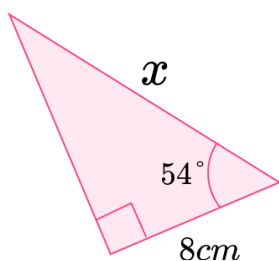THIRD SPACE LEARNING

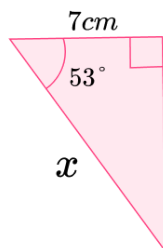# Trigonometry - Worksheet

Skill

Group A - Missing sides and angles in right angle triangle

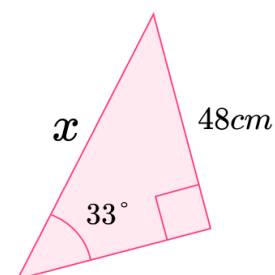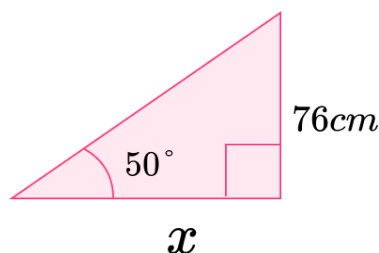Use SOHCAHTOA to calculate the missing side or angle for each right angle triangle
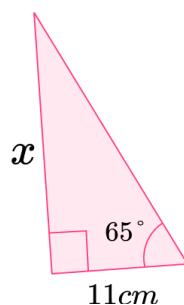
1)

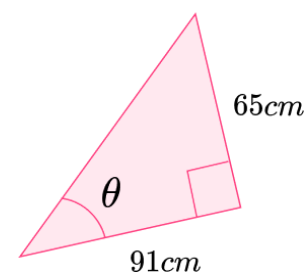x

$54°$

$8cm$

2)

$7cm$

$53°$

x

3)

x

$48cm$

$33°$

4)

$76cm$

$50°$

x

5)

x

$65°$

$11cm$

6)

$65cm$

θ

$91cm$

7)

$77cm$

$56cm$

θ

8)

$7\sqrt{2}mm$

θ

$7\sqrt{2}mm$

9)

x

$9\sqrt{7}m$

$45°$

10)

$9\sqrt{2}cm$

$60°$

x

11)

x

$30°$

$7\sqrt{2}m$

12)

$5\sqrt{2}cm$

θ

$\frac{5}{2}\sqrt{6}cm$
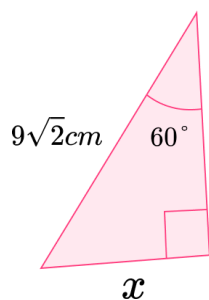
Trigonometry - Worksheet

Group B - Missing sides and angles in non right-angle triangle

Use either the sine rule or the cosine rule to find the missing side or angle in each non right-angle triangle to 2.d.p

1)

2)

3)
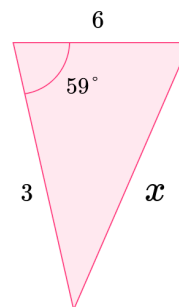
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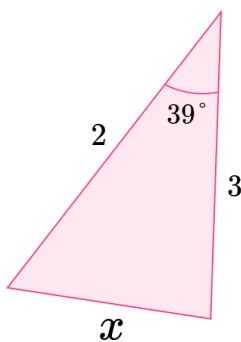
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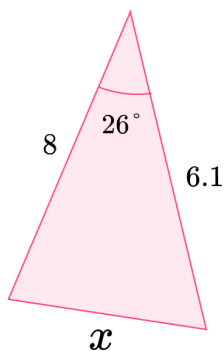
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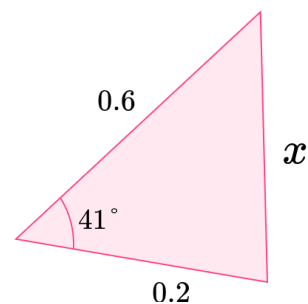
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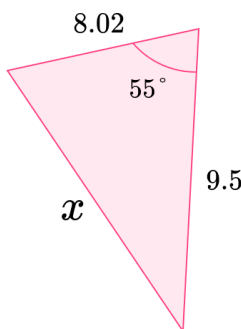
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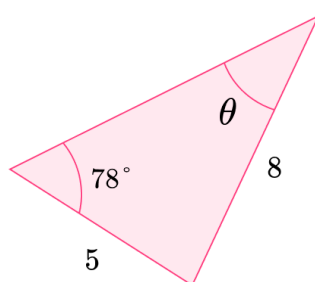
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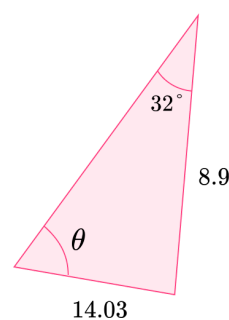
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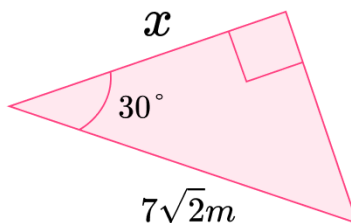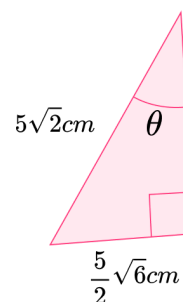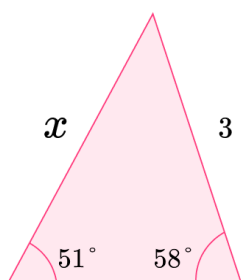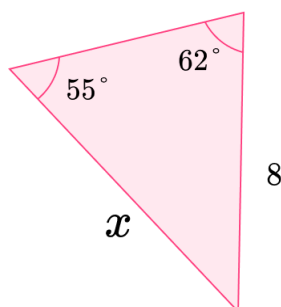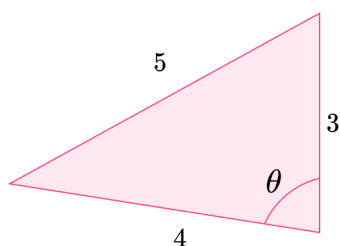**11)**
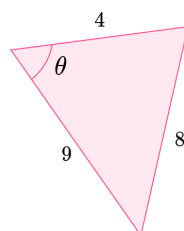
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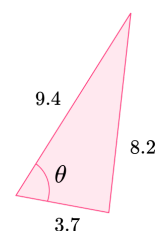
Trigonometry - Worksheet

