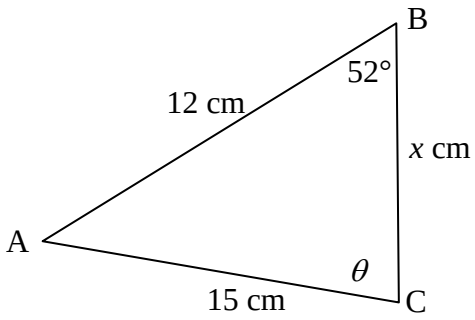
Edexcel AS Mathematics Trigonometry

Topic assessment

1. Find the angle θ and the length x in the triangle shown below.



[6]

2. Chang walks 5 km on a bearing of 140°, and then walks 3 km on a bearing of 025°.
   (i) How far is Chang from his starting point? [3]
   (ii) On what bearing should Chang walk to get back to his starting point? [4]

3. A triangular field has sides of length 100 m, 120 m and 150 m. Find the area of the field. [5]

4. Solve these equations for $0° \le \theta \le 360°$
   (i) $\cos\theta = 0.5$
   (ii) $\sin\theta = -0.5$
   (iii) $\tan\theta = 2$ [6]

5. Solve these equations for $0° \le \theta \le 360°$.
   (i) $\cos^2\theta = \frac{3}{4}$
   (ii) $3\tan^2\theta = 1$ [6]

6. Solve these equations for $0° \le x \le 360°$
   (i) $\sin 2x = -\frac{1}{2}\sqrt{3}$
   (ii) $\cos\frac{1}{2}x = 0.3$
   (iii) $\tan 3x = 0.5$ [9]

7. Solve these equations for $0° \le \theta \le 360°$
   (i) $\cos^2\theta + \sin\theta = 1$ [4]
   (ii) $2\sin\theta\cos\theta + \sin\theta = 0$ [4]
   (iii) $\sqrt{3}\sin\theta = \cos\theta$ [3]

Total 50 marks

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Edexcel AS Maths Trigonometry Assessment solns

Topic assessment solutions

1. Using the sine rule: $\dfrac{\sin\theta}{12} = \dfrac{\sin 52^\circ}{15}$

$$\sin\theta = \frac{12\sin 52^\circ}{15}$$

$$\theta = 39.1 \text{ or } 140.9^\circ$$

The value of θ cannot be 149.0° as the total of the angles would be greater than 180°.
So $\theta = 39.1^\circ$.

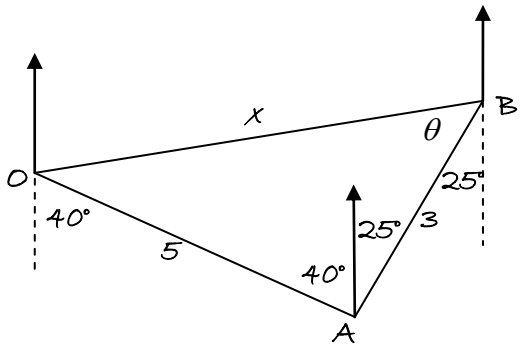
Angle A $= 180^\circ - 52^\circ - 39.08^\circ = 88.92^\circ$

Using the sine rule: $\dfrac{x}{\sin 88.92} = \dfrac{15}{\sin 52^\circ}$

$$x = \frac{15\sin 88.92}{\sin 52^\circ} = 19.0 \text{ cm}$$

[6]

2.



(i) Using the cosine rule: $x^2 = 5^2 + 3^2 - 2\times 3\times 5\cos 65^\circ$

$$x = 4.62 \text{ km}$$

[3]

(ii) Using the cosine rule: $\cos\theta = \dfrac{4.6175^2 + 3^2 - 5^2}{2\times 3\times 4.6175}$

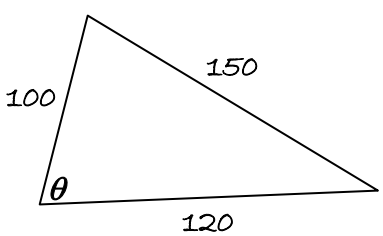
$$\theta = 78.9^\circ$$

Bearing $= 180^\circ + 25^\circ + 78.9^\circ$

$= 283.9^\circ$

[4]

3.



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Using the cosine rule: $\cos\theta = \dfrac{100^2 + 120^2 - 150^2}{2 \times 100 \times 120}$

$\theta = 85.459°$

Area $= \frac{1}{2} \times 100 \times 120 \sin 85.459°$

$= 5981 \text{ m}^2$ (4 s.f.)

