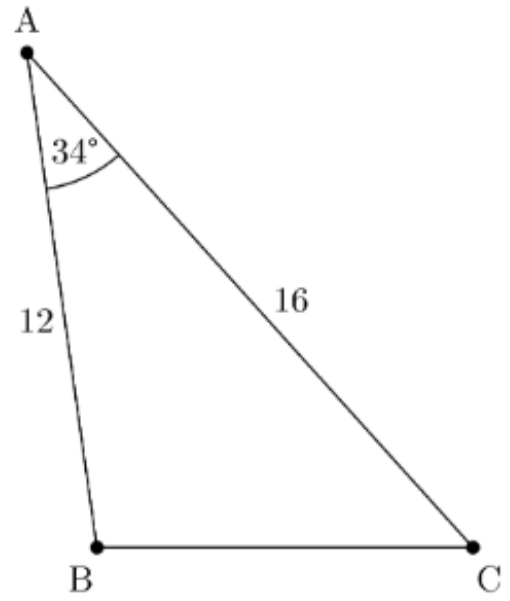
Title:	Trigonometry – problem solving

[Maximum mark: 8]

The following diagram shows triangle ABC.



$AB = 12$ cm, $AC = 16$ cm, $B\hat{A}C = 34°$.

(a) Find BC. [3]

(b) Find $C\hat{B}A$, given that it is obtuse. [3]

(c) Find the area of the triangle ABC. [2]

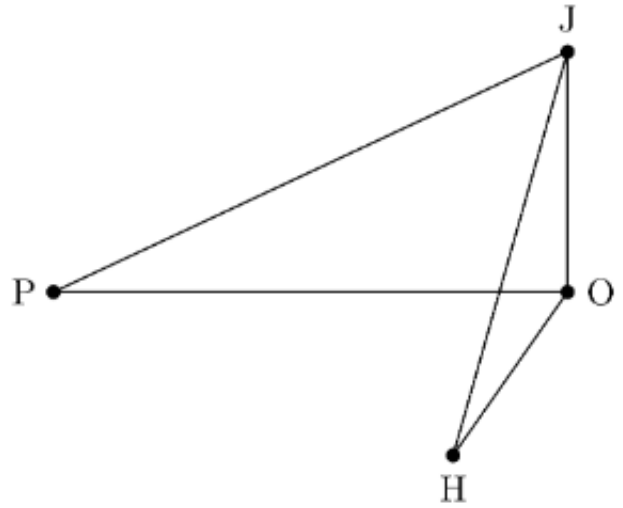
Title:	Trigonometry – problem solving

[Maximum mark: 6]

Cabin boy Jim is at the top of a cliff on Tortuga Island, standing 100 m above the sea level, and observes two ships in the Caribbean sea.

The Black Pearl (P) is at an angle of depression of 25° and the Hispaniola (H) is at an angle of depression of 50°.

The following three dimensional diagram shows the foot of the cliff at O, Jim at J, two ships at P and H, and the angle POH = 75°.



Find the distance between the two ships, giving your answer correct to 3 significant figures.

Title:	Trigonometry – problem solving

[Maximum mark: 6]

Consider a triangle with sides AB = 10 mm and AC = 8 mm. Given that the area of the triangle is 24 mm^2, find the possible values for the length of [BC].

Title:	Trigonometry – problem solving

[Maximum mark: 6]

ABC is a triangle of area 32 cm^2. The sides AB and BC have lengths 7 cm and and 12 cm respectively. Find the two possible lengths of the side AC, giving your answers correct to 3 significant figures.

Title:	Trigonometry – problem solving

[Maximum mark: 6]

The triangle ABC is equilateral of side 5 cm. The point D lies on [BC] such that DC = 2 cm.

Find $\cos(\hat{CDA})$.

Title:	Trigonometry – problem solving

[Maximum mark: 8]

In a triangle ABC, $AB = 3$ cm, $BC = 5$ cm and $A\hat{C}B = \frac{\pi}{6}$.

