Year 11 Mathematics Advanced

Topic: Trigonometry and Measure of Angles (2 of 5)
Review Questions: The sine rule, cosine rule and area of a triangle
Term 3, 2026

How to use this review set

These are real past-paper questions, grouped by question pattern. The grey label on each question shows where it is from and its marks.

- The questions are grouped by the pattern that keeps coming up in exams, a few of each in a row, running from the plainer patterns into the harder ones near the end. Work through them and you will meet every type an exam can throw at you.
- This set **is your diagnostic**. Working through it shows you exactly which patterns are solid and which need work. Attempt every question properly in your own book, and go back to your notes to help you work through tough questions if needed.
- Every question you get wrong, need help with or struggle with goes in your **Mistakes Log**, which you should be working on daily to get you exam-ready.

Contents

Non-right-angled triangles

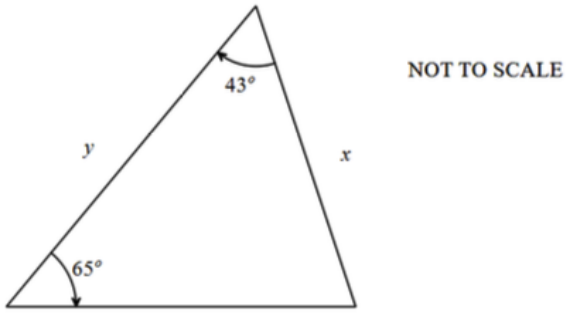
1. The sine rule
2. The cosine rule
3. The ambiguous case of the sine rule
4. The area of a triangle
5. Finding sides and angles: choosing the rule
6. Trigonometry in three dimensions

Non-right-angled triangles

1. The sine rule

Q1 Roseville 2022 Trial Q6 · **1 mark**

In the triangle shown below, the side of length x is opposite the angle of 72° and the side y is opposite the angle of 65°. From the diagram, what is the value of y?



(A) $y = \dfrac{x \sin 72°}{\sin 65°}$

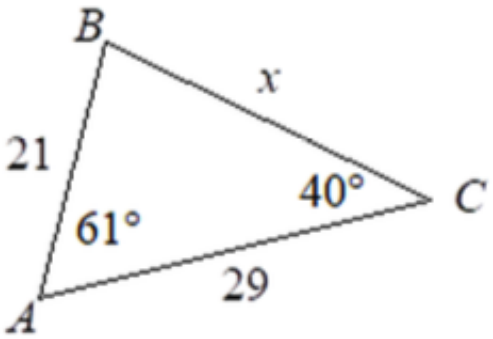
(B) $y = \dfrac{x \sin 43°}{\sin 65°}$

(C) $y = \dfrac{x \sin 65°}{\sin 72°}$

(D) $y = \dfrac{x \sin 72°}{\sin 43°}$

Q2 Hunters Hill 2022 Trial Q8 · **1 mark**

In $\triangle ABC$ shown below, the side of length 29 is opposite the angle of 79° and the side x is opposite the angle of 61°. What is the correct expression for the value of x?



(A) $x = \dfrac{29 \sin 79°}{\sin 61°}$

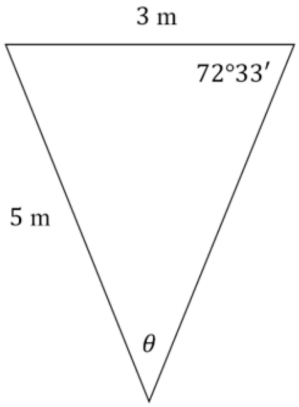
(B) $x = \dfrac{21 \sin 40°}{\sin 61°}$

(C) $x = \dfrac{29 \sin 61°}{\sin 79°}$

(D) $x = \dfrac{21 \sin 40°}{\sin 79°}$

Q3 Hills Grammar 2025 Trial Q26 · **2 marks**

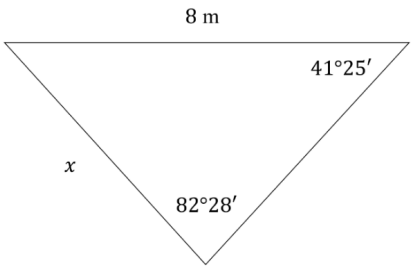
A triangle has one side that is 5 metres in length, with the angle opposite being 72°33′ (correct to the nearest minute). A second side is 3 metres in length. Show that the size of θ, the acute angle opposite the side of length 3 metres, is 34°55′ correct to the nearest minute.



NOT TO SCALE

Q4 Hornsby Girls 2025 Trial Q22 · **2 marks**

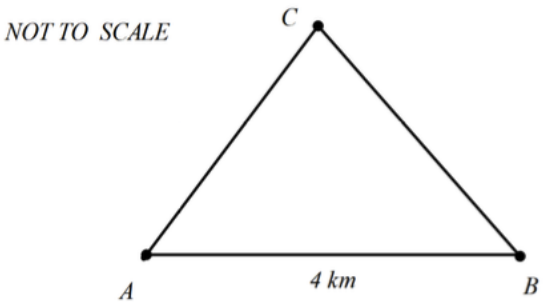
A triangle has one side that is 8 metres in length, with an opposite angle of $82°28'$. A second angle is $41°25'$, with an opposite side of x metres. Find the length of x, correct to the nearest centimetre.



NOT TO SCALE

Q5 Presbyterian 2021 Trial Q15 · **3 marks**

Two campsites A and B are such that campsite A is due west of campsite B, at a distance of 4 kilometres. A third campsite C bears $035°$ from A and $330°$ from B.

