STUDY GUIDE

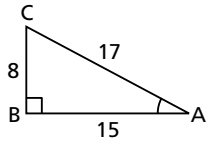
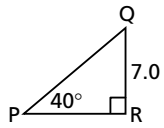
CONCEPT SUMMARY

Big Ideas	Applying the Big Ideas
In a right triangle: ■ The ratio of any two sides remains constant if the triangle is enlarged or reduced.	This means that: ■ The size of the triangle does not affect the value of any trigonometric ratio of an acute angle in the triangle.
■ You can use the ratio of the lengths of two sides to determine the measure of one of the acute angles.	■ If the tangent ratio, sine ratio, or cosine ratio of an angle is known, the related inverse operation — $\tan^{-1}$, $\sin^{-1}$, or $\cos^{-1}$ — on a scientific calculator can be used to determine the measure of the angle.
■ You can use the length of one side and the measure of an acute angle to determine the length of another side of the triangle.	■ You can use the definition of the tangent ratio, sine ratio, or cosine ratio to create an equation. You can then solve this equation to determine the unknown side length.
■ You can use the primary trigonometric ratios to solve problems that can be represented using right triangles.	■ You can solve problems that involve more than one right triangle by applying the trigonometric ratios to one triangle at a time.

Reflect on the Chapter

- How were the properties of similar triangles used to establish the meaning of the sine, cosine, and tangent ratios?
- When you used the trigonometric ratios to solve a problem, why was it important to be able to sketch the situation to show the given information?

SKILLS SUMMARY

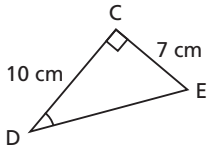
Skill	Description	Example
Calculate a trigonometric ratio. [2.1, 2.4]	$\tan A = \frac{\text{opposite}}{\text{adjacent}}$ $\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$ $\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$	 $\tan A = \frac{\text{opposite}}{\text{adjacent}}$ $\tan A = \frac{BC}{BA}$ $\tan A = \frac{8}{15}$, or $0.5\overline{3}$
Determine the measure of an angle. [2.1, 2.4]	In right $\triangle ABC$, to determine the measure of acute $\angle A$ when you are given: ■ the length of the adjacent leg, AB ■ the length of the hypotenuse, AC **1.** Determine cos A using the given lengths. **2.** Use $\cos^{-1}$ on a scientific calculator to determine the measure of $\angle A$.	In $\triangle ABC$ above, $\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$ $\cos A = \frac{AB}{AC}$ $\cos A = \frac{15}{17}$ $\angle A \doteq 28°$
Determine the length of a side. [2.2, 2.3, 2.5]	In right $\triangle PQR$, to determine the length of the hypotenuse QP when you are given: ■ the measure of $\angle P$ and ■ the length of the leg QR **1.** Identify the trigonometric ratio to use, then write an equation. **2.** Substitute the known values. **3.** Solve the equation for the unknown length. Then, if you need to determine the length of the leg PR: **4.** Use a trigonometric ratio, or use the Pythagorean Theorem.	 $\sin P = \frac{\text{opposite}}{\text{hypotenuse}}$ $\sin P = \frac{QR}{QP}$ $\sin 40° = \frac{7}{QP}$ $QP = \frac{7}{\sin 40°}$ $QP \doteq 10.9$

REVIEW

2.1

1. Determine each indicated angle to the nearest degree.

a)



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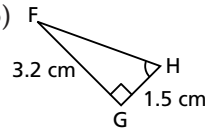


2. **a)** Is tan 20° greater than or less than 1?
b) Is tan 70° greater than or less than 1?
c) How could you answer parts a and b if you did not have a calculator? Sketch a right triangle to illustrate your answer.

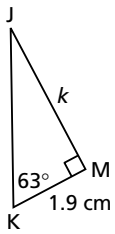
3. A road rises 15 m for each 150 m of horizontal distance. What is the angle of inclination of the road to the nearest degree?