(a) Find, to three significant figures, the two possible lengths of [AC]. [5]

(b) Find the difference between the areas of the two possible triangles ABC. [3]

Title:	Trigonometry – problem solving

[Maximum mark: 7]

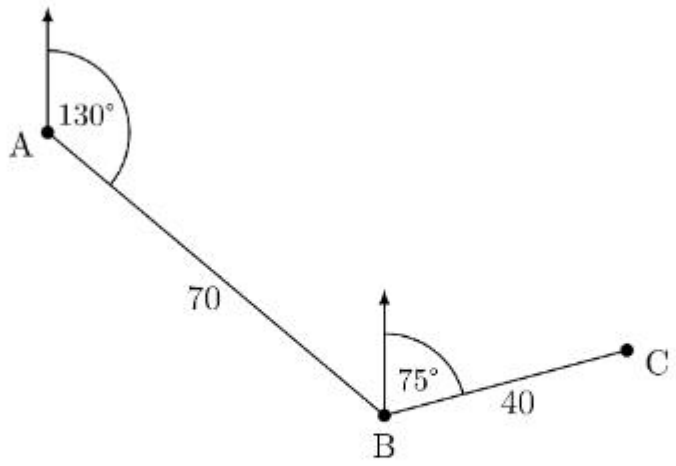
A triangle ABC has $a = 10.2\,\text{cm}$, $b = 17.5\,\text{cm}$ and area $32\,\text{cm}^2$. Find the largest possible perimeter of triangle ABC.

Title:	Trigonometry – problem solving

[Maximum mark: 12]

The following diagram shows three cities A, B and C.

City B is 70 km from A, on a bearing of 130°. City C is 40 km from City B, on bearing of 75°.



(a) Find $C\hat{B}A$. [2]

(b) Find the distance from City A to C. [3]

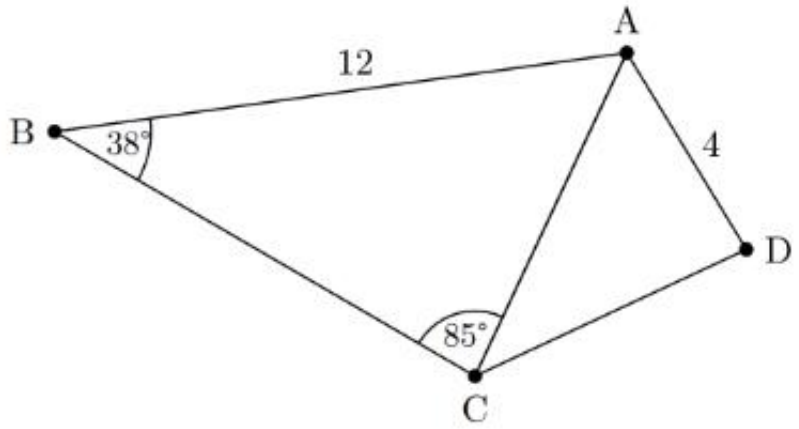
(c) If you wanted to travel from city A directly to City C, find the bearing you would need to travel. [4]

(d) Find the area enclosed by connecting the three cities in a triangle ABC. [3]

Title:	Trigonometry – problem solving

[Maximum mark: 15]

The following diagram shows quadrilateral ABCD.



$AB = 12\text{ cm},\ AD = 4\text{ cm},\ A\hat{C}B = 85°,\ C\hat{B}A = 38°.$

(a) Find AC. [3]

(b) Find the area of triangle ABC. [4]

The area of triangle ABC is three times bigger than the area of triangle ACD.

(c) Find the acute angle $C\hat{A}D$. [5]

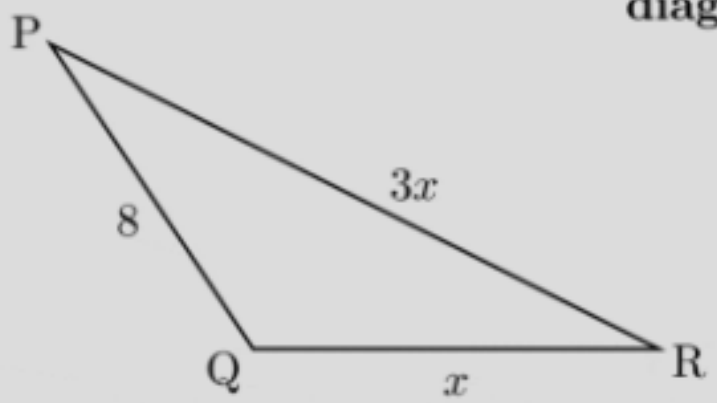
(d) Find CD. [3]

Title:	Trigonometry – problem solving

[Maximum mark: 6]

The following diagram shows triangle PQR, with PQ $= 8$, QR $= x$ and PR $= 3x$.

diagram not to scale



Given that $\cos \hat{R} = \frac{1}{3}$, find the area of the triangle.

