

MATHEMATICS

Stage 5



Measurement and Space

Trigonometry

Right-Angled Trig

Non Right-Angled Trig

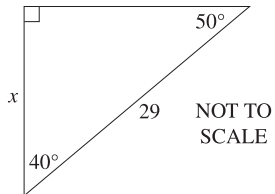
Teacher: Haeun Jang

Exam Equivalent Time: 124.5 minutes *(based on allocation ~1.25 min/mark)*

Questions

1. Right-Angled Trig (002108)

Which expression could be used to calculate the value of x in this triangle?

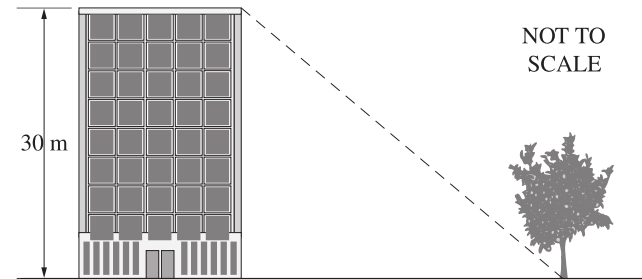


- A. $29 \times \cos 40^\circ$
- B. $29 \times \cos 50^\circ$
- C. $\frac{\cos 40^\circ}{29}$
- D. $\frac{\cos 50^\circ}{29}$

2. Right-Angled Trig (025813)

The angle of depression of the base of the tree from the top of the building is 65° . The height of the building is 30 m.

How far away is the base of the tree from the building, correct to one decimal place?



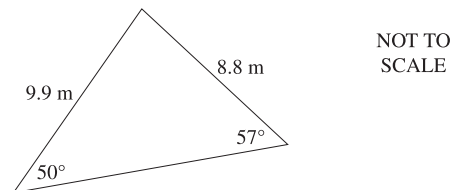
- A. 12.7 m
- B. 14.0 m
- C. 33.1 m
- D. 64.3 m

3. Right-Angled Trig (137255)

Which compass bearing is the same as a true bearing of 110° ?

- A. $S20^\circ E$
- B. $S20^\circ W$
- C. $S70^\circ E$
- D. $S70^\circ W$

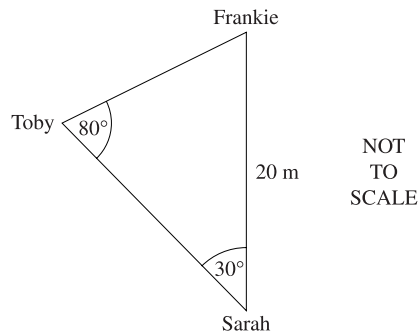
4. Non Right-Angled Trig (002209)



What is the area of this triangle, to the nearest square metre?

- A. 33 m^2
- B. 37 m^2
- C. 42 m^2
- D. 44 m^2

5. Non Right-Angled Trig (025445)

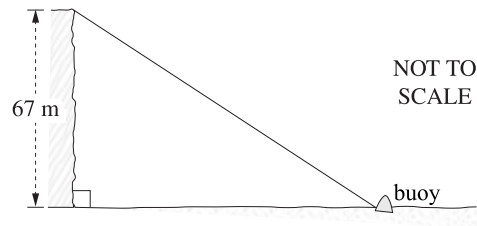


Which formula should be used to calculate the distance between Toby and Frankie?

- A. $\frac{a}{\sin A} = \frac{b}{\sin B}$
- B. $c^2 = a^2 + b^2$
- C. $A = \frac{1}{2}ab \sin C$
- D. $c^2 = a^2 + b^2 - 2ab \cos C$

6. Right-Angled Trig (029082)

From the top of a cliff 67 metres above sea level, the angle of depression of a buoy is 42°.



How far is the buoy from the base of the cliff, to the nearest metre?

- A. 60 m
- B. 74 m
- C. 90 m
- D. 100 m

7. Right-Angled Trig (137316)

An owl is 7 metres above ground level, in a tree. The owl sees a mouse on the ground at an angle of depression of 32°.