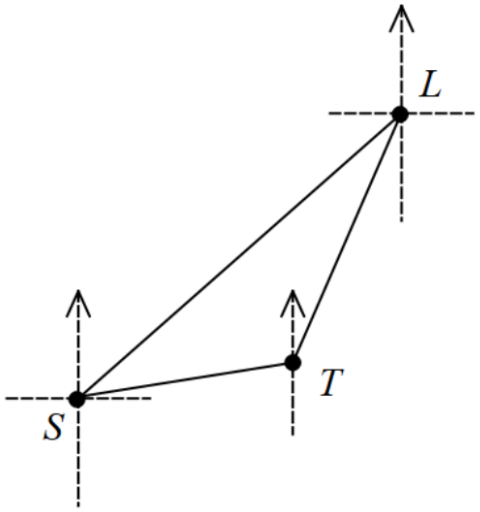


(a) Show that $\angle CBA = 60°$ and $\angle BAC = 55°$.

(b) Find the distance from campsite A to campsite C. Give your answer correct to one decimal place.

Q6 Girraween 2025 Trial Q18 · **3 marks**

A ship S observes a lighthouse L to be on a bearing of N 26°E and a tower T to be on a bearing of N 70°E. The bearing of the lighthouse from the tower is N 15°E, and the distance from the lighthouse to the tower is 6.8 km.

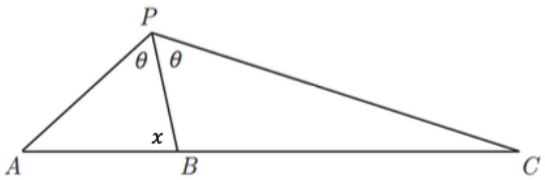


(a) Draw a diagram showing the above information.

(b) Find the distance of the ship from the tower, correct to one decimal place.

Q7 Hurlstone 2024 Prelim Q21 · **3 marks**

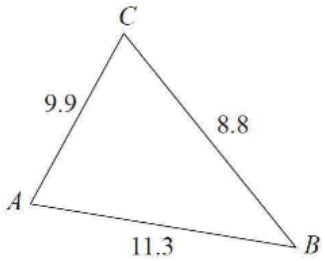
In $\triangle APC$, B is the point on AC such that $\angle APB = \angle BPC = \theta$. Let $\angle PBA = x$. Using the sine rule in $\triangle APB$ and $\triangle BPC$, or otherwise, show that $AB \times PC = AP \times BC$.



2. The cosine rule

Q8 North Sydney Boys 2022 Trial Q8 · **1 mark**

In triangle ABC, $AB = 11.3$, $BC = 8.8$ and $CA = 9.9$ (not drawn to scale). Determine the size of angle A.



Not drawn to scale

(A) 48.5°

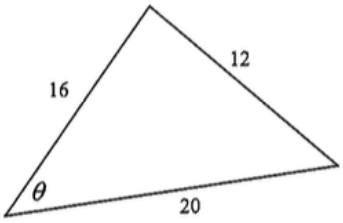
(B) 61.4°

(C) 118.6°

(D) 131.5°

Q9 Caringbah 2020 Trial Q12 · **2 marks**

In the triangle below (not to scale), θ is the angle between the sides of length 16 and 20, and the side opposite θ has length 12. Find the value of θ, correct to the nearest minute.



NOT TO SCALE

Q10 Girraween 2022 Trial Q31 · **2 marks**

A circular clock face, centre O, has a minute hand OA and an hour hand OB, where $OA = 10$ cm and $OB = 7$ cm. Calculate the length of AB when the hands show 5 o'clock. Give your answer correct to 1 decimal place.

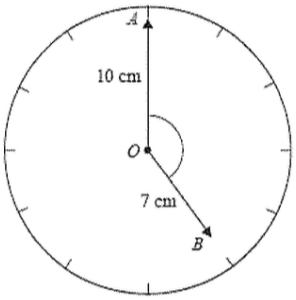
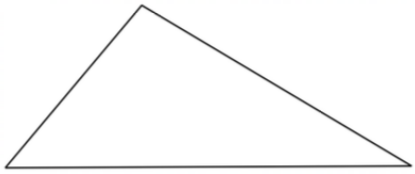


Diagram NOT accurately drawn

Q11 St George Girls 2022 Prelim Q30 · **3 marks**

Aria and Ben are flying kites in the local park when their kites collide mid-air. The angles of elevation of Aria's and Ben's kites are 50° and 31° respectively. Aria's kite string was 13 metres and Ben's kite string was 19 metres long at the time of impact.



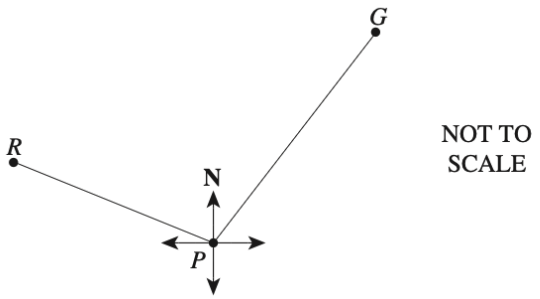
Not to scale

(a) Label the above information on the diagram. (1 mark)

(b) Use the cosine rule to find the distance between Aria and Ben when their kites collide. Give your answer correct to the nearest whole number. (2 marks)

Q12 Danebank 2021 Trial Q11 · **3 marks**

Ringo and Greg start at location P and drive in different directions. Ringo drives at a speed of 70 km/h on a bearing of 285°, while Greg drives at a speed of 60 km/h on a bearing of 030°.