[5]

4. (i) $\cos\theta = 0.5$

Roots are in the 1st and 4th quadrants.

$\theta = 60°$ or $\theta = 360° - 60° = 300°$

$\theta = 60°, 300°$

[2]

(ii) $\sin\theta = -0.5$

Roots are in the 3rd and 4th quadrants

$\theta = 180° + 30° = 210°$ or $\theta = 360° - 30° = 330°$

$\theta = 210°, 330°$

[2]

(iii) $\tan\theta = 2$

Roots are in 1st and 3rd quadrants.

$\theta = 63.4°$ or $\theta = 180° + 63.4° = 243.4°$

$\theta = 63.4°, 243.4°$

[2]

5. (i) $\cos^2\theta = \dfrac{3}{4}$

$\cos\theta = \pm\dfrac{\sqrt{3}}{2}$

$\cos\theta = \dfrac{\sqrt{3}}{2}$ has roots in the 1st and 4th quadrants

$\theta = 30°$ or $\theta = 360° - 30° = 330°$

$\cos\theta = -\dfrac{\sqrt{3}}{2}$ has roots in the 2nd and 4th quadrants

$\theta = 180° - 30° = 150°$ or $\theta = 180° + 30° = 210°$

$\theta = 30°, 150°, 210°, 330°$

[3]

(ii) $3\tan^2\theta = 1$

$\tan^2\theta = \dfrac{1}{3}$

$\tan\theta = \pm\dfrac{1}{\sqrt{3}}$

$\tan\theta = \dfrac{1}{\sqrt{3}}$ has roots in the 1st and 3rd quadrants

$\theta = 30°$ or $\theta = 180° + 30° = 210°$

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$\tan\theta = -\frac{1}{\sqrt{3}}$ has roots in the 2nd and 4th quadrants

$\theta = 180° - 30° = 150°$ or $\theta = 360° - 30° = 330°$

$\theta = 30°, 150°, 210°, 330°$

[3]

6. (i) $\sin 2x = -\frac{1}{2}\sqrt{3}$

Roots for 2x are in the 3rd and 4th quadrants.

$2x = 180° + 60° = 240°$ or $2x = 360° - 60° = 300°$

or $2x = 360° + 240° = 600°$ or $2x = 360° + 300° = 660°$

$x = 120°,\ 150°,\ 300°,\ 330°$

[3]

(ii) $\cos\frac{1}{2}x = 0.3$

Roots for $\frac{1}{2}x$ are in the 1st and 4th quadrants, but the one in the 4th quadrant will give a value for x which is out of the range.

$\frac{1}{2}x = 72.5°$

$x = 145°$

[3]

(iii) $\tan 3x = 0.5$

Roots for 3x are in the 1st and 3rd quadrants

$3x = 26.6°$ or $3x = 180° + 26.6° = 206.6°$

or $3x = 360° + 26.6° = 386.6°$ or $3x = 360° + 206.6° = 566.6°$

or $3x = 360° + 386.6° = 746.6°$ or $3x = 360° + 566.6° = 926.6°$

$x = 8.9°,\ 68.9°,\ 128.9°,\ 188.9°,\ 248.9°,\ 308.9°$

[3]

7. (i) $\cos^2\theta + \sin\theta = 1$

$(1 - \sin^2\theta) + \sin\theta = 1$

$\sin^2\theta - \sin\theta = 0$

$\sin\theta(\sin\theta - 1) = 0$

$\sin\theta = 0$	or	$\sin\theta - 1 = 0$
$\theta = 0°, 180°, 360°$		$\sin\theta = 1$
		$\theta = 90°$

$\theta = 0°, 90°, 180°, 360°$

[4]

(ii) $2\sin\theta\cos\theta + \sin\theta = 0$

$\sin\theta(2\cos\theta + 1) = 0$

$\sin\theta = 0$	or	$2\cos\theta + 1 = 0$
$\theta = 0°, 180°, 360°$		$\cos\theta = -\frac{1}{2}$
		$\theta = 120°, 240°$

$\theta = 0°, 120°, 180°, 240°, 360°$

[4]

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(iii) $\sqrt{3}\sin\theta = \cos\theta$

$\sqrt{3}\tan\theta = 1$

$\tan\theta = \frac{1}{\sqrt{3}}$

$\theta = 30°, 210°$ [3]

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