How far must the owl fly in a straight line to catch the mouse, assuming the mouse does not move?

- A. 3.7 m
- B. 5.9 m
- C. 8.3 m
- D. 13.2 m

8. Right-Angled Trig (245013)

Peter is standing 8 metres due west of Mary.

Bob is standing 8 metres due north of Mary.

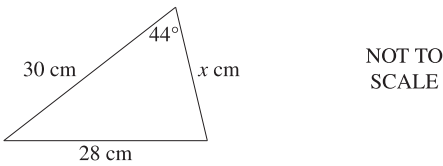
Bob is facing north. He then turns anticlockwise so that he is facing Peter.

How many degrees does Bob turn through?

- A. 45°
- B. 60°
- C. 120°
- D. 135°

9. Non Right-Angled Trig (029257)

The area of the triangle shown is 250 cm².

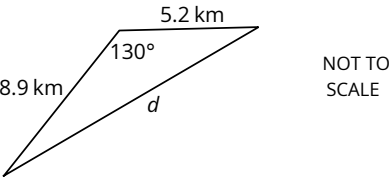


What is the value of x , correct to the nearest whole number?

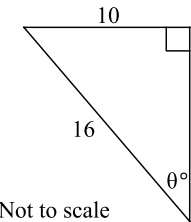
- A. 11
- B. 18
- C. 22
- D. 24

10. Non Right-Angled Trig (245556)

Find the value of d , correct to 2 decimal places. (3 marks)



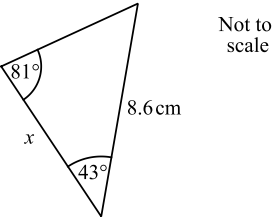
11. Right-Angled Trig (232457)



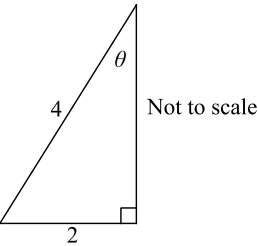
Find the value of θ , correct to the nearest minute. (2 marks)

12. Non Right-Angled Trig (245134)

Find the value of x , correct to 1 decimal place. (2 marks)

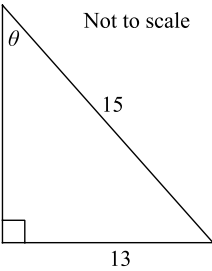


13. Right-Angled Trig (232476)



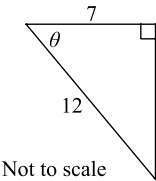
Express $\cos\theta$ as a fraction in its simplest form. (3 marks)

14. Right-Angled Trig (232462)



Find the value of θ , correct to the nearest minute. (2 marks)

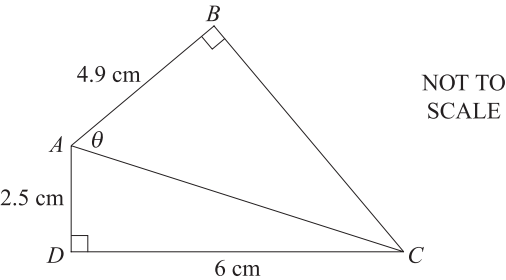
15. Right-Angled Trig (232610)



Find the value of θ , correct to the nearest minute. (2 marks)

16. Right-Angled Trig (137059)

Two right-angled triangles, ABC and ADC , are shown.