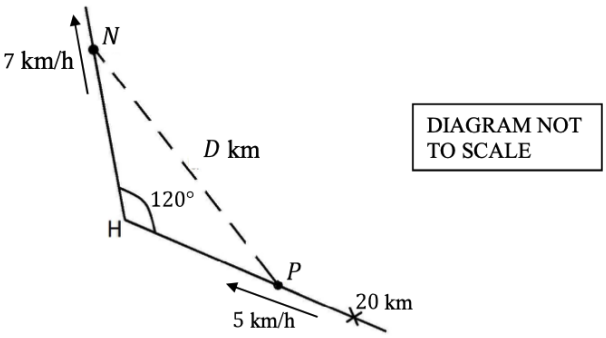


(a) Show that $\angle GPR = 105°$. (1 mark)

(b) What will be the distance between Ringo and Greg after travelling for 2 hours? Give your answer correct to the nearest kilometre. (2 marks)

Q13 Penrith 2022 Trial Q34 · **2 marks**

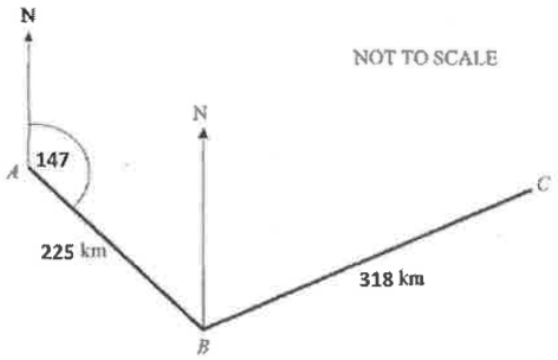
Ned Kelly, N, left his hideout, H, and walked along a straight path at 7 km/h. At the same time that Ned left his hideout, the police, P, are 20 km away from his hideout, walking towards it along a different straight path at 5 km/h. The two paths meet at H at an angle of 120°. Let the distance between Ned Kelly and the police at time t hours be D km.



Show that $D^2 = 39t^2 - 60t + 400$.

Q14 North Sydney Boys 2023 Trial Q18 · **5 marks**

A ship sails 225 km from Adhiban Island (A) on a bearing of 147° and arrives at Port Bologan (B) to pick up some cattle. It then progresses to its destination, Port Cramling (C), a distance of 318 km on a bearing of 071°.



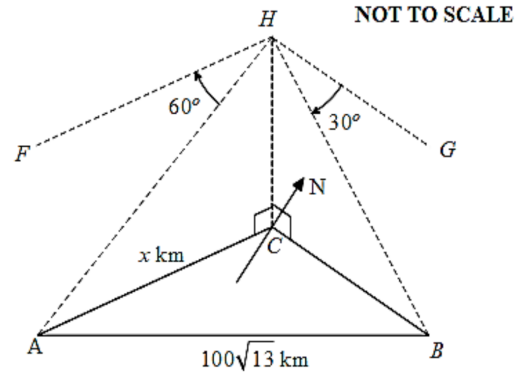
(i) Show that $\angle ABC = 104°$. (1 mark)

(ii) Show that the distance AC is approximately 431.7 km. (2 marks)

(iii) The return trip is a straight line back to Adhiban Island, not passing through Port Bologan. Find the bearing that the ship must take to go straight from Port Cramling to Adhiban Island. (2 marks)

Q15 Hills Grammar 2025 Trial Q35 · **6 marks**

Three buoys at sea are at A, B and C. A helicopter is flying along FH and then HG, where F, G and H are three points at the same height vertically above A, B and C respectively. When the helicopter reaches H, the angles of depression of A and B from the helicopter are 60° and 30° respectively, while the true bearings of A and B from C are 250° and 130° respectively. The distance between A and B is $100\sqrt{13}$ km.



(a) Show that the distance between A and C is 100 km. (3 marks)

(b) At 9 a.m., two destroyers start travelling from A and B. The destroyer at A travels along AC with a uniform speed of 20 km/h, while the destroyer at B travels along BC with a uniform speed of 50 km/h. Show that the distance between the two destroyers after travelling for t hours is $10\sqrt{1300 - 450t + 39t^2}$ km. (3 marks)

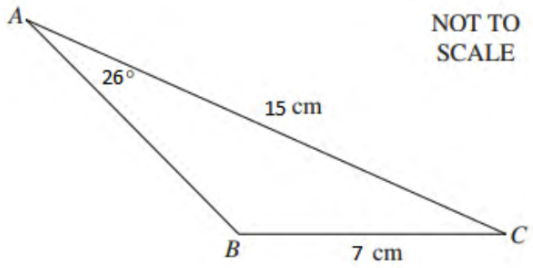
3. The ambiguous case of the sine rule

Q16 Sydney Boys 2025 Trial Q12 · **2 marks**

Triangle ABC has $\angle A = 38°$, $BC = 16$ cm and $AC = 18$ cm. Find $\angle B$, where $\angle B$ is obtuse, to the nearest minute.

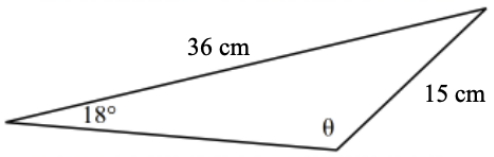
Q17 Gosford 2023 Trial Q18 · **3 marks**

In triangle ABC, $\angle BAC = 26°$, $BC = 7$ (the side opposite $\angle A$) and $AC = 15$ (the side opposite $\angle B$). Find the size of the obtuse angle ABC, correct to the nearest degree.



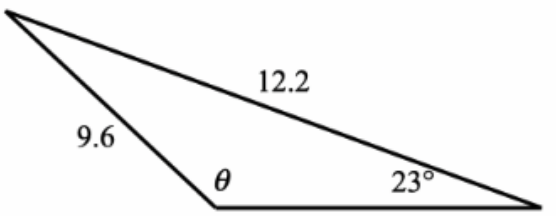
Q18 Barker 2021 Prelim Q11 · **2 marks**

In the triangle shown, an angle of 18° is opposite the side of length 15 cm, and the obtuse angle θ is opposite the side of length 36 cm. Find the value of the obtuse angle θ, rounding your answer to the nearest minute.



Q19 Hurlstone 2021 Prelim Q4 · **1 mark**

In the triangle shown, θ is obtuse. The side of length 9.6 is opposite a 23° angle, and the side of length 12.2 is opposite θ. To the nearest degree, what is the size of θ?



