]

(b) Calculate the length \( YZ \).
Give your answer correct to 3 significant figures.

\[ \sin \theta = \frac{\text{Opp}}{\text{Hyp}} \]
\[ \sin 32^\circ = \frac{5}{12} \]
\[ 12 \cdot \sin 32^\circ = 5 \]
\[ 12 = \frac{5}{\sin 32^\circ} \]
\[ 12 = 9.44 \text{ cm (3sf)} \]
10. The diagram shows a quadrilateral $ABCD$.

$AB = 16$ cm.
$AD = 12$ cm.
Angle $BCD = 40^\circ$.
Angle $ADB = angle CBD = 90^\circ$.

Calculate the length of $CD$.
Give your answer correct to 3 significant figures.

Using Pythagoras:

\[
\begin{align*}
12^2 + BD^2 &= 16^2 \\
BD^2 &= 16^2 - 12^2 \\
BD &= \sqrt{112} \\
BD &= 10.5830...
\end{align*}
\]

Using Trigonometry:

\[
\begin{align*}
\sin 40^\circ &= \frac{BD}{CD} \\
CD \sin 40^\circ &= 10.5830... \\
CD &= \frac{10.5830...}{\sin 40} \\
CD &= 16.46623... \\
CD &= 16.5\text{ cm (3sf)}
\end{align*}
\]

.......................... cm

(5 marks)
ABC is a triangle.
ADC is a straight line with BD perpendicular to AC.
AB = 7 cm.
BC = 12 cm.
Angle BAD = 65°.

Calculate the length of AC.
Give your answer correct to 3 significant figures.

Length of AC = Length of AD + Length of DC
= 2.958327... + 10.1858...
= 13.144185...
= 13.1 cm (3 sf)

13.1 cm

Diagran NOT accurately drawn