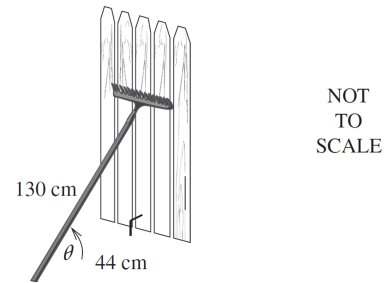


Calculate the size of angle θ , correct to the nearest minute. (3 marks)

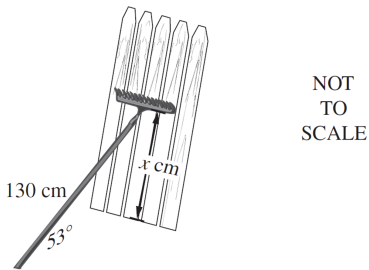
17. Non Right-Angled Trig (026748)

A 130 cm long garden rake leans against a fence. The end of the rake is 44 cm from the base of the fence.

a. If the fence is vertical, find the value of θ to the nearest degree. (2 marks)



b. The fence develops a lean and the rake is now at an angle of 53° to the ground. Calculate the new distance (x cm) from the base of the fence to the head of the rake. Give your answer to the nearest centimetre. (2 marks)

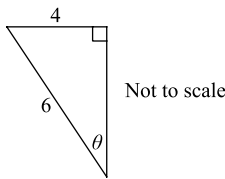


18. Right-Angled Trig (245577)

Boat A leaves port on a bearing of 065° and sails for 22 km until it is due east of Boat B.

If Boat B is due north of the port, find the distance between the port and Boat B in kilometres, correct to two decimal places. (3 marks)

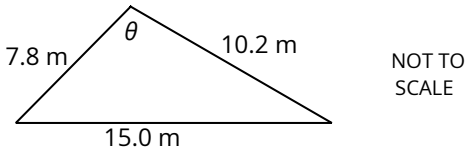
19. Right-Angled Trig (232643)



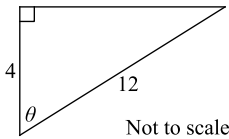
Express $\tan \theta$ as a fraction in its simplest form. (3 marks)

20. Non Right-Angled Trig (245569)

Find the value of θ , correct to the nearest minute. (3 marks)

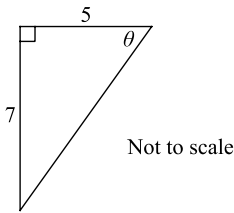


21. Right-Angled Trig (232614)



Find the value of θ , correct to the nearest minute. (2 marks)

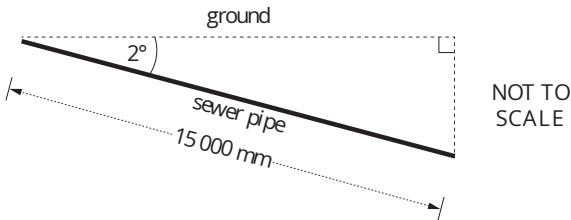
22. Right-Angled Trig (232670)



Find the value of θ , correct to the nearest minute. (2 marks)

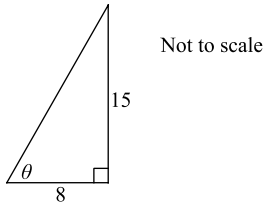
23. Right-Angled Trig (096648)

A sewer pipe needs to be placed into the ground so that it has a 2° angle of depression. The length of the pipe is 15 000 mm.



How much deeper should one end of the pipe be compared to the other end? Answer to the nearest mm. (2 marks)

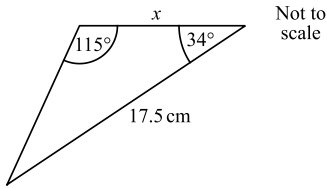
24. Right-Angled Trig (232661)



Find the value of θ , correct to the nearest minute. (2 marks)

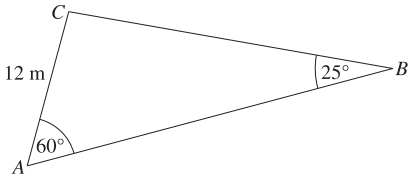
25. Non Right-Angled Trig (245140)

Find the value of x , correct to 1 decimal place. (2 marks)



26. Non Right-Angled Trig (233533)

The diagram shows triangle ABC .



