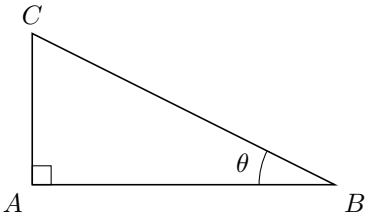
RIGHT-TRIANGLE TRIGONOMETRY

A SIDES OF A RIGHT-ANGLED TRIANGLE

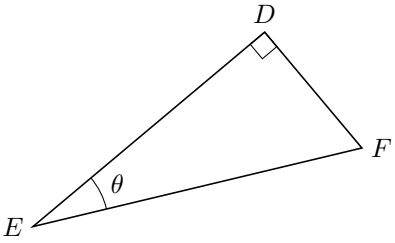
A.1 IDENTIFYING TRIANGLE SIDES

MCQ 1: In the triangle below, identify the adjacent side to the angle θ:



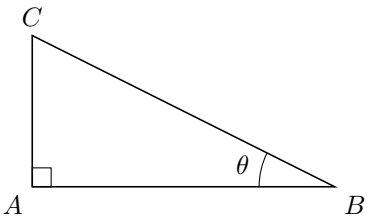
- ☐ $\overline{AB}$
- ☐ $\overline{AC}$
- ☐ $\overline{BC}$

MCQ 2: In the triangle below, identify the hypotenuse relative to the angle θ:



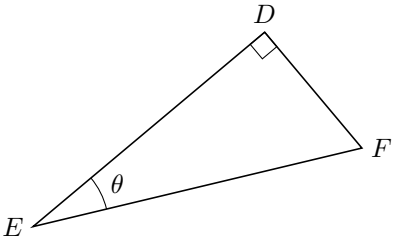
- ☐ $\overline{DE}$
- ☐ $\overline{DF}$
- ☐ $\overline{EF}$

MCQ 3: In the triangle below, identify the opposite side to the angle θ:



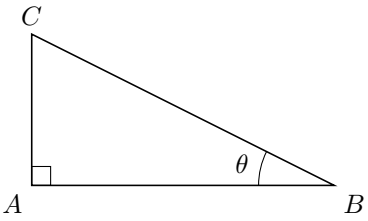
- ☐ $\overline{AB}$
- ☐ $\overline{AC}$
- ☐ $\overline{BC}$

MCQ 4: In the triangle below, identify the opposite side to the angle θ:



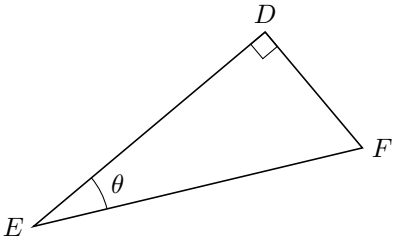
- ☐ $\overline{DE}$
- ☐ $\overline{DF}$
- ☐ $\overline{EF}$

MCQ 5: In the triangle below, identify the hypotenuse relative to the angle θ:



- ☐ $\overline{AB}$
- ☐ $\overline{AC}$
- ☐ $\overline{BC}$

MCQ 6: In the triangle below, identify the adjacent side to the angle θ:

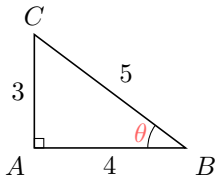


- ☐ $\overline{DE}$
- ☐ $\overline{DF}$
- ☐ $\overline{EF}$

B TRIGONOMETRIC RATIOS

B.1 CALCULATING TRIGONOMETRIC RATIOS

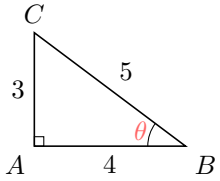
Ex 7:



Calculate $\cos(\theta)$.

$$\cos(\theta) = \square$$

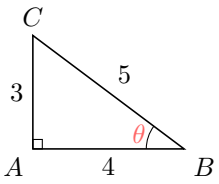
Ex 8:



Calculate $\sin(\theta)$.