4. Sketch a triangle to show that tan 45° = 1. Describe the triangle.

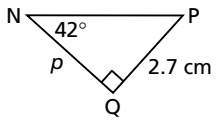
2.2

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

i)



ii)

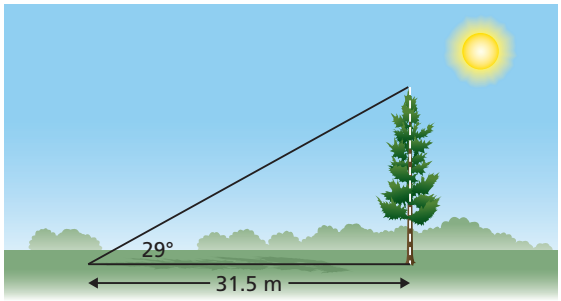


b) Use the Pythagorean Theorem to determine the length of the hypotenuse of each triangle in part a. What other strategy could you have used to determine each length?

6. At a point 100 m from the base of the Eiffel tower, the angle of elevation of the top of the tower is 73°. How tall is the tower to the nearest metre?

7. The shorter side of a rectangle is 5.7 cm. The angle between this side and a diagonal is 64°.
a) Determine the length of the rectangle.
b) Determine the length of a diagonal.
State the answers to the nearest tenth of a centimetre.

8. A tree casts a shadow that is 31.5 m long when the angle between the sun's rays and the ground is 29°. What is the height of the tree to the nearest tenth of a metre?



9. Aidan knows that the observation deck on the Vancouver Lookout is 130 m above the ground. He measures the angle between the ground and his line of sight to the observation deck as 77°. How far is Aidan from the base of the Lookout to the nearest metre?

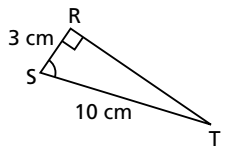
2.3

10. Use your drinking-straw clinometer to measure the height of your gymnasium to the nearest tenth of a metre. Explain your strategy. Include a sketch that shows all the measurements you made or calculated.

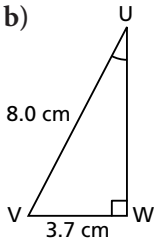
2.4

11. Determine the measure of each indicated angle to the nearest degree. Which trigonometric ratio did you use each time? Explain why.

a)



b)



12. Sketch and label right $\triangle BCD$ with BC = 5 cm, CD = 12 cm, and BD = 13 cm.

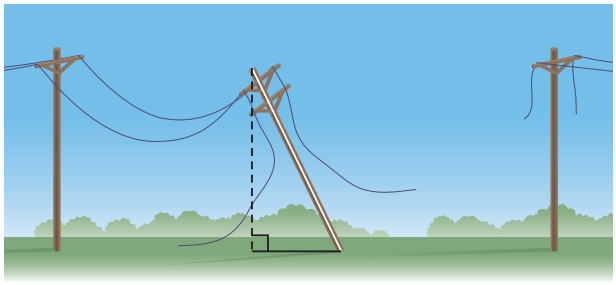
a) What is the value of each ratio?

i) sin D **ii)** sin B

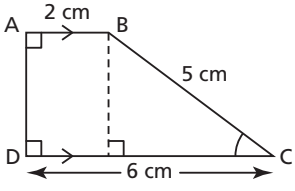
iii) cos B **iv)** cos D

b) How are the ratios in part a related? Explain why this relationship occurs.

13. During a storm, a 10.0-m telephone pole was blown off its vertical position. The top of the pole was then 9 m above the ground. What was the angle of inclination of the pole to the nearest tenth of a degree?



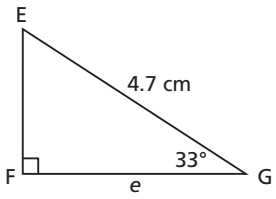
14. Determine the measure of $\angle C$ in this trapezoid. Give your answer to the nearest tenth of a degree. Describe your strategy.