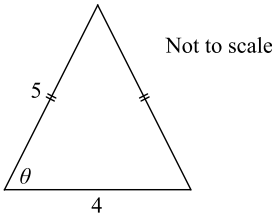
Calculate the area of the triangle, to the nearest square metre. (3 marks)

27. Right-Angled Trig (245579)

Gerry flies his helicopter from a heliport on a bearing of $S50^\circ W$ for 75 km until he stops at Town P which is due west of Town Q.

If Town Q is due south of the heliport, find the distance between the heliport and Town Q in kilometres, correct to two decimal places. (3 marks)

28. Right-Angled Trig (232622)



Find the value of θ , correct to the nearest minute. (3 marks)

29. Right-Angled Trig (245010)

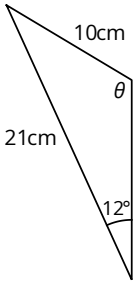
Ian is facing south. He turns 150° clockwise.

Ian then turns anticlockwise until he faces east.

By how many degrees did Ian turn anticlockwise? (2 marks)

30. Non Right-Angled Trig (245402)

Find the value of θ , correct to the nearest degree. (3 marks)

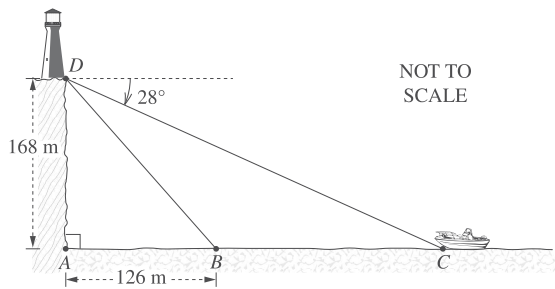


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31. Right-Angled Trig (004483)

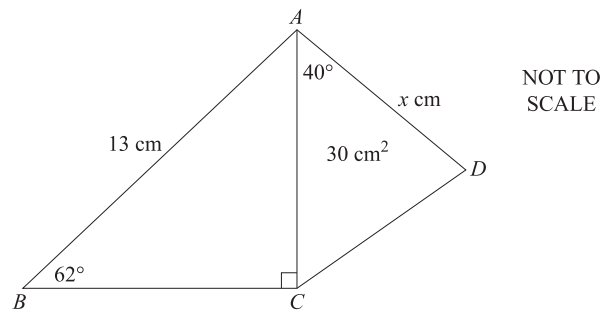
The base of a lighthouse, D , is at the top of a cliff 168 metres above sea level. The angle of depression from D to a boat at C is 28° . The boat heads towards the base of the cliff, A , and stops at B . The distance AB is 126 metres.



- a. What is the angle of depression from D to B , correct to the nearest degree? (3 marks)
- b. How far did the boat travel from C to B , correct to the nearest metre? (2 marks)

32. Non Right-Angled Trig (118613)

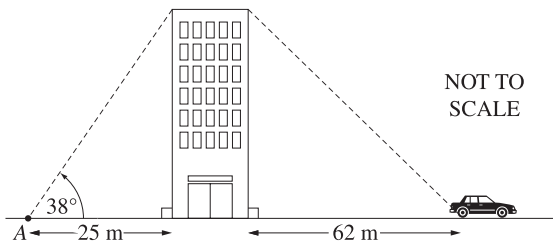
The diagram shows two triangles.
Triangle ABC is right-angled, with $AB = 13\text{cm}$ and $\angle ABC = 62^\circ$.
In triangle ACD , $AD = x\text{ cm}$ and $\angle DAC = 40^\circ$. The area of triangle ACD is 30 cm^2 .



What is the value of x , correct to one decimal place? (3 marks)

33. Right-Angled Trig (003943)

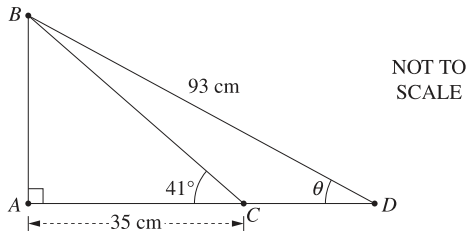
The point A is 25 m from the base of a building. The angle of elevation from A to the top of the building is 38° .