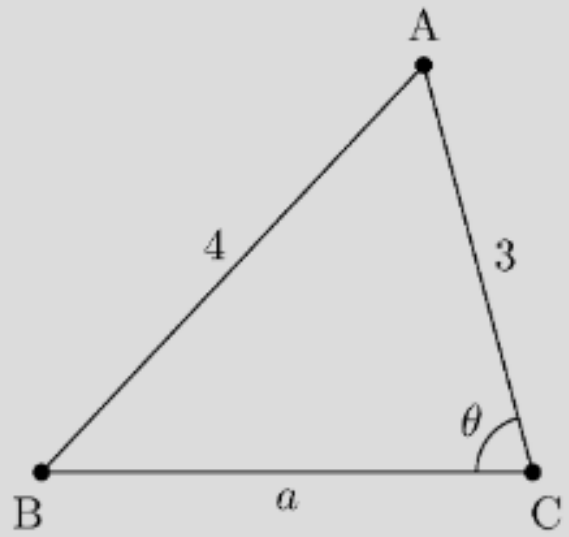
Give your answer in the form $a\sqrt{b}$ where $a, b \in \mathbb{Z}^+$.

Title:	Trigonometry – problem solving

[Maximum mark: 6]

(a) Find the set of values of h that satisfy the inequality $2h^2 - 3h - 14 > 0$. [2]

(b) The triangle ABC is shown in the following diagram.



Given that $\cos\theta > 0.25$, find the range of possible values of a. [4]

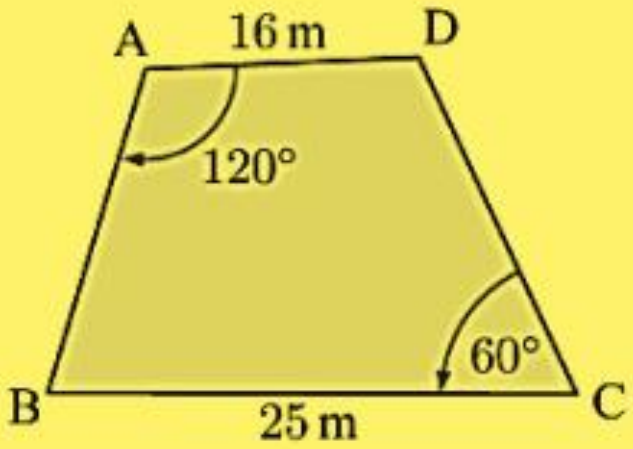
11 The angles of a triangle measure 104°, 51°, and 25°. The perimeter of the triangle is 10 m. Find, rounded to 2 decimal places, the length of each side of the triangle.

Title:	Trigonometry – problem solving

11 The angles of a triangle measure 104°, 51°, and 25°. The perimeter of the triangle is 10 m. Find, rounded to 2 decimal places, the length of each side of the triangle.

Title:	Trigonometry – problem solving

9



The quadrilateral ABCD represents David's garden plot. AD = 16 m, BC = 25 m, and [DC] is 5 m longer than [AB]. A fence runs around the entire boundary of the plot. How long is the fence?

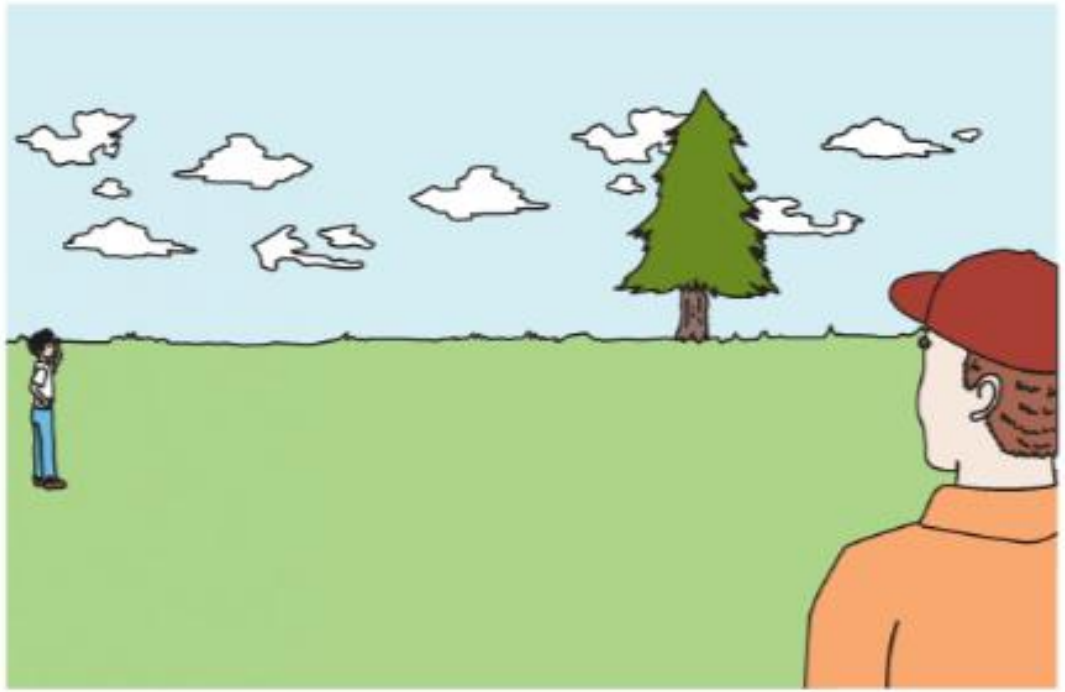
11 The angles of a triangle measure 104°, 51°, and 25°. The perimeter of the triangle is 10 m. Find, rounded to 2 decimal places, the length of each side of the triangle.