(A) 147°

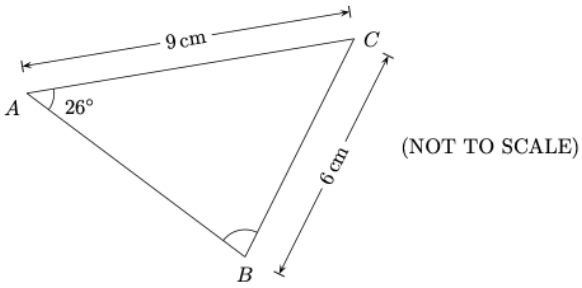
(B) 150°

(C) 153°

(D) 156°

Q20 Normanhurst Boys 2020 Trial Q6 · **1 mark**

In triangle ABC, $\angle A = 26°$, $AC = 9$ cm and $BC = 6$ cm. What are the possible values of $\angle ABC$, correct to the nearest minute?



(A) 41°

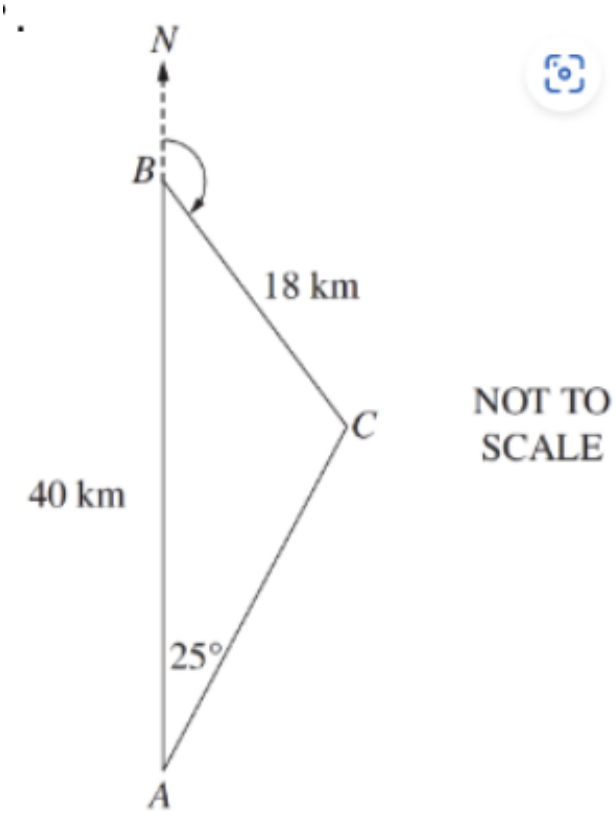
(B) 17°

(C) 17°, 163°

(D) 41°, 139°

Q21 St George Girls 2022 Prelim Q9 · **1 mark**

Towns A, B and C are such that town B is 40 km due North of town A. The distance from town B to town C is 18 km and the bearing of town C from town A is 025°. What is the bearing of town C from town B, given that $\angle BCA$ is obtuse?



(A) 070°

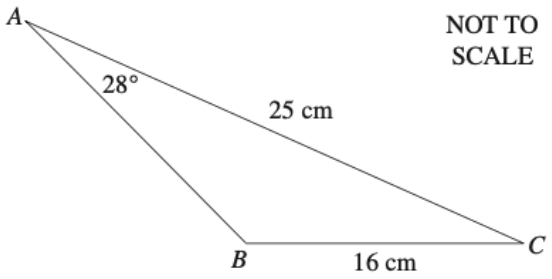
(B) 095°

(C) 110°

(D) 135°

Q22 2021 HSC Q18 · **3 marks**

In triangle ABC, $AC = 25$ cm, $BC = 16$ cm, $\angle BAC = 28°$ and angle ABC is obtuse. Find the size of the obtuse angle ABC, correct to the nearest degree.



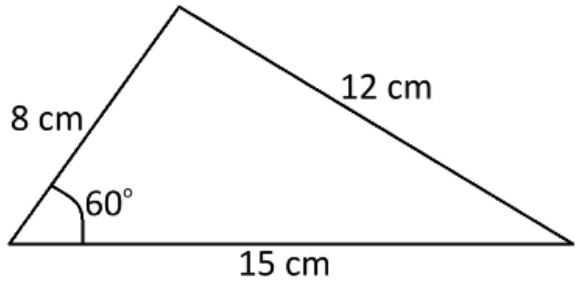
Q23 Manly 2022 Prelim Q21 · **4 marks**

In triangle ABC, $\angle BAC = 0.6$ radians, $BC = 4$ (the side opposite $\angle A$) and $AB = 5$ (the side opposite $\angle C$). Given that AB is the longest side, so that $\angle ACB$ is obtuse, find the size of $\angle ABC$ in radians, correct to three decimal places.

4. The area of a triangle

Q24 Penrith 2024 Trial Q1 · **1 mark**

A triangle has two sides of length 8 cm and 15 cm meeting at an included angle of 60°. What is the area of the triangle?



(A) 30 cm^2

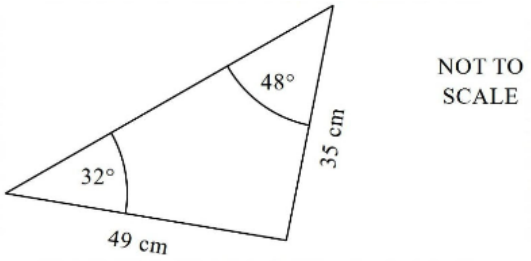
(B) $24\sqrt{3}$ cm^2

(C) $30\sqrt{3}$ cm^2

(D) 52 cm^2

Q25 Cherrybrook Tech 2021 Trial Q8 · **1 mark**

A triangle has a side of length 49 cm and a side of length 35 cm. The angle at the end of the 49 cm side (between it and the third side) is 32°, and the angle at the top of the triangle (between the third side and the 35 cm side) is 48°. What is the area of the triangle, to the nearest square centimetre?