Group C - Area of a triangle

Calculate the area of each shape

1)

$26cm$

$17cm$

2)

$15cm$

$9cm$

3)

$4cm$

$10cm$

$6cm$

4)

$4cm$

$5cm$

$6cm$

5)

$9cm$

$9cm$

$6cm$

$19cm$

6)

$8cm$

$10cm$

$3cm$

7)

$13cm$

$67.4°$

$5cm$

$10cm$

8)

$7cm$

$33°$

$11cm$

9)

$5cm$

$45°$

$5\sqrt{2}cm$

10)

$7cm$

$52°$

$8cm$

11)

$11cm$

$15cm$

$6cm$

12)

$7cm$

$68°$

$6cm$
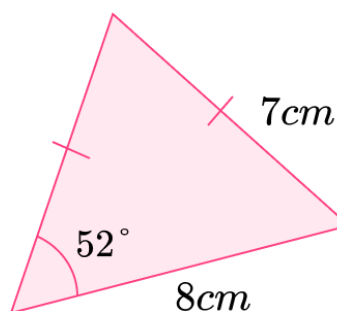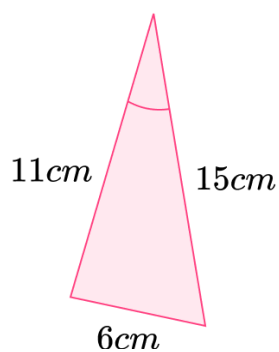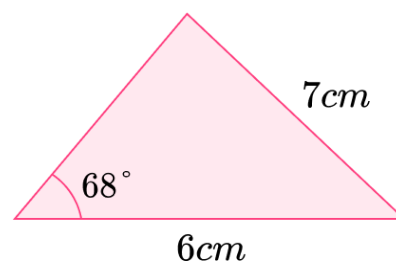
Trigonometry - Worksheet

Applied

1) **(a)** A new donut company is designing their logo. The logo is in the shape of a regular dodecagon, made up of 12 identical triangles shown below. Calculate the width of one triangular section, x, to the nearest 3 significant figures.

$x \; cm$

xcm

$3.8cm$

(b) Hence, calculate the value of y.

$3.8cm$

y

2) **(a)** Shape AOB is a sector of a circle with radius $8cm$. Calculate the area of the shaded section, to 2 decimal places.

A

$8cm$

$30°$

B

O

(b) Calculate the length of the chord from A to B to 2.d.p.

