1. The height of a vertical cliff is 450 m. The angle of elevation from a ship to the top of the cliff is 23°. The ship is x metres from the bottom of the cliff.

(a) Draw a diagram to show this information.

Diagram:

(b) Calculate the value of x.

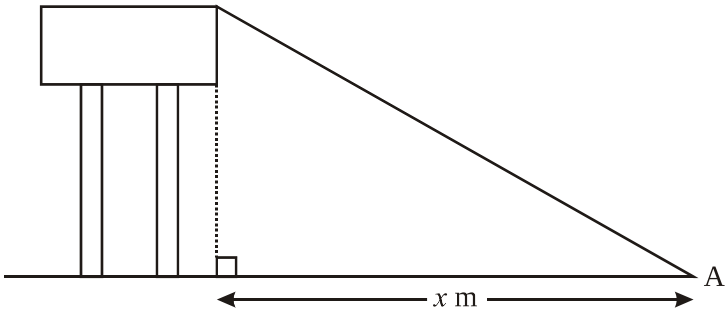
Working:

Answer:

(b) …………………………………………..

(Total 4 marks)

2. The diagram shows a water tower standing on horizontal ground. The height of the tower is 26.5 m.



From a point A on the ground the angle of elevation to the top of the tower is 28°.

(a) On the diagram, show and label the angle of elevation, 28°.

(b) Calculate, **correct to the nearest metre**, the distance x m.

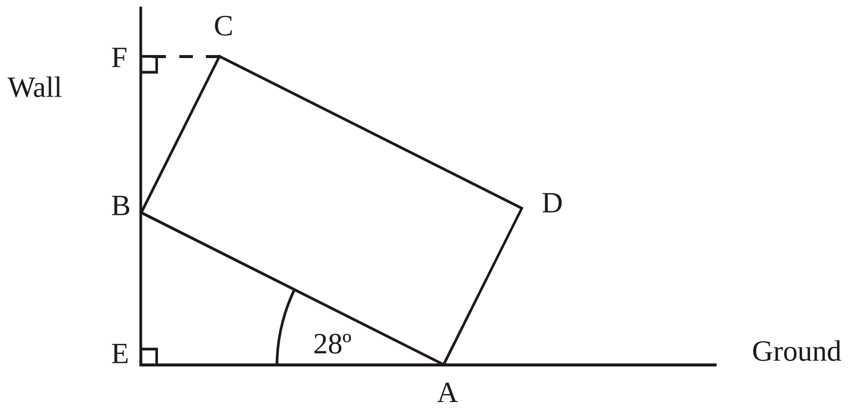
Working:

Answers:

(b) …………………………………………..

(Total 4 marks)

3. A rectangular block of wood with face ABCD leans against a vertical wall, as shown in the diagram below. AB = 8 cm, BC = 5 cm and angle $B\hat{A}E = 28°$.



Find the vertical height of C above the ground.

Working:

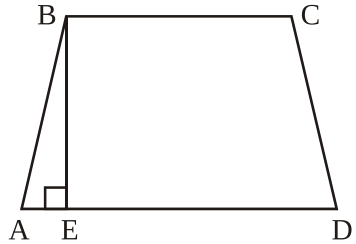
Answer:

....

(Total 4 marks)

4. ABCD is a trapezium with AB = CD and [BC] parallel to [AD]. AD = 22 cm, BC = 12 cm, AB = 13 cm.

Diagram not to scale



(a) Show that AE = 5 cm.

(2)

(b) Calculate the height BE of the trapezium.

(2)

(c) Calculate

(i) $B\hat{A}E$;

(ii) $B\hat{C}D$.

(3)

(d) Calculate the length of the diagonal [CA].

(3)
(Total 10 marks)

5. Andrew is at point A in a park. A deer is 3 km directly north of Andrew, at point D. Brian is 1.8 km due west of Andrew, at point B.

(a) Draw a diagram to represent this information.

(b) Calculate the distance between Brian and the deer.

(c) Brian looks at Andrew, and then turns through an angle θ to look at the deer. Calculate the value of θ.

Diagram: (a)

Working:

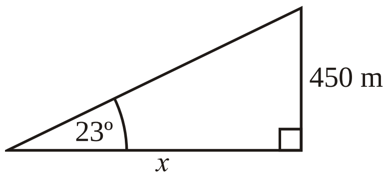
Answers:

(b) ……………………………………

(c) ……………………………………..