(A) 422 cm^2

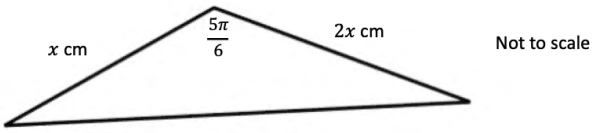
(B) 637 cm^2

(C) 844 cm^2

(D) 858 cm^2

Q26 Gosford 2023 Trial Q8 · 1 mark

A triangle has an area of 18 cm^2. Two of its sides have lengths x cm and $2x$ cm, and the angle included between these two sides is $\frac{5\pi}{6}$. What is the value of x?



(A) 3 cm

(B) 6 cm

(C) 12 cm

(D) 24 cm

Q27 Knox 2023 Prelim Q14 · 2 marks

The side length of an equilateral triangle is 4 cm. Find the exact area of the triangle.

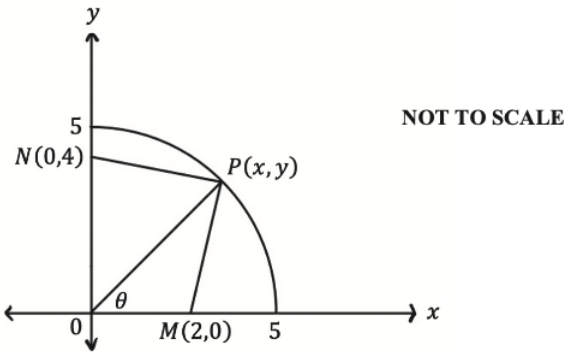
Q28 Manly 2022 Trial Q25 · 3 marks

In $\triangle ABC$, $AB = 12$ cm, $BC = 20$ cm and $AC = 28$ cm. Find the exact area of the triangle.

Q29 St George Girls 2022 Trial Q29 · 2 marks

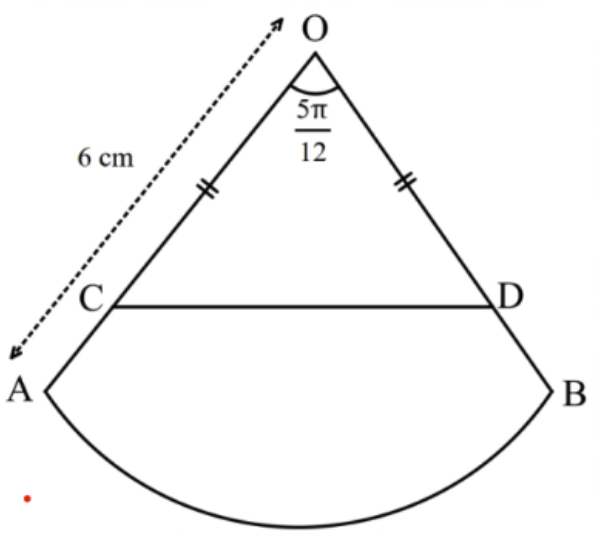
The point $P(x, y)$ lies on the part of the circle $x^2 + y^2 = 25$ in the first quadrant, and O is the origin. The point M has coordinates $(2, 0)$ and the point N has coordinates $(0, 4)$. The angle $\angle MOP = \theta$ is measured in radians. Show that the area, A, of the quadrilateral $OMPN$ is given by

$$A = 5\sin\theta + 10\cos\theta.$$



Q30 Knox 2022 Prelim Q15 · **3 marks**

A sector AOB has $OA = 6$ cm and $\angle AOB = \dfrac{5\pi}{12}$. The points C and D lie on OA and OB respectively, with $OC = OD$.



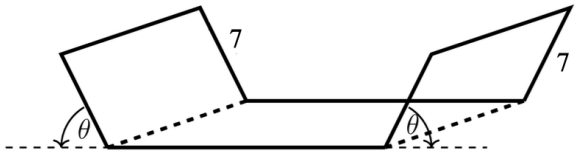
(i) Find the exact area of sector AOB.

(ii) If the area of triangle COD is half the area of sector AOB, find the length of OC, correct to two significant figures.

Q31 Sydney Girls 2025 Trial Q39 · **2 marks**

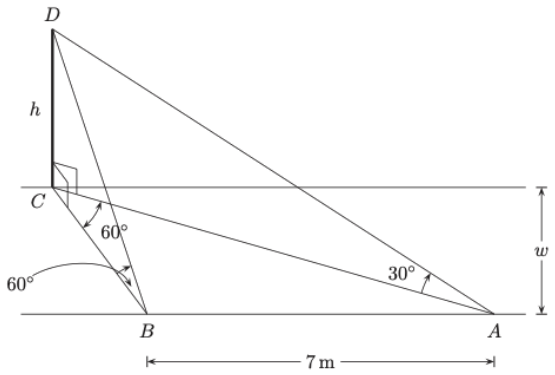
A water trough is made from a 21 m long strip of tin. The strip is divided into three equal 7 m segments: the middle 7 m segment forms the horizontal base, and the two outer 7 m segments are bent up by the same angle θ (each to the horizontal) to form the two sloping sides. The cross-section is then an isosceles trapezium with the base 7 m and each sloping side 7 m. Show that the cross-sectional area is given by

$$A = 49(\sin\theta + \sin\theta\cos\theta).$$



Q32 Normanhurst Boys 2022 Trial Q18 · **6 marks**

A footpath on horizontal ground has two parallel edges. CD is a vertical street sign pole of height h metres which stands with its base C on one edge of the footpath. A and B are two points on the other edge of the footpath such that $AB = 7$ m and $\angle ACB = 60°$. From A and B, the angles of elevation to the top of the pole at D are 30° and 60° respectively.