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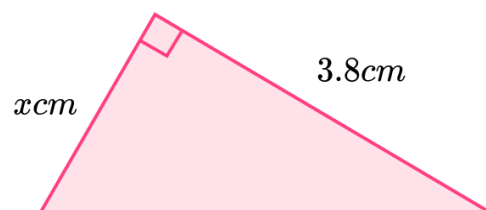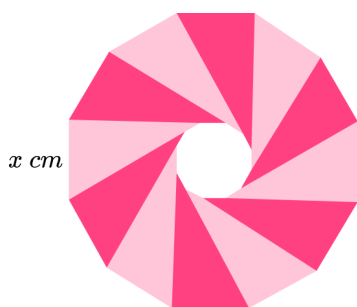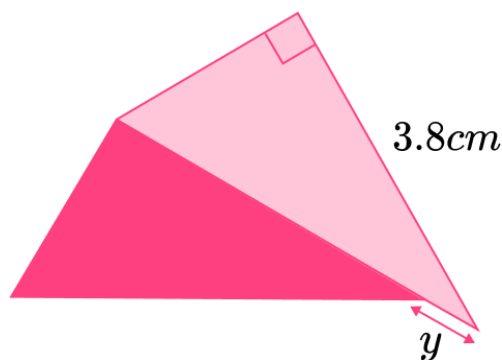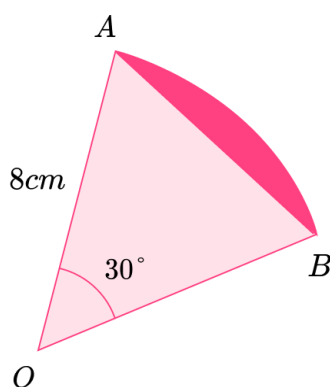
Trigonometry - Worksheet

3) **(a)** Two beacons are placed at the top of two hills, $16.4km$ away from each other. Each beacon is $70m$ tall. Beacon A is located at the top of a hill that is $3km$ high, whilst Beacon B is located at the top of a $2.4km$ high hill. Calculate the angle θ of demotion between the top of each beacon to 1 decimal place.
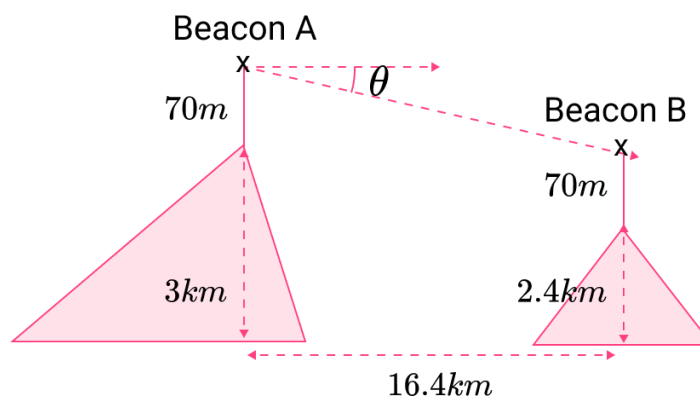
(b) Beacon A requires a repair. It takes an engineer 1.5 hours to reach the beacon from the base of the hill. He walked at a pace of $3.2kmph$ on the shallower route. Calculate the average angle of elevation of the hill to 2.d.p.

4) **(a)** Harry stands at the end of a $10m$ diving board. He aims to land in the water at a maximum of 5 degrees in front of where he leaves the board. How far is the horizontal displacement of his dive, x?
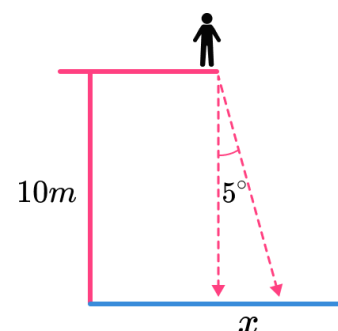
(b) The next diver lands in the water, $2.6m$ in front of the end of the diving board. Calculate the average angle of his dive.
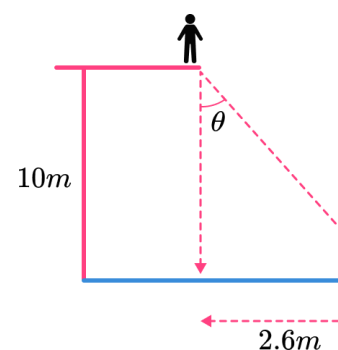
Trigonometry - Exam Questions

1) **(a)** Agatha and Beatrice set off from the same point at the same time.
Agatha walks at a bearing of 120° at 5kmph. Beatrice walks at a
bearing of 200° at a speed of $4.8kmph$. Calculate the distance between
them after 30 minutes. Write your answer correct to 2 decimal places.

....

(5)

(b) Use your answer to part a) to calculate the bearing of Beatrice from
Agatha at this time.

....

(4)

(9 marks)

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Trigonometry - Exam Questions

2) **(a)** A cube shown below has a surface area of $36cm^2$. Calculate the length of the line BE. write your answer in the form $a\sqrt{b}$ where a and b are prime numbers.

....
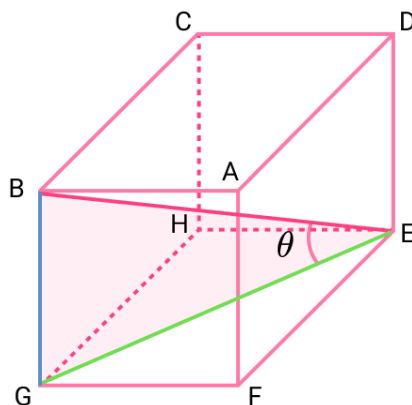
(4)

(b) Calculate the size of angle BEG.