- a. Show that the height of the building is approximately 19.5 m. (1 mark)
- b. A car is parked 62 m from the base of the building.
What is the angle of depression from the top of the building to the car?
Give your answer to the nearest **minute**. (2 marks)

34. Non Right-Angled Trig (195483)

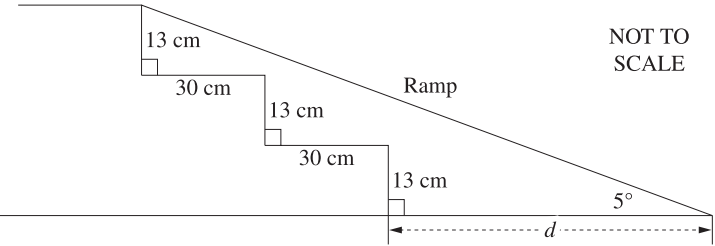
The diagram shows two right-angled triangles, ABC and ABD , where $AC = 35\text{ cm}$, $BD = 93\text{ cm}$, $\angle ACB = 41^\circ$ and $\angle ADB = \theta$.



Calculate the size of angle θ , to the nearest minute. (4 marks)

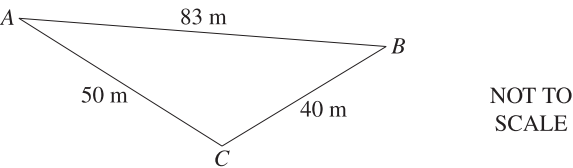
35. Right-Angled Trig (003156)

A disability ramp is to be constructed to replace steps, as shown in the diagram.
The angle of inclination for the ramp is to be 5° .



Calculate the extra distance, d , that the ramp will extend beyond the bottom step.
Give your answer to the nearest centimetre. (3 marks)

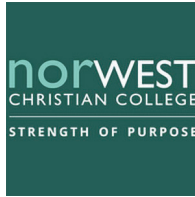
36. Non Right-Angled Trig (005369)



Find the area of triangle ABC , correct to the nearest square metre. (3 marks)

STANDARD 2 (2027)

Stage 6



Measurement (Std2-2027)

Trigonometry (Y12)

Non-right-angled Trig

Pythagoras and Right-angled Trig

Bearings and Radial Surveys

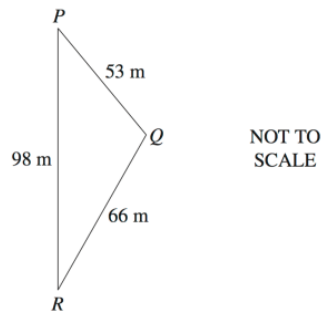
Teacher: Haeun Jang

Exam Equivalent Time: 42 minutes (based on allocation of 1.5 minutes per mark)

Questions

1. Measurement, STD2 2013 HSC 26a

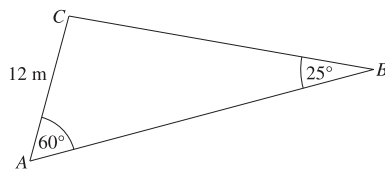
Triangle PQR is shown.



Find the size of angle Q , to the nearest degree. (2 marks)

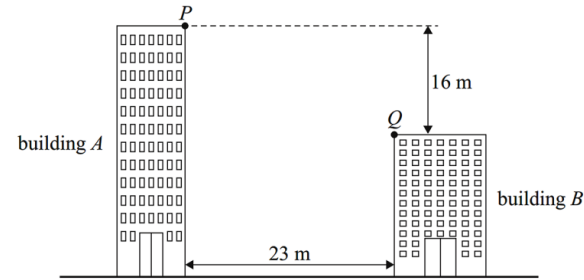
2. Measurement, STD2 2023 HSC 35

The diagram shows triangle ABC .