Title:	Trigonometry – true bearings

The ship sailed from the port on a bearing of 288°. After 38 kilometres it changed the direction to east. How far did it sail then if its distance from the port was 20 kilometres?

Title:	Trigonometry – problem solving

20 Sam and Markus are standing on level ground 100 metres apart. A large tree is due north of Markus and on the bearing 065° from Sam. The top of the tree appears at an angle of elevation of 25° to Sam and 15° to Markus. Find the height of the tree.



Title:	Trigonometry – problem solving

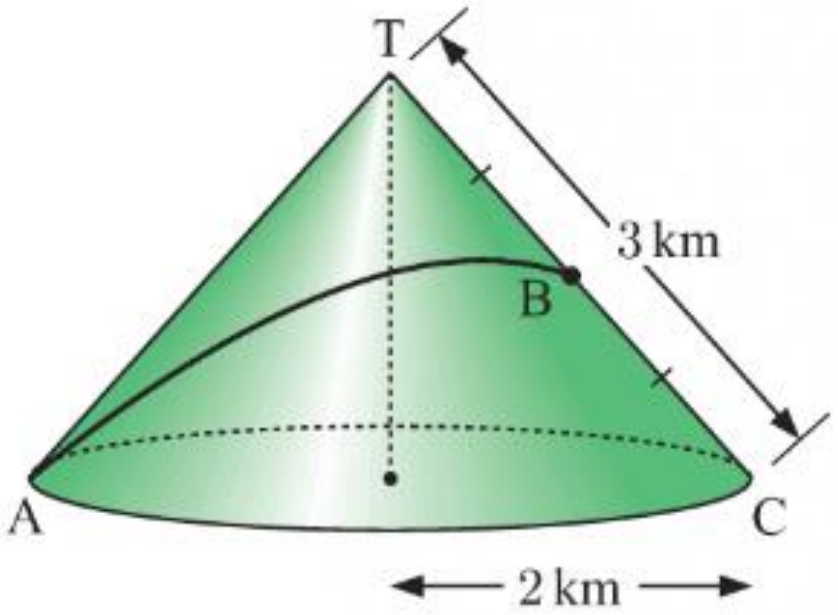
21 A mountain is a perfect cone with base radius 2 km and slant height 3 km.

From the southernmost point A on the base, a path leads up around the side of the mountain to B, the point on the northern slope which is halfway up the slope from the base C. A and C are diametrically opposite.

The path leading from A to B is the shortest possible distance from A to B around the mountainside. Find:

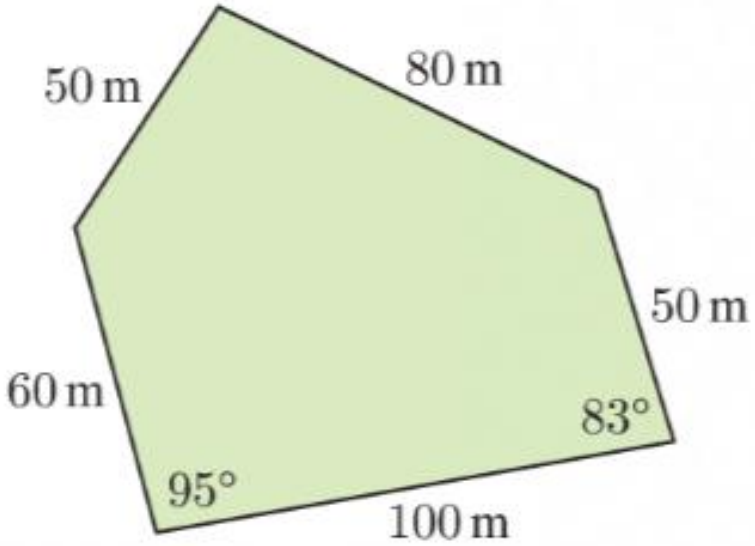
a the length of the path from A to B

b the length of the part of the path from B to the point where the path is horizontal.



Title:	Trigonometry – problem solving

17



A surveyor has produced this plan of a property.
Find its area.

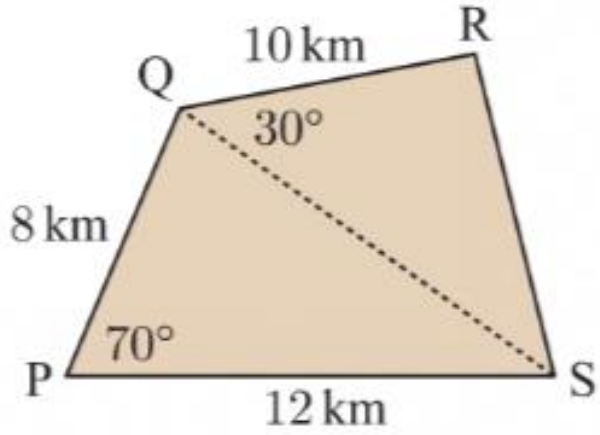
Title:	Trigonometry – problem solving

19 One angle of a triangular garden measures $60°$. The garden has perimeter 36 m and area $30\sqrt{3}$ m^2. Find the measure of the remaining two angles of the garden.

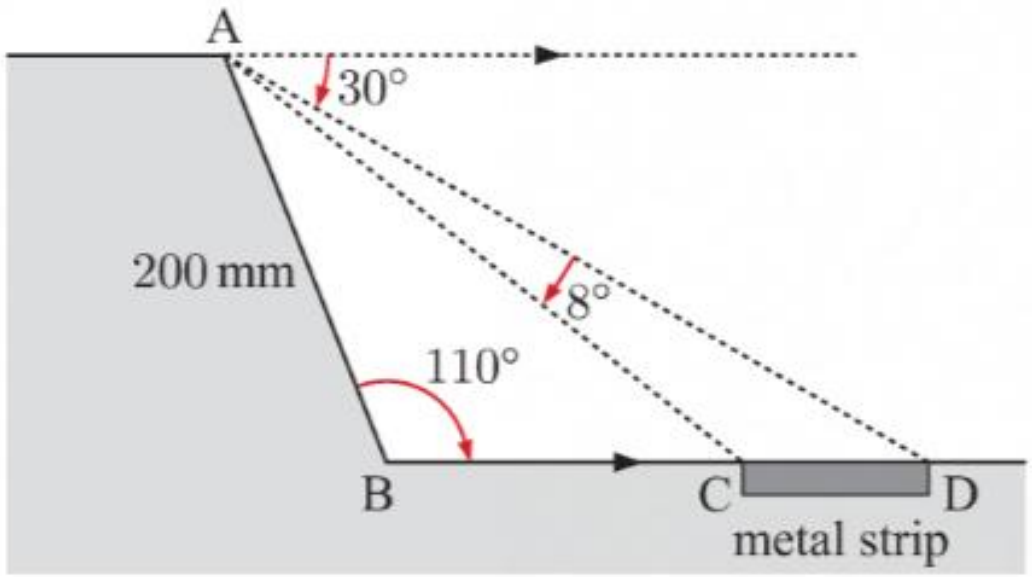
Title:	Trigonometry – problem solving

14 Stan and Olga are considering buying a sheep farm. A surveyor has supplied them with the given accurate sketch. Find the area of the property, giving your answer in:

a km^2 **b** hectares.