....

(3)

(7 marks)

Trigonometry - Exam Questions

3) **(a)** Triangle ABC has an area of $105m^2$. Calculate the length of x.

....
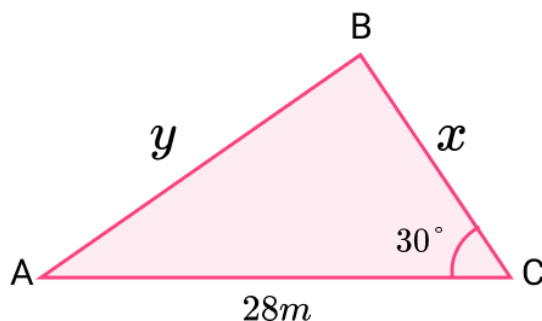
(2)

(b) Calculate the value of y correct to 2 decimal places.

....

(3)

(5 marks)

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Trigonometry - Exam Questions

4) **(a)** ABCD is a kite with the following information:
- AD $= 2.4cm$,
- Angle ADE $= 40°$,
- E is the intersection point of the two diagonals AC and BD
- AE:EC $= 2:3$.
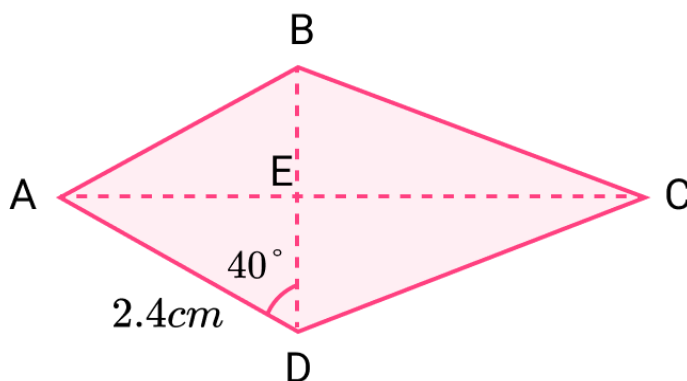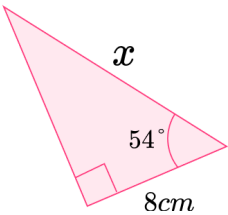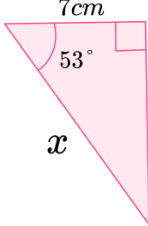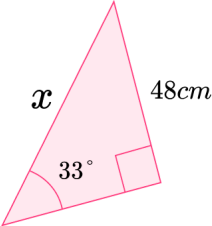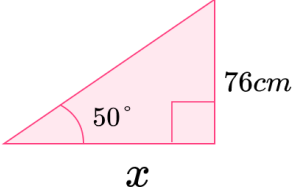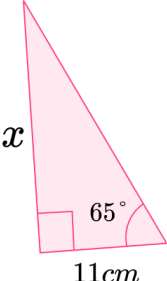
Calculate the length of the line AC. Write your answer correct to 2 decimal places.

....

(3)
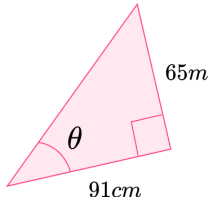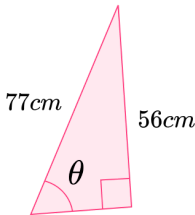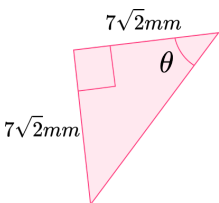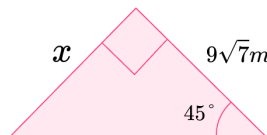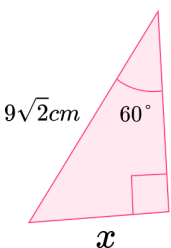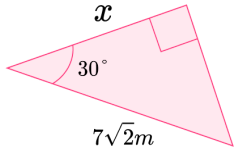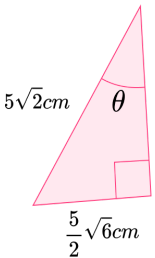
(b) Calculate the area of ABD.

....

