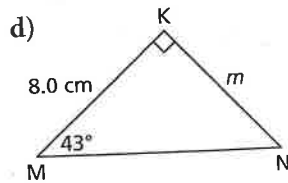
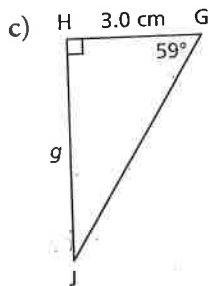
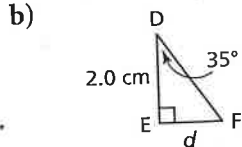
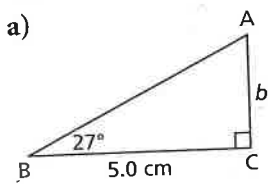


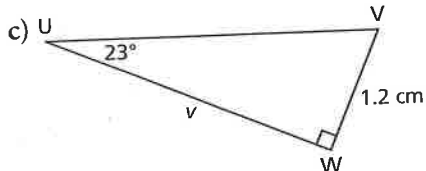
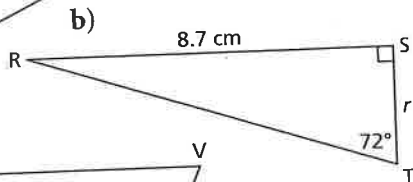
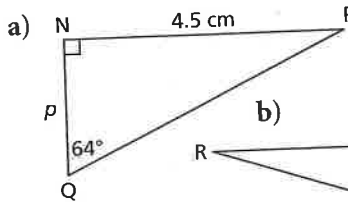
Exercises

A

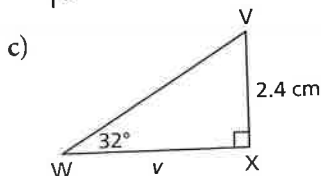
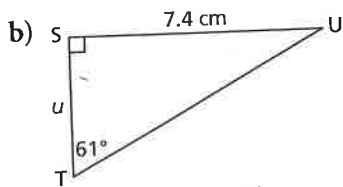
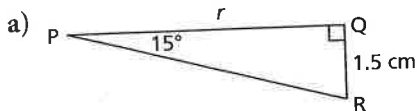
3. Determine the length of each indicated side to the nearest tenth of a centimetre.



4. Determine the length of each indicated side to the nearest tenth of a centimetre.

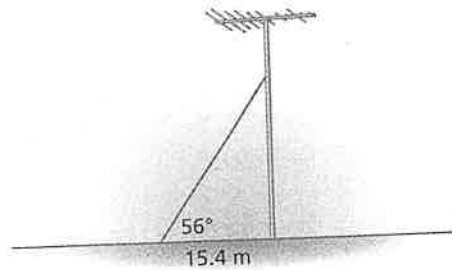


5. Determine the length of each indicated side to the nearest tenth of a centimetre.

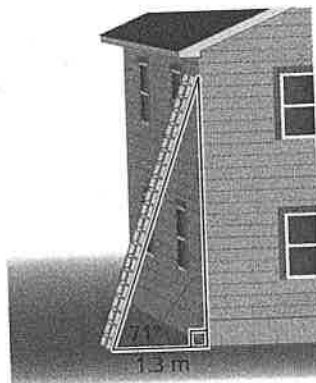


B

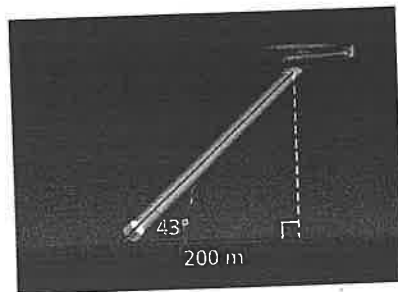
6. A guy wire helps to support a tower. The angle between the wire and the level ground is 56° . One end of the wire is 15.4 m from the base of the tower. How high up the tower does the wire reach to the nearest tenth of a metre?



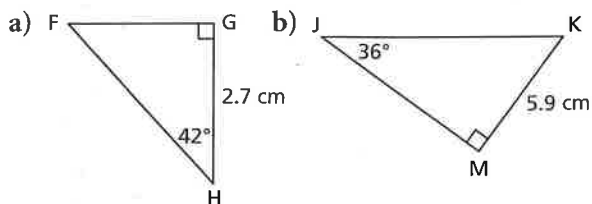
7. The base of a ladder is on level ground 1.3 m from a wall. The ladder leans against the wall. The angle between the ladder and the ground is 71° . How far up the wall does the ladder reach to the nearest tenth of a metre?



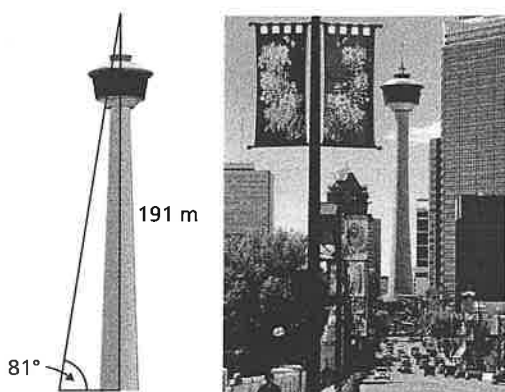
8. A helicopter is descending vertically. On the ground, a searchlight is 200 m from the point where the helicopter will land. It shines on the helicopter and the angle the beam makes with the ground is 43° . How high is the helicopter at this point to the nearest metre?



9. Determine the length of the hypotenuse of each right triangle to the nearest tenth of a centimetre. Describe your strategy.