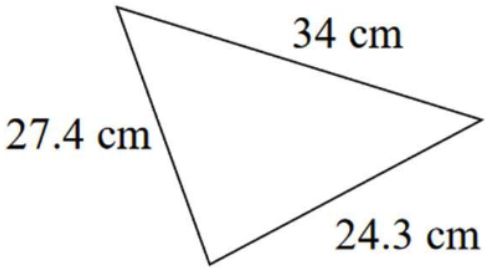
(a) Show that the exact height of the pole is $h = \sqrt{21}$ metres.

(b) By considering the area of $\triangle ABC$, find the exact width w of the footpath.

5. Finding sides and angles: choosing the rule

Q33 James Ruse 2024 Trial Q4 · **1 mark**

The triangle below has sides of length 34 cm, 27.4 cm and 24.3 cm. Which of the following gives the magnitude of the smallest angle in the triangle, to the nearest degree?



(A) 30°

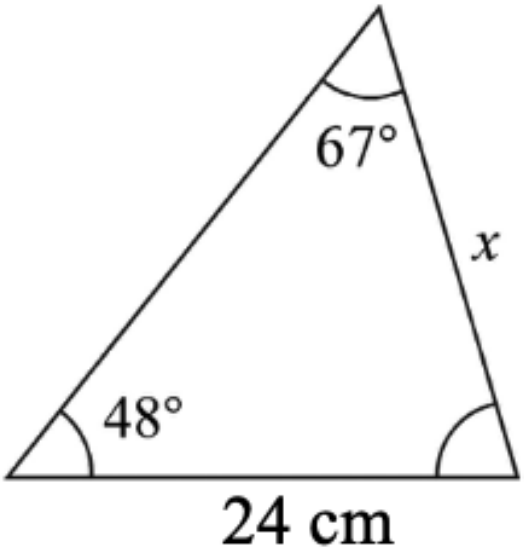
(B) 45°

(C) 53°

(D) 79°

Q34 Barker 2025 Trial Q14 · **3 marks**

In the triangle below, the side of length 24 cm is opposite an angle of 67°. A second angle of the triangle is 48°, and the side opposite this 48° angle has length x cm.

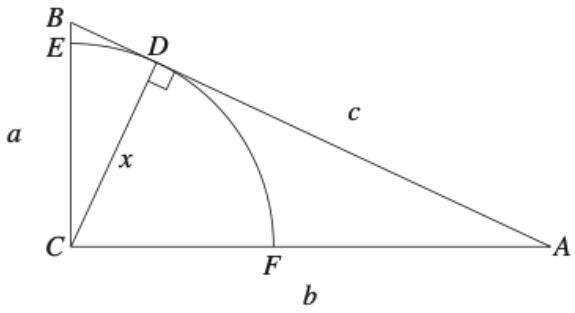


(i) Find the length of x, correct to 2 decimal places. (2 marks)

(ii) Hence, find the area of the triangle, correct to 2 decimal places. (1 mark)

Q35 Sydney Boys 2023 Trial Q32 · **2 marks**

In triangle ABC, BC is perpendicular to AC. Side BC has length a, side AC has length b and side AB has length c. The point D lies on AB such that CD is perpendicular to AB, and CD has length x.

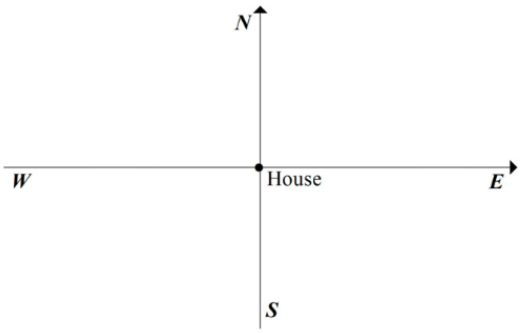


(i) Show that triangles ABC and ACD are similar. (1 mark)

(ii) Hence, show that $x = \dfrac{ab}{c}$. (1 mark)

Q36 Baulkham Hills 2022 Prelim Q19 · **3 marks**

Asmita walks 270 metres from her house on a bearing of 330° to point B. She then walks in a straight line 290 metres to a point C which is due west of her house.



(a) Draw a diagram showing the above information. (1 mark)

(b) Calculate the distance of C from her house. Give your answer in metres, correct to 1 decimal place. (2 marks)

Q37 Presbyterian 2022 Prelim Q33 · **4 marks**

A circle with centre O and radius r mm is divided into five equal sectors. One of these sectors is OAB, with $\angle AOB = \theta$ radians. The area of sector OAB is 20π mm^2.

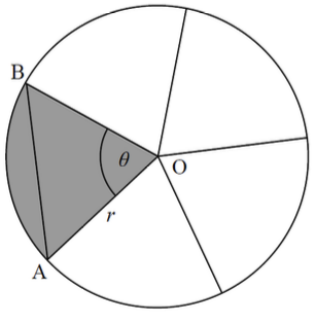


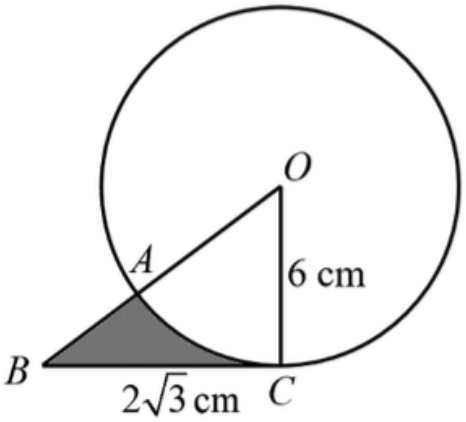
diagram not to scale

(a) Find the value of r. (2 marks)

(b) Find the length of the chord AB. Give your answer correct to 1 decimal place. (2 marks)

Q38 Hurlstone 2022 Prelim Q13 · **8 marks**

The points R, S and Q lie on the same horizontal ground. PQ is a vertical pole standing on the plane RSQ, so PQ is perpendicular to the ground at Q. PR and PS are ropes running from the top of the pole. The rope PS has length 20 m and makes an angle of 30° with the ground at S; the rope PR makes an angle of 45° with the ground at R; and $\angle RPS = 60°$.