(3)

(6 marks)

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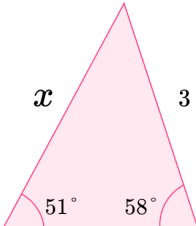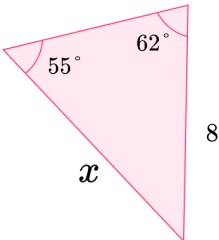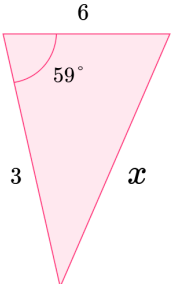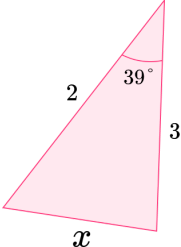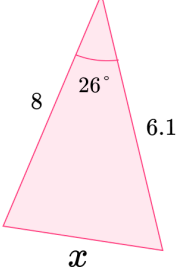
Trigonometry - Answers

	Question	Answer
	Skill Questions	
Group A	Use SOHCAHTOA to calculate the missing side or angle for each right angle triangle	
	1)	1) $x = \dfrac{8}{\cos(54)}$ $x = 13.61cm$
	2)	2) $x = \dfrac{7}{\cos(53)}$ $x = 11.63m$
	3)	3) $x = \dfrac{48}{\sin(33)}$ $x = 88.13cm$
	4)	4) $x = \dfrac{76}{\tan(50)}$ $x = 63.77m$
	5)	5) $x = 11 \times \tan(65)$ $x = 23.59m$

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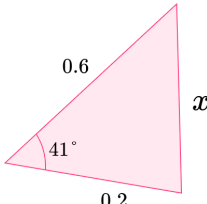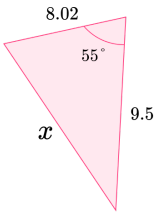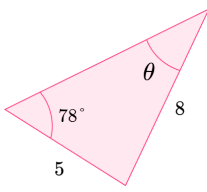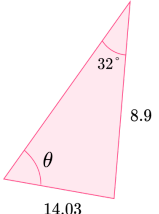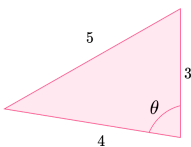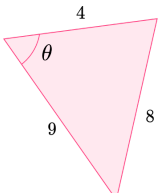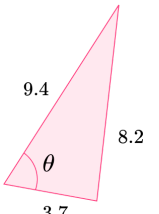
Trigonometry - Answers

Group A contd		
6) 65m θ 91cm		**6)** $\theta = \tan^{-1}\left(\dfrac{65}{91}\right)$ $\theta = 35.54^{o}$
7) 77cm 56cm θ		**7)** $\theta = \sin^{-1}\left(\dfrac{56}{77}\right)$ $\theta = 46.66^{o}$
8) $7\sqrt{2}mm$ θ $7\sqrt{2}mm$		**8)** $\theta = \tan^{-1}\left(\dfrac{7\sqrt{2}}{7\sqrt{2}}\right)$ $\theta = 45^{o}$
9) x $9\sqrt{7}m$ $45°$		**9)** $x = 9\sqrt{7} \times \tan(45)$ $x = 9\sqrt{7}m$
10) $9\sqrt{2}cm$ $60°$ x		**10)** $x = 9\sqrt{2} \times \sin(60)$ $x = \dfrac{9\sqrt{6}}{2}cm$
11) x $30°$ $7\sqrt{2}m$		**11)** $x = 7\sqrt{2} \times \cos(30)$ $x = \dfrac{7\sqrt{6}}{2}m$
12) $5\sqrt{2}cm$ θ $\dfrac{5}{2}\sqrt{6}cm$		**12)** $\theta = \sin^{-1}\left(\dfrac{\frac{5}{2}\sqrt{6}}{5\sqrt{2}}\right)$ $\theta = 60^{o}$

Trigonometry - Answers

Group B	Use either the sine rule or the cosine rule to find the missing side or angle in each non right-angle triangle	
	1) x 3 $51°$ $58°$	**1)** $x = \dfrac{3\sin(58)}{\sin(51)}$ $x = 3.27$
	2) $62°$ $55°$ 8 x	**2)** $x = \dfrac{8\sin(62)}{\sin(55)}$ $x = 8.62$
	3) 6 $59°$ 3 x	**3)** $x^2 = 3^2 + 6^2 - 2 \times 3 \times 6 \times \cos(59)$ $x = 5.14$
	4) 2 $39°$ 3 x	**4)** $x^2 = 2^2 + 3^2 - 2 \times 2 \times 3 \times \cos(39)$ $x = 1.92$
	5) 8 $26°$ 6.1 x	**5)** $x^2 = 8^2 + 6.1^2 - 2 \times 8 \times 6.1 \times \cos(26)$ $x = 3.67$