10. Claire knows that the Calgary Tower is 191 m high. At a certain point, the angle between the ground and Claire's line of sight to the top of the tower was 81° . To the nearest metre, about how far was Claire from the tower? Why is this distance approximate?



11. The angle between one longer side of a rectangle and a diagonal is 34° . One shorter side of the rectangle is 2.3 cm.
- Sketch and label the rectangle.
 - What is the length of the rectangle to the nearest tenth of a centimetre?
12. In $\triangle PQR$, $\angle R = 90^\circ$, $\angle P = 58^\circ$, and $PR = 7.1$ cm. Determine the area of $\triangle PQR$ to the nearest tenth of a square centimetre. Describe your strategy.

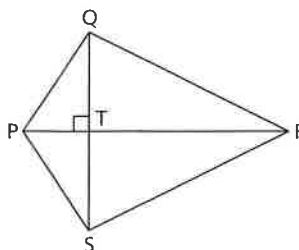
13. The height of the Manitoba Legislature Building, from the ground to the top of the Golden Boy statue, is about 77 m. Liam is lying on the ground near the building. The angle between the ground and his line of sight to the top of the building is 52° . About how far is Liam from a point on the ground vertically below the statue? How do you know?



14. Janelle sees a large helium-filled balloon anchored to the roof of a store. When she is 100 m from the store, the angle between the ground and her line of sight to the balloon is 30° . About how high is the balloon? What assumptions are you making?

C

15. In kite PQRS, the shorter diagonal, QS, is 6.0 cm long, $\angle QRT$ is 26.5° , and $\angle QPT$ is 56.3° . Determine the measures of all the angles and the lengths of the sides of the kite to the nearest tenth.



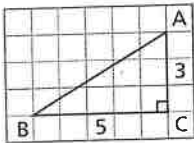
16. On a coordinate grid:
- Draw a line through the points $A(4, 5)$ and $B(-4, -5)$. Determine the measure of the acute angle between AB and the y -axis.
 - Draw a line through the points $C(1, 4)$ and $D(4, -2)$. Determine the measure of the acute angle between CD and the x -axis.

Reflect

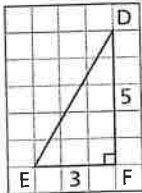
Summarize what you have learned about using the tangent ratio to determine the length of a side of a right triangle.

6. Sketches will vary. For example:

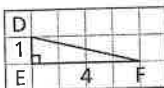
a)



b)



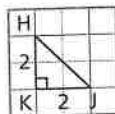
c)



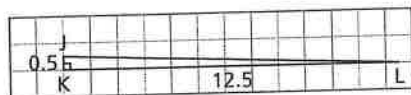
d)



e)



f)



7. a) $\tan 60^\circ > 1$ b) $\tan 30^\circ < 1$
 8. a) 36.4° b) 68.0°
 9. b) i) $\angle A \doteq 26.6^\circ$; $\angle B \doteq 63.4^\circ$
 ii) $\angle D \doteq 63.4^\circ$; $\angle F \doteq 26.6^\circ$
 iii) $\angle G \doteq 63.4^\circ$; $\angle H \doteq 26.6^\circ$
 c) No
 10. a) 36.0° b) 49.1°
 c) 20.3° d) 82.4°
 11. a) 11° b) 14°
 c) 6° d) 9°
 12. Whitehorse
 13. $\angle P = \angle RQS \doteq 67.4^\circ$, $\angle R = \angle PQS \doteq 22.6^\circ$
 14. 22°
 15. 20.6° ; 69.4°
 16. The side opposite the acute angle has the same length as the side adjacent to the angle.

17. 25°

18. 22°

19. 146°

20. 76°

21. $\angle X \doteq 50.1^\circ$, $\angle Y = \angle Z \doteq 64.9^\circ$

22. a) There is no least possible value; the tangent can be arbitrarily close to zero.

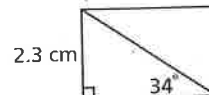
b) There is no greatest possible value; the tangent can be arbitrarily large.

23. a) 1 ; $\frac{1}{\sqrt{2}}$; $\frac{1}{\sqrt{3}}$; $\frac{1}{\sqrt{4}}$, or $\frac{1}{2}$; $\frac{1}{\sqrt{5}}$

b) $\frac{1}{\sqrt{100}}$, or $\frac{1}{10}$

2.2 Using the Tangent Ratio to Calculate Lengths, page 82

3. a) 2.5 cm b) 1.4 cm
 c) 5.0 cm d) 7.5 cm
 4. a) 2.2 cm b) 2.8 cm
 c) 2.8 cm
 5. a) 5.6 cm b) 4.1 cm
 c) 3.8 cm
 6. 22.8 m
 7. 3.8 m
 8. 187 m
 9. a) 3.6 cm b) 10.0 cm
 10. Approximately 30 m
 11. a)



- b) 3.4 cm
 12. 40.3 cm^2
 13. Approximately 60 m
 14. Approximately 58 m, assuming the balloon is directly over the store
 15. $\angle QRT = \angle SRT = 26.5^\circ$, $\angle QRS = 53.0^\circ$,
 $\angle QPT = \angle SPT = 56.3^\circ$, $\angle QPS = 112.6^\circ$,
 $\angle RQT = \angle RST = 63.5^\circ$,
 $\angle PQT = \angle PST = 33.7^\circ$,
 $\angle PQR = \angle PSR = 97.2^\circ$,
 $\angle PTQ = \angle PTS = \angle QTR = \angle RTS = 90.0^\circ$
 $PQ = PS \doteq 3.6 \text{ cm}$, $QR = SR \doteq 6.7 \text{ cm}$
 16. a) Approximately 38.7°
 b) Approximately 63.4°