Calculate the area of the triangle, to the nearest square metre. (3 marks)

3. Measurement, STD2 2011 FUR1 2



The point Q on building B is visible from the point P on building A , as shown in the diagram above.

Building A is 16 metres taller than building B .

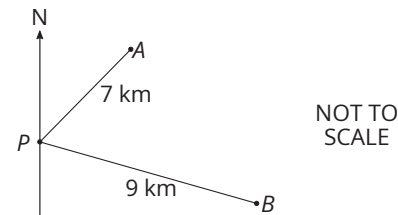
The horizontal distance between point P and point Q is 23 metres.

Calculate the angle of depression of point Q from point P . Give your answer correct to 1 decimal place.

(2 marks)

4. Measurement, STD2 2020 HSC 31

Mr Ali, Ms Brown and a group of students were camping at the site located at P . Mr Ali walked with some of the students on a bearing of 035° for 7 km to location A . Ms Brown, with the rest of the students, walked on a bearing of 100° for 9 km to location B .



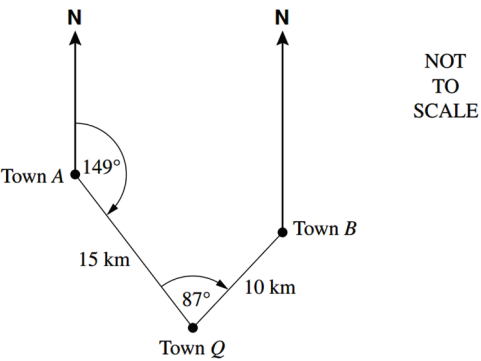
a. Show that the angle APB is 65° . (1 mark)

b. Find the distance AB . (2 marks)

c. Find the bearing of Ms Brown's group from Mr Ali's group. Give your answer correct to the nearest degree. (2 marks)

5. Measurement, STD2 2007 HSC 26a

The diagram shows information about the locations of towns A , B and Q .

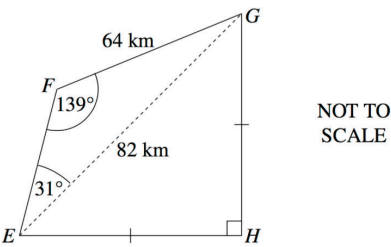


NOT ASSESSED

- a. It takes Elina 2 hours and 48 minutes to walk directly from Town A to Town Q . Calculate her walking speed correct to the nearest km/h. (1 mark)
- b. Elina decides, instead, to walk to Town B from Town A and then to Town Q . Find the distance from Town A to Town B . Give your answer to the nearest km. (2 marks)
- c. Calculate the bearing of Town Q from Town B . (1 mark)

6. Measurement, STD2 2012 HSC 29c

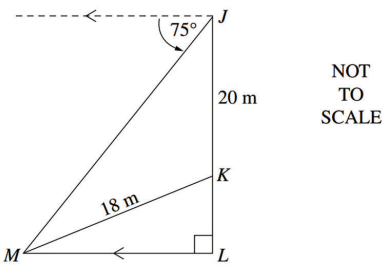
Raj cycles around a course. The course starts at E , passes through F , G and H and finishes at E . The distances EH and GH are equal.



- a. What is the length of EF , to the nearest kilometre? (2 marks)
- b. What is the total distance that Raj cycles, to the nearest kilometre? (3 marks)

7. Measurement, STD2 2007 HSC 25b

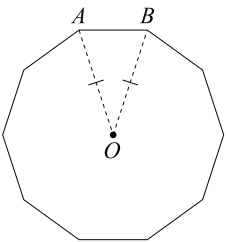
The angle of depression from J to M is 75° . The length of JK is 20 m and the length of MK is 18 m.



Copy or trace this diagram into your writing booklet and calculate the angle of elevation from M to K . Give your answer to the nearest degree. (3 marks)

8. Measurement, STD2 2020 HSC 32

The diagram shows a regular decagon (ten-sided shape with all sides equal and all interior angles equal). The decagon has centre O .