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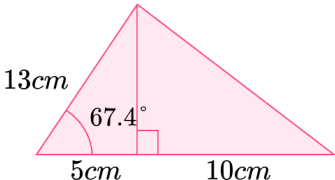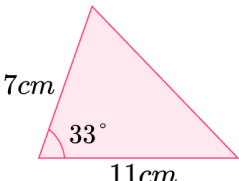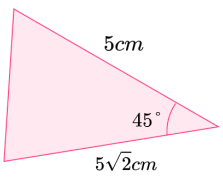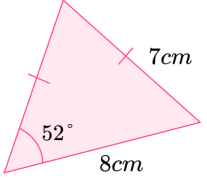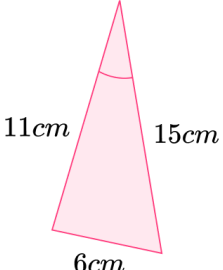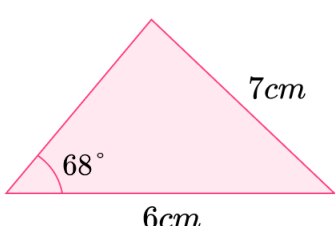
Trigonometry - Answers

Group B contd		
	6)	**6)** $x^2 = 0.6^2 + 0.2^2 - 2 \times 0.6 \times 0.2 \times \cos(41)$ $x = 0.47$
	7)	**7)** $x^2 = 8.02^2 + 9.5^2 - 2 \times 8.02 \times 9.5 \times \cos(55)$ $x = 8.20 \ (2.d.p)$
	8)	**8)** $\theta = \sin^{-1}\left(\dfrac{5\sin(78)}{8}\right)$ $\theta = 37.69^o$
	9)	**9)** $\theta = \sin^{-1}\left(\dfrac{8.9\sin(32)}{14.03}\right)$ $\theta = 19.64^o$
	10)	**10)** $\theta = \cos^{-1}\left(\dfrac{3^2+4^2-5^2}{2\times3\times4}\right)$ $\theta = 90^o$
	11)	**11)** $\theta = \cos^{-1}\left(\dfrac{9^2+4^2-8^2}{2\times9\times4}\right)$ $\theta = 62.7^o$
	12)	**12)** $\theta = \cos^{-1}\left(\dfrac{9.4^2+3.7^2-8.2^2}{2\times9.4\times3.7}\right)$ $\theta = 59.97^o$

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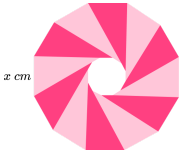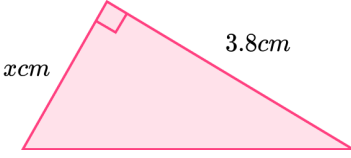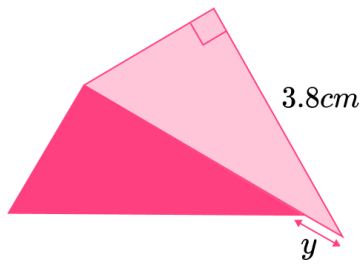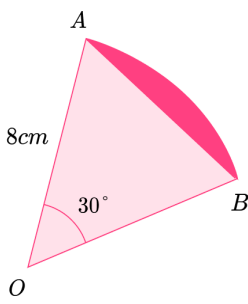
Trigonometry - Answers

Group C	Calculate the area of each shape	
	1)	**1)** $A = \dfrac{26 \times 17}{2}$ $A = 221cm^2$
	2)	**2)** $A = \dfrac{15 \times 9}{2}$ $A = 67.5cm^2$
	3)	**3)** $A = \dfrac{10 \times 4}{2} + (10 \times 6)$ $A = 80cm^2$
	4)	**4)** $A = \left(\dfrac{4 \times 6}{2}\right) + (5 \times 6)$ $A = 42cm^2$
	5)	**5)** $A = \dfrac{19 \times 6}{2} + \dfrac{10 \times 9}{2}$ $A = 102cm^2$
	6)	**6)** $\sqrt{10^2 - 8^2} = 6$ Bottom triangle area $= \dfrac{6 \times 8}{2} = 24cm^2$ Top triangle area $= \dfrac{(6+3) \times 8}{2} = 36cm^2$ $A = 24 + 36 = 60cm^2$