15



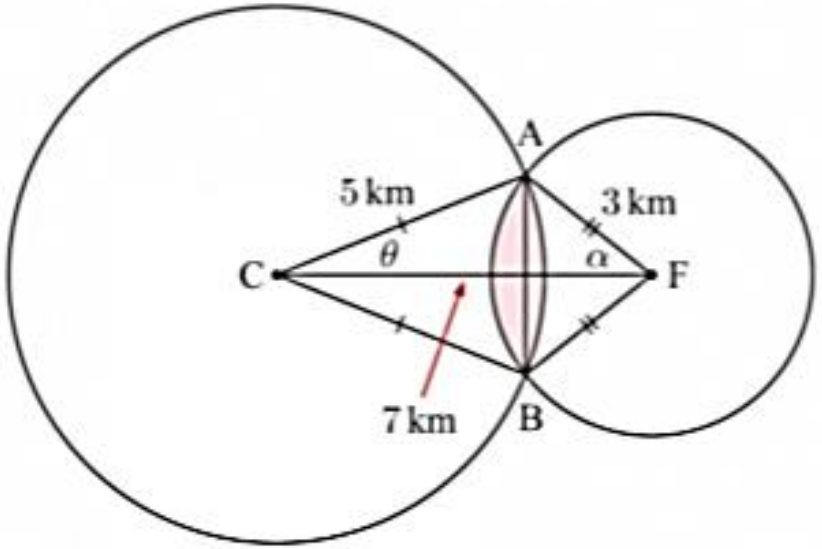
The cross-section design of the kerbing for a driverless-bus roadway is shown opposite. The metal strip is inlaid into the concrete and is used to control the direction and speed of the bus. Find the width of the metal strip.

Title:	Trigonometry – problem solving

18 A Chinese restaurant and a fish and chip shop are 7 km apart. The Chinese restaurant offers free delivery within 5 km, and the fish and chip shop offers free delivery within 3 km. Find the area of the region which receives free delivery from both locations.

Title:	Trigonometry – problem solving

18 Let the location of the Chinese restaurant be C and the location of the fish and chip shop be F, such that CF = 7 km. The area enclosed by the larger circle shows the free delivery region for the Chinese restaurant and the area enclosed by the smaller circle shows the free delivery region for the fish and chip shop.



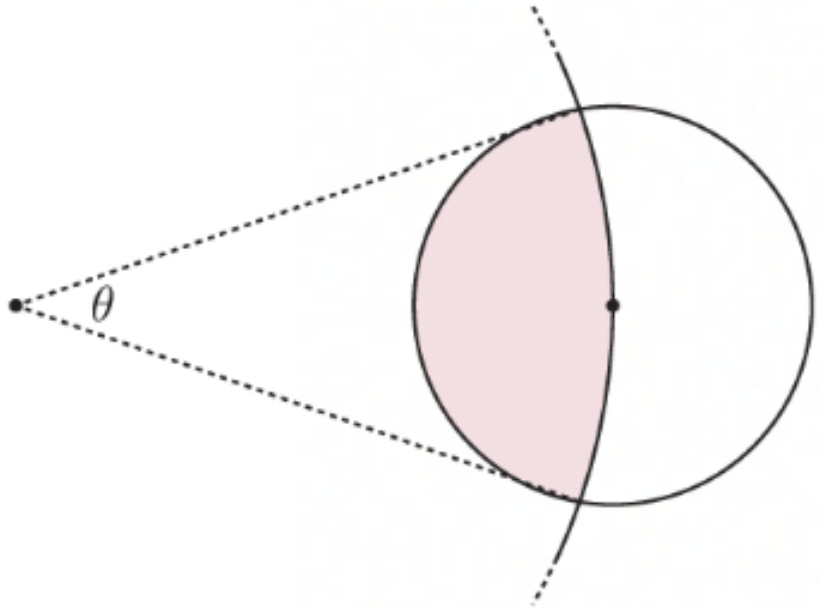
Title:	Trigonometry – problem solving

22 Two circles have radii in the ratio $3 : 1$. The larger circle passes through the centre of the smaller circle as shown.

The shaded area is π cm^2.

a Show that $\theta = 4\sin^{-1}\left(\frac{1}{6}\right)$.

b Find, to 3 decimal places, the radius of the smaller circle.



Title:	Trigonometry – true bearings

Two ships left a port simultaneously and both sailed with constant speeds along straight lines. The first ship's bearing from the port was 353° while the second's 028°. After some time they were 40 kilometres apart. Find the distance that each of them covered if:

(1) their speeds were the same,

(2) the first ship was twice faster than the second.

Title:	Trigonometry – true bearings

6 A boat travels 13 km in the direction 138°, and then a further 11 km in the direction 067°. Find the distance and bearing of the boat from its starting point.