The perimeter of the shape is 80 cm.
By considering triangle OAB , calculate the area of the ten-sided shape. Give your answer in square centimetres correct to one decimal place. (4 marks)

Q1. $x = 29\cos(40^\circ)$

Q2. $d = 13.98 \dots m$

Q3. $S70^\circ T$

Q4. $A = 41.656m^2$

Q5. $\frac{a}{\sin A} = \frac{b}{\sin B}$

Q6. $x = \frac{67}{\tan 42^\circ}$

Q7. $\frac{\sin 32^\circ}{135^\circ}$

Q8. $x = \frac{250}{15\sin(44^\circ)}$

Q9. $d \approx 12.9km$ (1. d. p.)

Q10. $\theta = 38.41'$

Q11. $x \approx 7.2cm$ (1. d. p.)

Q12. $\cos \theta = \frac{\sqrt{12}}{4}$

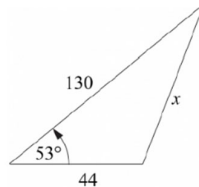
Q13. $\theta = 60^\circ 4'$

Q14. $\theta = 54^\circ 19'$

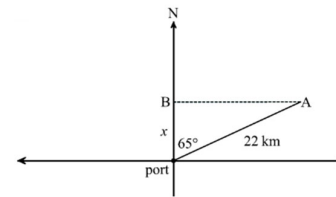
Q15. $AC = 6.5cm, \theta = 41^\circ 5' \text{ (nearest minute)}$

Q16. a) $\theta = 70^\circ \text{ (nearest degree)}$

b) $x = 109cm \text{ (nearest cm)}$



Q17.



$x = 9.30km$

Q18. $\tan \theta = \frac{2}{\sqrt{5}} \text{ or } \frac{2\sqrt{5}}{5}$

Q19. $\theta = 112^\circ 12' \text{ (nearest minute)}$

Q20. $\theta = 70^\circ 32'$

Q21. $\theta = 54^\circ 28'$

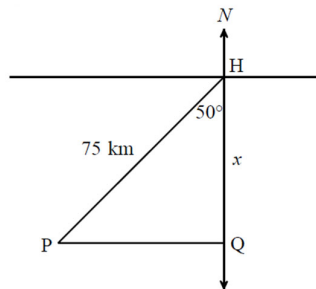
Q22. $\text{depth needed} = 523mm \text{ (nearest mm)}$

Q23. $\theta = 61^\circ 56'$

Q24. $x = 9.9cm$ (1. d. p.)

Q25. $A = \frac{1}{2} \times AC \times CB \times \sin(\angle ACB) = 147m^2$

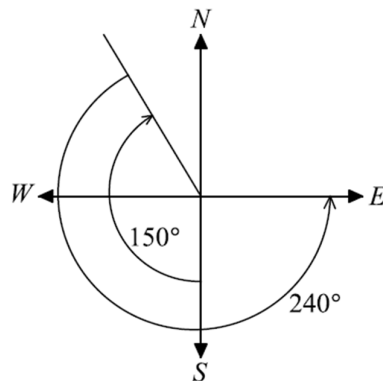
Q27.



$$x = 48.21 \text{ km (2. d. p)}$$

Q28. $\theta = 66^\circ 25' (1. \text{ d. p})$

Q29.



$$150^\circ + 90^\circ = 240^\circ$$

Q30. SKIPPED

Q31. a)

$$\tan \angle ADB = \frac{126}{168}$$

$$\angle ADB = 36.8698\dots = 36.9^\circ \quad (\text{to 1 d.p.})$$

$$\angle \text{Depression } D \text{ to } B = 90 - 36.9 = 53^\circ \quad (\text{nearest degree})$$

$$\text{b) } CB = AC - AB \approx 190 \text{ m (nearest m)}$$

Q32. $AC = 11.478 \dots$

$$\text{Area} = \frac{1}{2} \times AC \times x \times \sin(40^\circ)$$

$$x \approx 8.1 \text{ cm (1. d. p)}$$

Q33. a)