(i) Show that $PQ = 10$ m. (1 mark)

(ii) Find PR, giving your answer as an exact value. (1 mark)

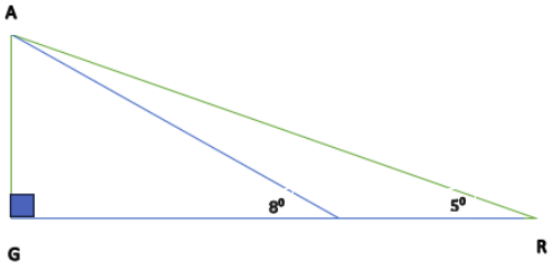
(iii) Find the distance between the points R and S. Give your answer correct to 1 decimal place. (2 marks)

(iv) Find the size of $\angle RQS$, correct to the nearest degree. (3 marks)

(v) Given that R is due south of Q, find the bearing of Q from S, to the nearest degree. (1 mark)

Q39 Penrith 2023 Trial Q27 · **4 marks**

Roberto, R, is directly in front of the goalkeeper, G. To score a goal he must kick the ball through the point A, where $\angle AGR = 90°$. From Roberto's position at R his kicking angle $\angle ARG$ is $5°$. If he runs the ball forward an extra five metres (directly towards G), his kicking angle increases from $5°$ to $8°$.

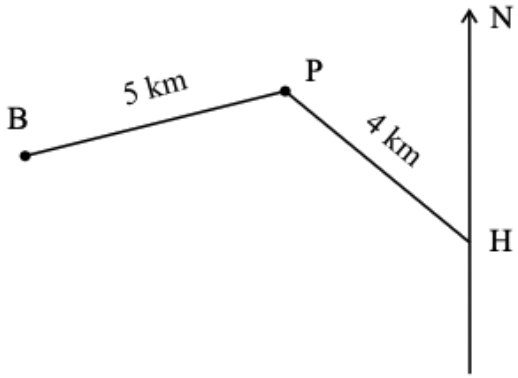


(a) Calculate Roberto's kicking distance to A from the $8°$ mark, correct to 2 decimal places. (2 marks)

(b) Find how far Roberto was from the goalkeeper at the $5°$ mark, correct to 1 decimal place. (2 marks)

Q40 Sydney Girls 2024 Trial Q16 · **5 marks**

Kate starts riding her bike from her house H. She rides 4 km on a bearing of $320°$ to the park P, then rides 5 km on a bearing of $250°$ to the beach B.



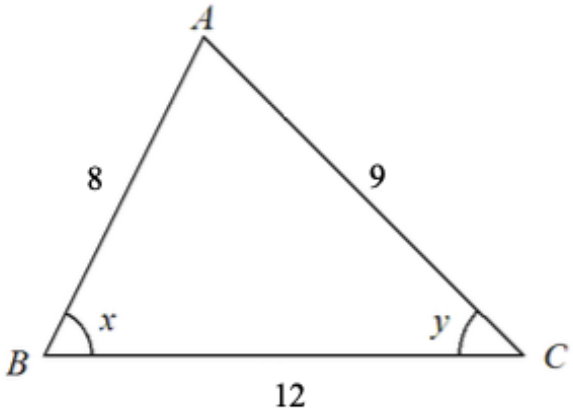
(i) Show that the angle HPB is $110°$. (1 mark)

(ii) Find the distance BH, correct to three decimal places. (2 marks)

(iii) Find the bearing of Kate's house H from the beach B, correct to the nearest degree. (2 marks)

Q41 North Sydney Girls 2023 Prelim Q33 · **4 marks**

In triangle ABC, $AC = 9$, $BC = 12$ and $AB = 8$. Let $\angle ABC = x$ and $\angle ACB = y$.



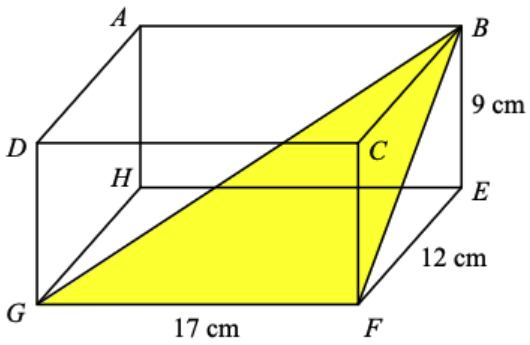
(a) Express the size of $\angle BAC$ in terms of x and y. (1 mark)

(b) Hence, show that $\sin x + \sin y = \dfrac{17\sin(x+y)}{12}$. (3 marks)

6. Trigonometry in three dimensions

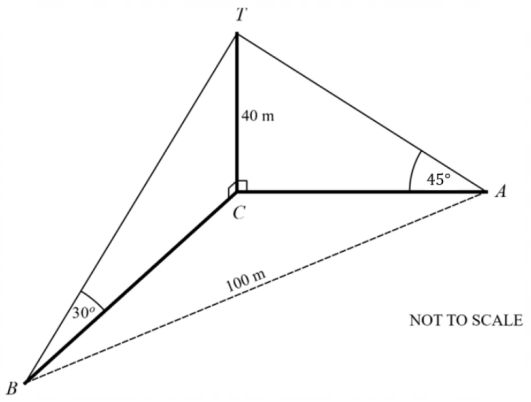
Q42 St George Girls 2022 Prelim Q22 · **3 marks**

The diagram shows a rectangular prism $ABCDEFGH$ (top face $ABCD$, bottom face $EFGH$, with E directly below B). The edge $BE = 9$ cm, the edge $EF = 12$ cm and the edge $GF = 17$ cm. Find the size of $\angle GBF$, to the nearest degree.