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Trigonometry - Answers
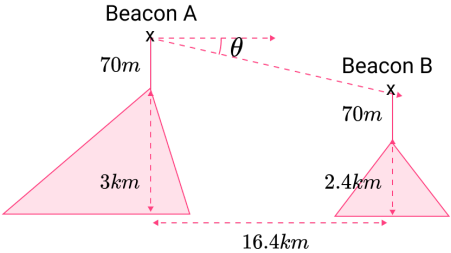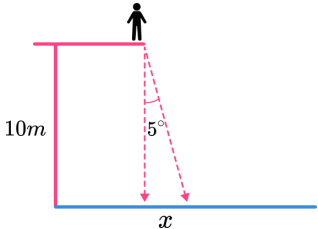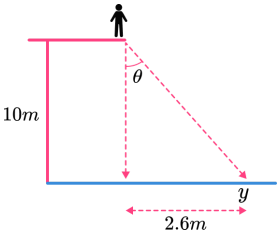
Group C contd	**7)**	**7)** $A = \frac{1}{2}ab\sin(C)$ $A = \frac{1}{2} \times 13 \times 15 \times \sin(67.4)$ $A = 90.09cm^2$
	8)	**8)** $A = \frac{1}{2}ab\sin(C)$ $A = \frac{1}{2} \times 7 \times 11 \times \sin(33)$ $A = 20.97cm^2$
	9)	**9)** $A = \frac{1}{2}ab\sin(C)$ $A = \frac{1}{2} \times 5 \times 5\sqrt{2} \times \sin(45)$ $A = 12.5cm^2$
	10)	**10)** $A = \frac{1}{2}ab\sin(C)$ $A = \frac{1}{2} \times 7 \times 8 \times \sin(52)$ $A = 22.06cm^2$
	11)	**11)** $\theta = \cos^{-1}\left(\frac{11^2+15^2-6^2}{2\times11\times15}\right)$ $\theta = 20.05^o$ $A = \frac{1}{2}ab\sin(C)$ $A = \frac{1}{2} \times 11 \times 15 \times \sin(20.05)$ $A = 28.28cm^2$
	12)	**12)** Top angle $= \sin^{-1}\left(\frac{6\sin(68)}{7}\right) = 52.63^o$ RHS angle $= 59.37^o$ $A = \frac{1}{2}ab\sin(C)$ $A = \frac{1}{2} \times 7 \times 6 \times \sin(59.37)$ $A = 18.07cm^2$

Trigonometry - Answers
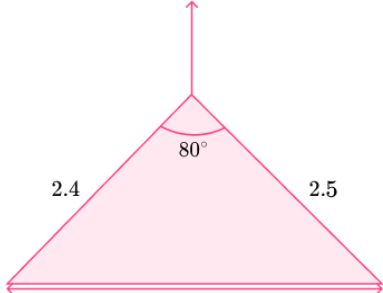
	Question	Answer
	Applied Questions	
1)	**a)** A new donut company is designing their logo. The logo is in the shape of a regular dodecagon, made up of 12 identical triangles shown below. Calculate the width of one triangular section, x, to the nearest 3 significant figures. 	**a)** $360 \div 12 = 30^{o}$ $x = 3.8 \tan(30)$ $x = 2.19cm\ (3sf)$
	b) Hence, calculate the value of y. 	**b)** $2.19^{2} + 3.8^{2} = 19.2361$ $\sqrt{19.2361} = 4.385897856...$ $y = 4.385... - 3.8$ $y = 0.59cm$
2)	**a)** Shape AOB is a sector of a circle with radius $8cm$. Calculate the area of the shaded section, to 2 decimal places. 	**a)** Area of sector $= \dfrac{16}{3}\pi$ Area of triangle = $\dfrac{1}{2} \times 8^{2} \times \sin(30) = 16$ Area of segment = $= \dfrac{16}{3}\pi - 16 = 0.76cm^{2}$
	b) Calculate the length of the chord from A to B to 2.d.p.	**b)** AB^{2} $= 8^{2} + 8^{2} - 2 \times 8 \times 8 \cos(30)$ $AB^{2} = 17.14874832...$ $AB = 4.14cm$

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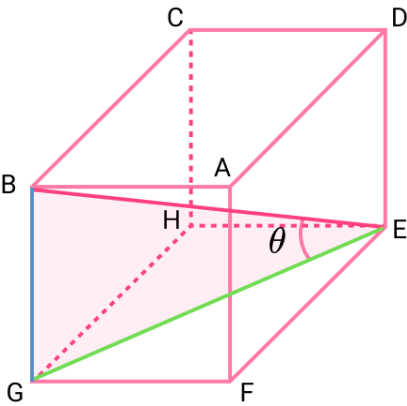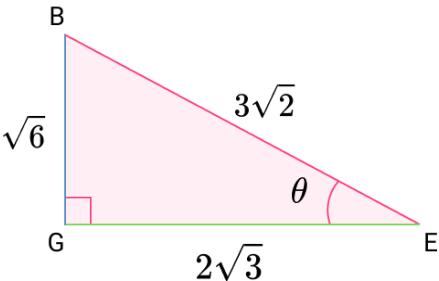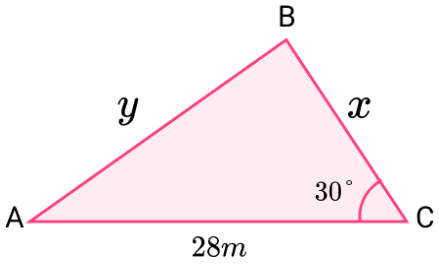
Trigonometry - Answers