$$\tan 38^\circ = \frac{h}{25}$$

$$h = 25 \times \tan 38^\circ$$

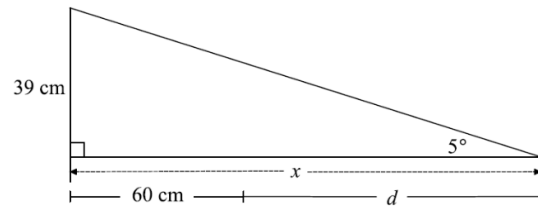
$$= 19.5321\dots$$

$$\approx 19.5 \text{ m } \dots \text{ as required.}$$

$$\text{b) } \theta = 17^\circ 28' \quad (\text{nearest minute})$$

Q34. $\theta = 19^\circ 6' (\text{nearest minute})$

Q35.



$$\tan 5^\circ = \frac{39}{x}$$

$$x = \frac{39}{\tan 5^\circ}$$

$$= 445.772 \dots$$

$$d = 386 \text{ cm (nearest cm)}$$

Q36. $\angle C = 134.2067 \dots^\circ$

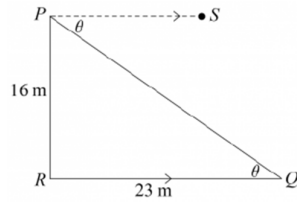
$$\text{Area of } \triangle ABC = \frac{1}{2} ab \sin C$$

$$\approx 717 \text{ m}^2 \text{ (nearest m}^2\text{)}$$

Q1. $\theta \approx 110^\circ$ (nearest degree)

Q2. $A = \frac{1}{2} \times AC \times CB \times \sin(\angle ACB) = 147m^2$

Q3



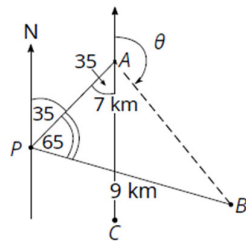
$$\tan \theta = \frac{16}{23}$$

$$\theta = 34.8^\circ$$

$\therefore$ Angle of depression from P to $Q = 34.8^\circ$
(alternate, $PS \parallel RQ$)

Q4 a) $\angle APB = 65^\circ$
b) $AB \approx 8.76km$ (2.d.p)

c)



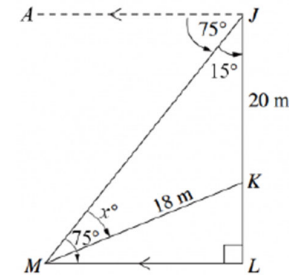
NOT TO
SCALE

$\angle PAB \approx 69^\circ$ (nearest degree, by using cosine rule)
Bearing of B from $A = 180 - (69 - 35) = 146^\circ$

Q5. SKIPPED

Q6. a) $EF \approx 22km$ (nearest km)
b) $EH = 57.983 \dots = GH$
 $\therefore$ distance Raj cycles $\approx 202km$ (nearest km)

Q7. d



$$\angle AJL = 90^\circ$$

$$\angle MJL = 90 - 75 = 15^\circ$$

$$x = 16.71 \dots^\circ \text{ (using sine rule)}$$

$$\angle KML = 75^\circ - x \approx 58^\circ \text{ (nearest degree)}$$

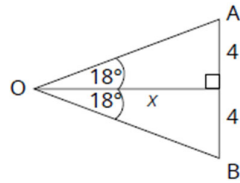
$$\therefore \text{Angle of elevation from } M \text{ to } K \text{ is } 58^\circ$$

$$\angle AOB = \frac{360}{10} = 36^\circ$$

$$AB = \frac{80}{10} = 8 \text{ cm}$$

$\triangle AOB$ is made up of 2 identical right-angled triangles

Q8.



$$x = \frac{4}{\tan(18^\circ)}$$

$$\text{Area of decagon} = 20 \times \frac{1}{2} \times x \times 4 \approx 492.4 \text{ cm}^2$$