5. Use a calculator.

a) $\sin 57° \doteq 0.84$
$\cos 57° \doteq 0.54$

b) $\sin 5° \doteq 0.09$
$\cos 5° \doteq 1.00$

c) $\sin 19° \doteq 0.33$
$\cos 19° \doteq 0.95$

d) $\sin 81° \doteq 0.99$
$\cos 81° \doteq 0.16$

6. Use a calculator.

a) $\sin X = 0.25$

$$\angle X = \sin^{-1}(0.25)$$
$$\doteq 14°$$

b) $\cos X = 0.64$

$$\angle X = \cos^{-1}(0.64)$$
$$\doteq 50°$$

c) $\sin X = \frac{6}{11}$

$$\angle X = \sin^{-1}\left(\frac{6}{11}\right)$$
$$\doteq 33°$$

d) $\cos X = \frac{7}{9}$

$$\angle X = \cos^{-1}\left(\frac{7}{9}\right)$$
$$\doteq 39°$$

B

7. a) In right △BCD, the length of the side opposite ∠C and the length of the hypotenuse are given.

$$\sin C = \frac{\text{opposite}}{\text{hypotenuse}}$$
$$\sin C = \frac{BD}{BC}$$
$$\sin C = \frac{5}{9}$$
$$\angle C \doteq 34°$$

b) In right △EFG, the length of the side opposite ∠E and the length of the hypotenuse are given.

$$\sin E = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\sin E = \frac{FG}{EG}$$

$$\sin E = \frac{4}{7}$$

$$\angle E \doteq 35°$$

c) In right △HJK, the length of the side opposite ∠H and the length of the hypotenuse are given.

$$\sin H = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\sin H = \frac{JK}{HJ}$$

$$\sin H = \frac{10}{16}$$

$$\angle H \doteq 39°$$

d) In right △MNP, the length of the side opposite ∠N and the length of the hypotenuse are given.

$$\sin N = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\sin N = \frac{MP}{NP}$$

$$\sin N = \frac{6}{11}$$

$$\angle N \doteq 33°$$

8. a) In right △QRS, the length of the side adjacent to ∠Q and the length of the hypotenuse are given.

$$\cos Q = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\cos Q = \frac{QR}{QS}$$

$$\cos Q = \frac{18}{24}$$

$$\angle Q \doteq 41°$$

b) In right △TUV, the length of the side adjacent to ∠U and the length of the hypotenuse are given.

$$\cos U = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\cos U = \frac{TU}{UV}$$

$$\cos U = \frac{5}{24}$$

$$\angle U \doteq 78°$$

c) In right △WYX, the length of the side adjacent to ∠Y and the length of the hypotenuse are given.

$$\cos Y = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\cos Y = \frac{XY}{WY}$$

$$\cos Y = \frac{9}{10}$$

$$\angle Y \doteq 26°$$

d) In right △ABZ, the length of the side adjacent to ∠A and the length of the hypotenuse are given.

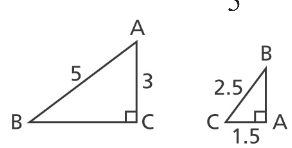
$$\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\cos A = \frac{AB}{AZ}$$

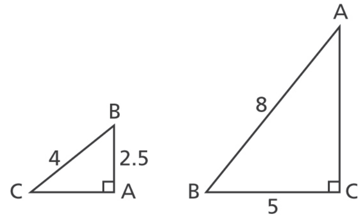
$$\cos A = \frac{2}{5}$$

$$\angle A \doteq 66°$$

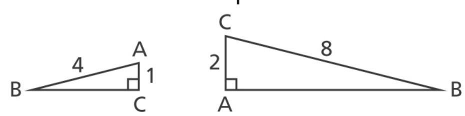
9. a) Sketch the triangles so that the ratio of the length of the side opposite ∠B to the length of the hypotenuse is $\frac{3}{5}$. For example:



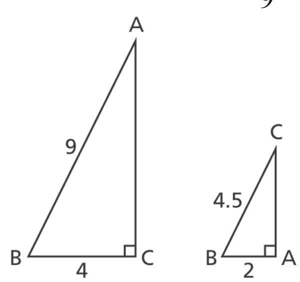
b) Sketch the triangles so that the ratio of the length of the side adjacent to ∠B to the length of the hypotenuse is $\frac{5}{8}$. For example:



c) Sketch the triangles so that the ratio of the length of the side opposite ∠B to the length of the hypotenuse is $\frac{1}{4}$. For example:



d) Sketch the triangles so that the ratio of the length of the side adjacent to ∠B to the length of the hypotenuse is $\frac{4}{9}$. For example:



10. I could use the sine and cosine ratios to determine the measures of both acute angles, or I could use the sine or cosine ratio to determine the measure of one angle and then use the fact that the sum of the angles in a triangle is 180° to determine the measure of the other angle.

a) In right △CDE:

$$\cos C = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\cos C = \frac{CD}{CE}$$

$$\cos C = \frac{2.4}{2.5}$$

$$\angle C \doteq 16.3°$$

Lesson 2.6 Applying the Trigonometric Ratios Exercises (pages 111–112)

A

3. **a)** In right $\triangle$ABC, the lengths of AC and BC are given.
AC is the hypotenuse and BC is the side opposite $\angle$A.
So, I would use the sine ratio.

b) In right $\triangle$DEF, the lengths of DE and EF are given.
DE is the side adjacent to $\angle$D and EF is the side opposite $\angle$D.
So, I would use the tangent ratio.

c) In right $\triangle$GHJ, the lengths of GH and GJ are given.
GJ is the hypotenuse and GH is the side adjacent to $\angle$G.
So, I would use the cosine ratio.

d) In right $\triangle$XYZ, the lengths of XZ and YZ are given.
YZ is the side adjacent to $\angle$Y and XZ is the side opposite $\angle$Y.
So, I would use the tangent ratio.

4. **a)** In right $\triangle$KMN, the length of KM is given and I need to determine the length of KN.
KM is the hypotenuse and KN is the side adjacent to $\angle$K.
So, I will use the cosine ratio.

$$\cos K = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\cos K = \frac{KN}{KM}$$

$$\cos 37° = \frac{m}{5.8} \qquad \text{Solve for } m.$$

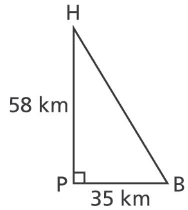
$$5.8 \cos 37° = \frac{m(5.8)}{5.8}$$

$$5.8 \cos 37° = m$$

$$m = 4.6320\ldots$$

KN is approximately 4.6 cm long.

9. Sketch and label a diagram to represent the information in the problem.



BP is the distance from the base to the sick person.
PH is the distance from the sick person to the hospital.
BH is the distance from the base to the hospital.
∠H is the angle between the path the helicopter took due north and the path it will take to return directly to its base.

a) In right △BHP, BH is the hypotenuse and BP and PH are the legs.
Use the Pythagorean Theorem.

$$BH^2 = BP^2 + PH^2$$
$$BH^2 = 35^2 + 58^2$$
$$= 4589$$
$$BH = \sqrt{4589}$$
$$= 67.7421\ldots$$

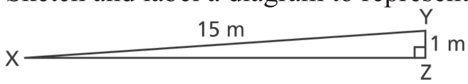
The distance between the hospital and the base is approximately 68 km.

b) In right △BHP, BP is the side opposite ∠H and PH is the side adjacent to ∠H.

$$\tan H = \frac{\text{opposite}}{\text{adjacent}}$$
$$\tan H = \frac{BP}{PH}$$
$$\tan H = \frac{35}{58}$$
$$\angle H = 31.1088\ldots°$$

The angle between the path the helicopter took due north and the path it will take to return directly to its base is approximately 31°.

10. Sketch and label a diagram to represent the information in the problem.



XY is the distance travelled along the road.
YZ is the rise of the road.
XZ is the horizontal distance travelled.
$\angle X$ is the angle of inclination of the road.

a) In right $\triangle XYZ$, YZ is the side opposite $\angle X$ and XY is the hypotenuse.

$$\sin X = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\sin X = \frac{YZ}{XY}$$

$$\sin X = \frac{1}{15}$$

$$\angle X = 3.8225\ldots°$$

The angle of inclination of the road is approximately 4°.

b) In right $\triangle XYZ$, XY is the hypotenuse and XZ and YZ are the legs.
Use the Pythagorean Theorem.

$$XY^2 = XZ^2 + YZ^2$$ Isolate the unknown.

$$XZ^2 = XY^2 - YZ^2$$

$$XZ^2 = 15^2 - 1^2$$

$$= 224$$

$$XZ = \sqrt{224}$$

$$= 14.9666\ldots$$

The horizontal distance travelled is approximately 15.0 m.