Q43 Sydney Tech 2025 Trial Q10 · **1 mark**

A vertical tower TC is 40 metres high. The point A is due east of the base C of the tower, with an angle of elevation to the top T of 45°. A second point B is on a different bearing from C (lying clockwise from A, on the southern side of the east line) and has an angle of elevation to the top of the tower of 30°. The points A and B are 100 m apart. The bearing from C to B, correct to the nearest degree, is:



(A) 131°

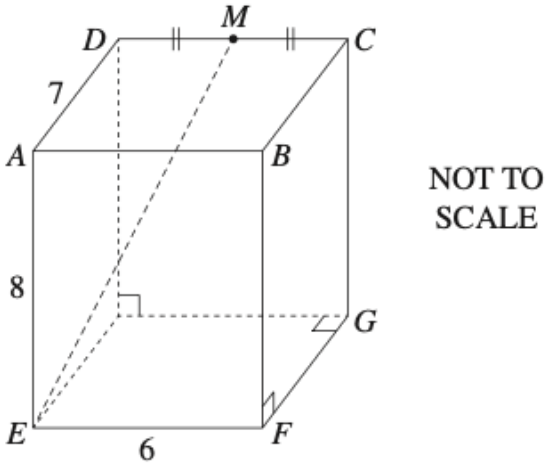
(B) 162°

(C) 221°

(D) 311°

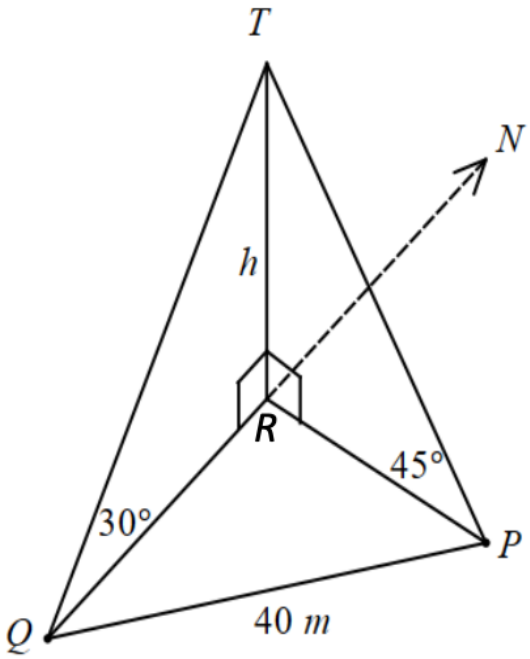
Q44 2023 HSC Q22 · **3 marks**

In the rectangular prism shown, $AD = 7$ cm, $AE = 8$ cm and $EF = 6$ cm. The point M is the midpoint of CD. Find $\angle AEM$, to the nearest degree.



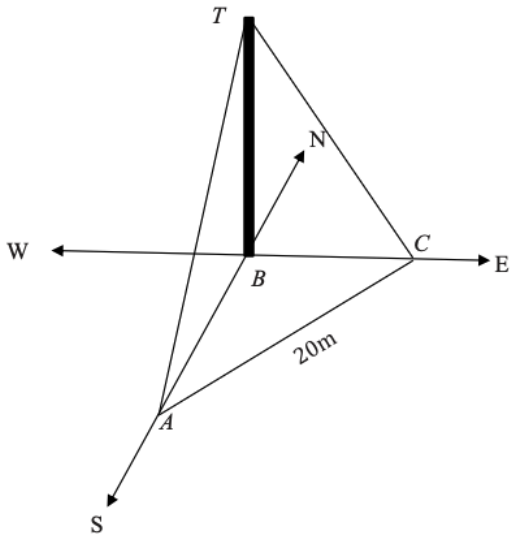
Q45 Girraween 2025 Trial Q29 · **4 marks**

A vertical tower of height h metres stands on horizontal ground. From a point P on the ground due east of the tower the angle of elevation of the top of the tower is 45°. From a point Q on the ground due south of the tower the angle of elevation of the top of the tower is 30°. If the distance PQ is 40 metres, find the exact height of the tower.



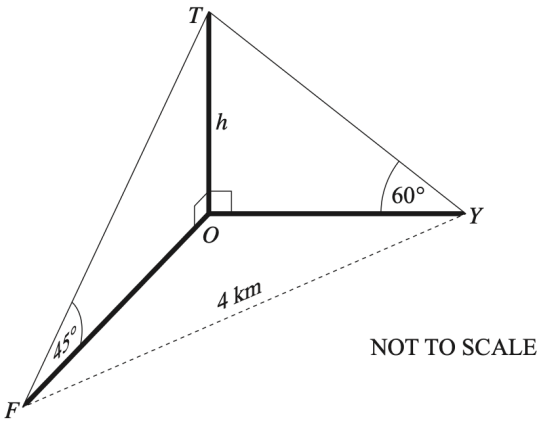
Q46 Knox 2023 Prelim Q20 · **5 marks**

A pillar BT of height h m is installed in a park, with B the base and T the top. Alex stands due south of the pillar and notices that the angle of elevation of the top is 45°. Chet stands due east of the pillar and notices that the angle of elevation of the top is 60°. If Alex and Chet are 20 m apart, find the height of the pillar to the nearest cm.



Q47 2025 HSC Q29 · **7 marks**

The point T is the peak of a mountain and the point O is directly below the peak. The point Y is due east of O, and the angle of elevation of T from Y is 60°. The point F is 4 km south-west of Y. The points O, Y and F are on level ground, and $YF = 4$ km. The angle of elevation of T from F is 45°. Let the height of the mountain be h.



(a) Show that $OY = \dfrac{h}{\sqrt{3}}$.

(b) Hence, or otherwise, find the value of h, correct to 2 decimal places.

(c) Find the bearing of point O from point F, correct to the nearest degree.