$$\sin(\theta) = \square$$

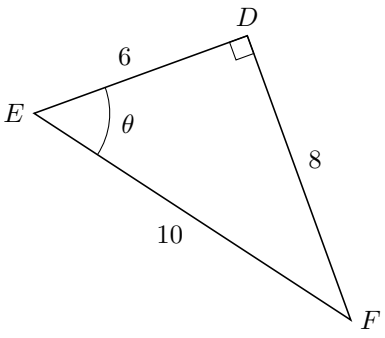
Ex 9:



Calculate $\tan(\theta)$.

$$\tan(\theta) = \square$$

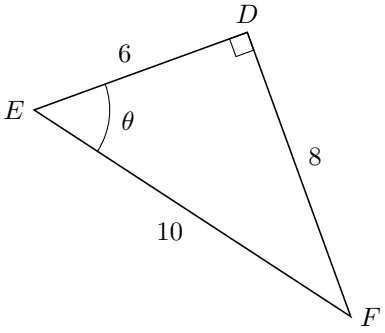
Ex 10:



Calculate $\sin(\theta)$.

$$\sin(\theta) = \square$$

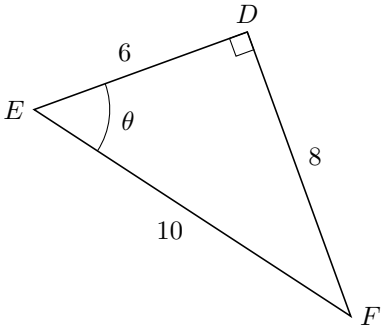
Ex 11:



Calculate $\tan(\theta)$.

$$\tan(\theta) = \square$$

Ex 12:

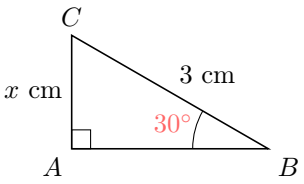


Calculate $\cos(\theta)$.

$$\cos(\theta) = \square$$

B.2 CALCULATING SIDE LENGTHS

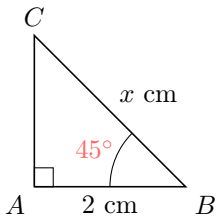
Ex 13:



Calculate x.

$x \approx \square$ cm (round to 2 decimal places)

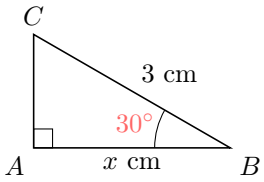
Ex 14:



Calculate x.

$x \approx \square$ cm (round to 2 decimal places)

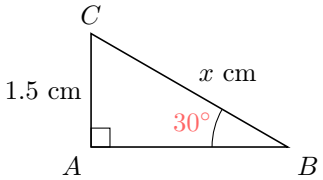
Ex 15:



Calculate x.

$x \approx \square$ cm (round to 2 decimal places)

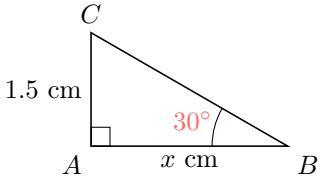
Ex 16:



Calculate x.

$x \approx \square$ cm (round to 2 decimal places)

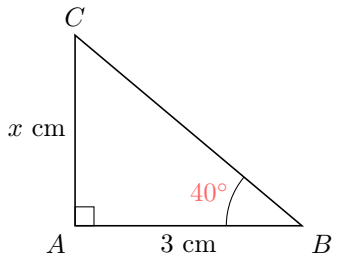
Ex 17:



Calculate x.

$x \approx$ ☐ cm (round to 2 decimal places)

Ex 18:



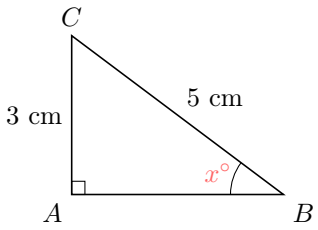
Calculate x.