3)	a)	Two beacons are placed at the top of two hills, $16.4km$ away from each other. Each beacon is $70m$ tall. Beacon A is located at the top of a hill that is $3km$ high, whilst Beacon B is located at the top of a $2.4km$ high hill. Calculate the angle θ of demotion between the top of each beacon to 1.d.p..	a)	$3 - 2.4 = 0.6km$ $$\theta = \tan^{-1}\left(\frac{0.6}{`16.4}\right) = 2.1^o$$
	b)	Beacon A requires a repair. It takes an engineer 1.5 hours to reach the beacon from the base of the hill. He walked at a pace of $3.2kmph$ on the shallower route. Calculate the average angle of elevation of the hill to 2.d.p.	b)	Distance $= 3.2 \times 1.5$ $= 4.8km$ $$\theta = \sin^{-1}\left(\frac{3}{4.8}\right)$$ $\theta = 38.68^o$
4)	a)	Harry stands at the end of a $10m$ diving board. He aims to land in the water at a maximum of 5 degrees in front of where he leaves the board. How far is the horizontal displacement of his dive, x?	a)	$x = 10\tan(5)$ $x = 0.87m$
	b)	The next diver lands in the water, $2.6m$ in front of the end of the diving board. Calculate the average angle of his dive.	b)	$$\theta = \tan^{-1}\left(\frac{2.6}{10}\right)$$ $\theta = 14.57^o$

Trigonometry - Mark Scheme

	Question	Answer	
	Exam Questions		
1) (a)	Agatha and Beatrice set off from the same point at the same time. Agatha walks at a bearing of 120° at 5kmph. Beatrice walks at a bearing of 200° at a speed of $4.8kmph$. Calculate the distance between them after 30 minutes. Write your answer correct to 2 decimal places.	**(a)** $4.8 \times 0.5 = 2.4km$ $5 \times 0.5 = 2.5km$ $200 - 120 = 80°$ Substitution into the cosine rule: $a^2 = 2.4^2 + 2.5^2 - 2 \times 2.4 \times 2.5 \cos(80)$ $a^2 = 9.926221868$ $a = 3.15km \,(2dp)$ 	**(1)** **(1)** **(1)** **(1)** **(1)**
(b)	Use your answer to part a) to calculate the bearing of Beatrice from Agatha at this time.	**(b)** $\dfrac{\sin(\theta)}{2.4} = \dfrac{\sin(80)}{3.15059...}$ $\theta = \sin^{-1}\left(\dfrac{2.4\sin(80)}{3.15059...}\right)$ $\theta = 48.606...^{o}$ Bearing of B from A $= 360 - (60 + 48.606..)$ $= 251^{o}$	**(1)** **(1)** **(1)** **(1)**

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Trigonometry - Mark Scheme

2)	**(a)**	A cube shown below has a surface area of $36cm^2$. Calculate the length of the line BE. write your answer in the form $a\sqrt{b}$ where a and b are prime numbers.	**(a)** $6x^2 = 36$ $x = \sqrt{6}$ $BE = \sqrt{(\sqrt{6})^2 + (\sqrt{6})^2 + (\sqrt{6})^2} = \sqrt{18}$ $BE = 3\sqrt{2}$		**(1)** **(1)** **(1)** **(1)**
	(b)	Calculate the size of angle BEG.	**(b)** or $BG = \sqrt{6}$ and $EG = 2\sqrt{3}$ $\theta = \tan^{-1}\left(\dfrac{\sqrt{6}}{2\sqrt{3}}\right)$ $\theta = 35.26^o \ (2dp)$		**(1)** **(1)** **(1)**
3)	**(a)**	Triangle ABC has an area of 105m². Calculate the length of x.	**(a)** $\dfrac{1}{2} \times 28 \times x \times \sin(30) = 105$ $7x = 105$ $x = 15m$		**(1)** **(1)**

Trigonometry - Mark Scheme

(b)	Calculate the value of y correct to 2 decimal places.	**(b)**	$y^2 = 15^2 + 28^2 - 2 \times 15 \times 28 \times \cos(30)$ $y^2 = 281.5386608$ $y = 16.78m \ (2dp)$	**(1)** **(1)** **(1)**
4) (a)	ABCD is a kite with the following information: ● AD = 2.4cm, ● Angle ADE = 40º, ● E is the intersection point of the two diagonals AC and BD ● AE:EC = 2:3. Calculate the length of the line AC. Write your answer correct to 2 decimal places.	**(a)**	$AE = 2.4\sin(40)$ $AE = 1.542690263$ $AC = 1.54... \times \dfrac{5}{2} = 3.86cm \ (2dp)$	**(1)** **(1)** **(1)**
(b)	Calculate the area of ABD.	**(b)**	Angle $BAD = 180 - (40 + 40) = 100^o$ $A = \dfrac{1}{2} \times 2.4 \times 2.4 \times \sin(100)$ $A = 2.84cm^2$	**(1)** **(1)** **(1)**

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