(Total 8 marks)

1. (a)



(M1) (C1)

Note: *All three (23°, x, 450 m) must be labelled and in correct position for (M1)*

(b) $\tan 23° = \dfrac{450}{x}$ (M1)

Note: *Follow through from candidate's diagram*

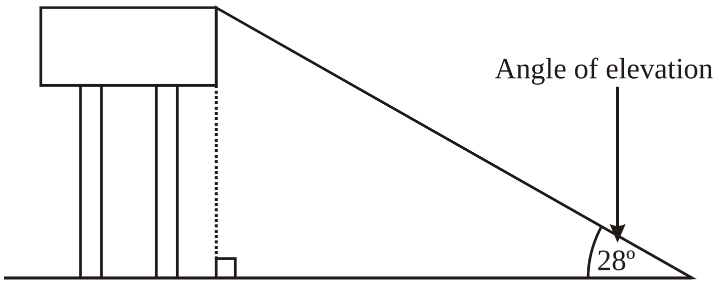
$x = \dfrac{450}{\tan 23°}$ (M1)

$x = 1060.13...$

$x = 1060$ (3 s.f.) (A1) (C3)

[4]

2. (a)



(A1)

(b) $x = \dfrac{26.5}{\tan 28°}$ (or equivalent, allow follow-through from part (a)) (M1)

$= 49.83925...$ (A1)

$= 50$ m (correct to nearest metre) (A1)

[4]

3. $\sin 28° = \dfrac{BE}{8}$ (M1)

$8 \times \sin 28° = BE$

$F\hat{B}C = 28°$ (M1)

$\cos 28° = \dfrac{BF}{5}$ (M1)

$5\cos 28° = BF$

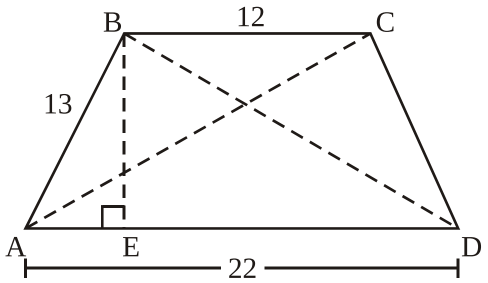
Altitude of C = $8\sin 28° + 5\cos 28°$

$= 8.170510467$

$= 8.17$ cm (3 s.f) (A1)

[4]

4.



(a) $22 - 12 = 10$ (R1)

Therefore, $AE = \dfrac{10}{2} = 5$ (R1)(AG)

Also allow $12 + 2(5) = 22$. (R2) 2

(b) $13^2 = 5^2 + BE^2$ (M1)

$BE = \sqrt{169 - 25}$

$= 12$ cm (A1)

Also allow just an answer 12 (Pythagorean triple) (C2) 2

(c) (i) $\tan B\hat{A}E = \dfrac{12}{5}$ (accept any other correct ratio) (M1)

$= 2.4$

$B\hat{A}E = 67.4°$ (3 s.f.) (A1)

(ii) $B\hat{C}D = 180 - 67.4$ (A1) 3

$= 113°$ (3 s.f.)

(d) $CA^2 = BD^2 = 13^2 + 22^2 - 2(13)(22)\cos 67.4°$ (M1)

$= 433.183$ (M1)

$CA = 20.8$ (3 s.f.) (A1)

OR

$ED = 17$ (M1)

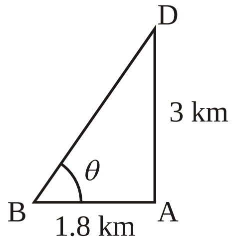
$CA^2 = BD^2 = 12^2 + 17^2 = 433$ (M1)

Therefore, $CA = 20.8$ cm (3 s.f) (A1) 3

Accept 20.9

[10]

5. (a)



(A3)(C3)

Note: *Award (A1) for AB = 1.8, (A1) for AD = 3, (A1) for* $\hat{A} = 90°$

(b) $\sqrt{3^2 + 1.8^2} = \sqrt{12.24}$ (3.50 (3s.f)) (M1)(A1)(C2)

(c) $\tan\theta = \dfrac{3}{1.8}$ (M1)

$\theta = 59.0°$ (or 1.03 radians) (A2)(C3)

[8]