$x \approx$ ☐ cm (round to 2 decimal places)

C INVERSE TRIGONOMETRIC FUNCTIONS

C.1 CALCULATING ANGLES

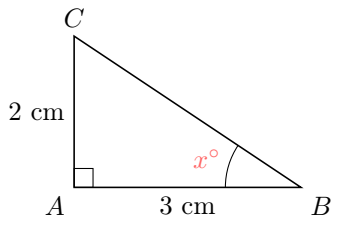
Ex 19:



Calculate the angle $x°$.

$x° \approx$ ☐ ° (round to 1 decimal place)

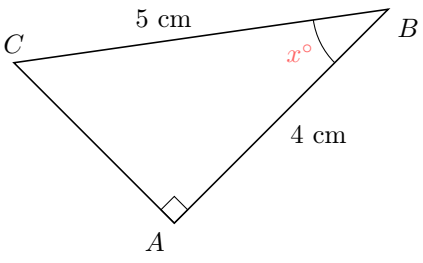
Ex 20:



Calculate the angle $x°$.

$x° \approx$ ☐ ° (round to 1 decimal place)

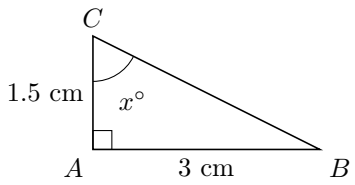
Ex 21:



Calculate the angle $x°$.

$x° \approx$ ☐ ° (round to 1 decimal place)

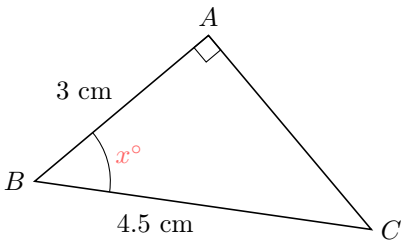
Ex 22:



Calculate the angle $x°$.

$x° \approx$ ☐ ° (round to 1 decimal place)

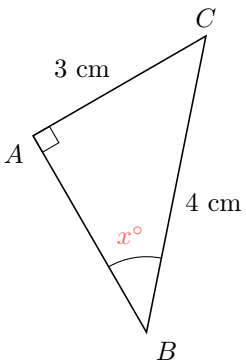
Ex 23:



Calculate the angle $x°$.

$x° \approx$ ☐ ° (round to 1 decimal place)

Ex 24:



Calculate the angle $x°$.

$x° \approx$ ☐ ° (round to 1 decimal place)

D SOLVING REAL-WORLD TRIGONOMETRY PROBLEMS

D.1 SOLVING REAL-WORLD TRIGONOMETRY PROBLEMS

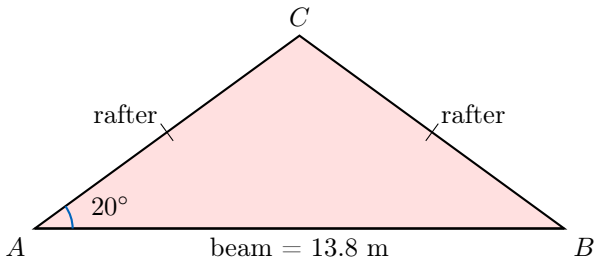
Ex 25: A cyclist in France rides up a long incline with an average rise of 6°. If he rides for 6 200 m, how far has he climbed vertically?

m (round to the nearest integer)

Ex 26: The lamp in a lighthouse is 64 m above sea level. The angle of depression from the lamp to a fishing boat is 11°. How far horizontally is the boat from the lighthouse?

m (round to the nearest integer)

Ex 27: For the triangular roof truss illustrated, find the length of a rafter if the beam is 13.8 m and the pitch is 20°.



m (round to 2 decimal places)

Ex 28: A person standing 50 m from the base of a tower looks up at the top with an angle of elevation of 28°. Find the height of the tower.

m (round to the nearest integer)

D.2 SOLVING MULTI-STEP TRIGONOMETRIC PROBLEMS

Ex 29: From a point A on the ground, the angle of elevation to the top of a building is 24°. From a point B, which is 50 m closer to the building, the angle of elevation is 38°. Find the height of the building, correct to one decimal place.

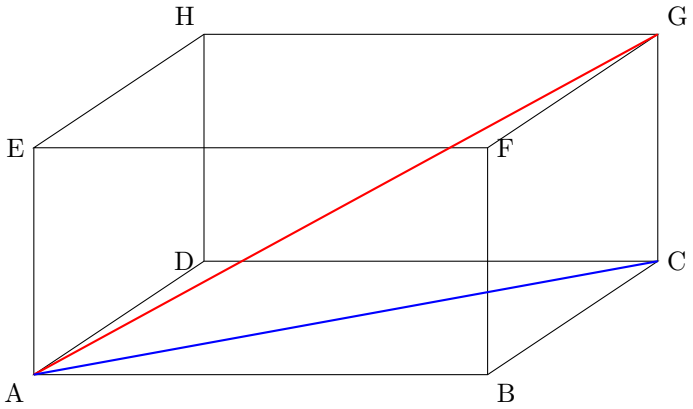
Ex 30: Two observers, on opposite sides of a radio tower, are standing on a straight line that passes through the base of the tower. The observers are 120 m apart. The angle of elevation from the first observer to the top of the tower is 32°, and from the second observer, it is 48°. Find the height of the tower, correct to one decimal place.

Ex 31: An observer stands on top of a vertical cliff of height 80 m. She measures the angle of depression to a boat at sea as 12°. At the same instant, she measures the angle of elevation to a helicopter flying directly above the boat as 20°. Find the height of the helicopter above the sea, correct to one decimal place.

E ANGLE BETWEEN A LINE AND A PLANE

E.1 APPLYING TRIGONOMETRY IN 3D SPACE

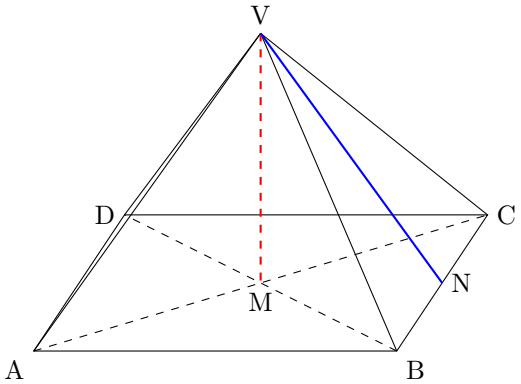
Ex 32: The diagram shows a cuboid with dimensions $AB = 8$ cm, $BC = 6$ cm, and $CG = 5$ cm.



Find:

1. The exact length of the space diagonal AG.
2. The angle that the diagonal AG makes with the base plane $ABCD$.

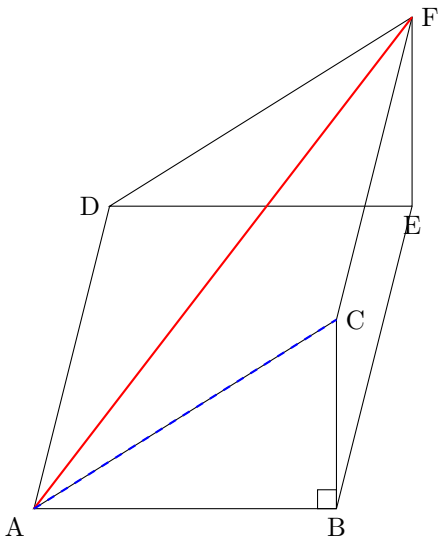
Ex 33: The diagram shows a right pyramid with a square base $ABCD$ of side length 10 cm. The vertex V is vertically above the center of the base, M, and the height of the pyramid VM is 12 cm.



Find:

1. The exact length of the slant height VN of the triangular face VBC.
2. The angle between the face VBC and the base plane $ABCD$.

Ex 34: The diagram shows a right wedge-shaped prism whose cross-section ABC is a right-angled triangle. The dimensions are $AB = 15$ cm, $BC = 8$ cm, and the length of the prism is 30 cm (so $CF = 30$ cm).



Find:

1. The exact length of the space diagonal AF.
2. The angle that the diagonal AF makes with the vertical face $BCFE$.