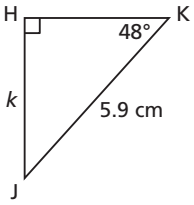
2.5

15. Determine the length of each indicated side to the nearest tenth of a centimetre. Which trigonometric ratio did you use each time? Explain why.

a)



b)



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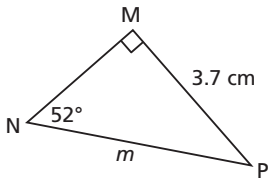

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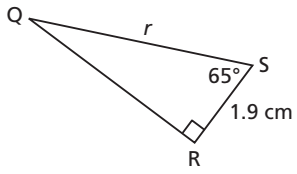
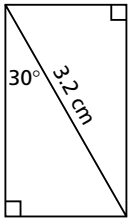


16. A ship is sailing off the west shore of Hudson Bay. At a certain point, the ship is 4.5 km due east of the town of Arviat. The ship then sails due north until the angle between the path of the ship and the line of sight to Arviat is 48.5°. How far is the ship from Arviat? State the answer to the nearest tenth of a kilometre.

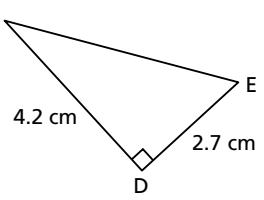
17. Determine the dimensions of this rectangle to the nearest tenth of a centimetre.



2.6

18. Solve each right triangle. State the measures to the nearest tenth.

a)



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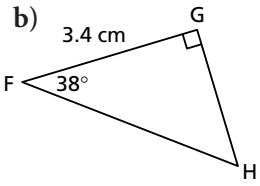

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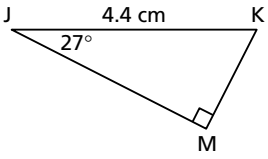
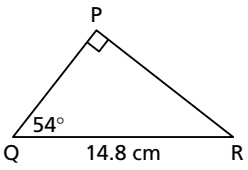


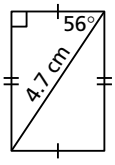
19. In Italy, the Leaning Tower of Pisa currently leans 13 ft. off the vertical. The tower is 183 ft. tall. What is its angle of inclination to the nearest tenth of a degree?

20. Determine the perimeter and area of each shape. Give the measures to the nearest tenth.

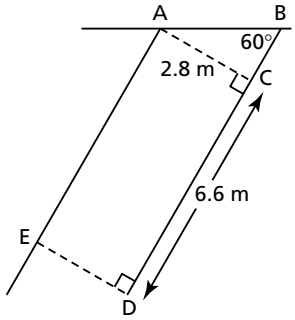
a)



b)



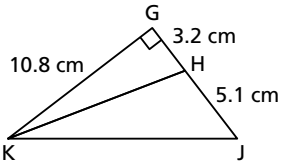
21. Cars are parked at an angle to the street. The diagram shows a parking space.



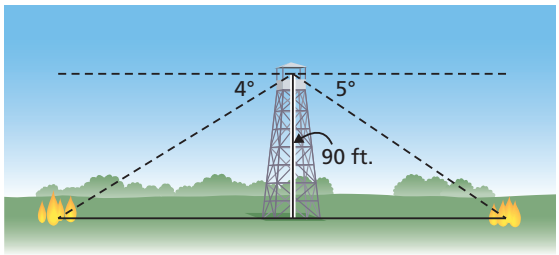
a) What is the length, AB?
b) What is the length, BD?
Give the measures to the nearest tenth of a metre.

2.7

22. In the diagram below, determine each measure.
a) KJ **b)** HK **c)** ∠HKJ
Give the measures to the nearest tenth.



23. A fire ranger is at the top of a 90-ft. observation tower. She observes smoke due east at an angle of depression of 5° and due west at an angle of depression of 4°. How far apart are the fires to the nearest foot? The diagram is *not* drawn to scale.



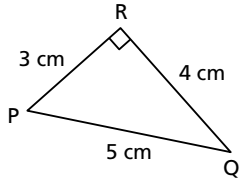
PRACTICE TEST

For questions 1 and 2, choose the correct answer: A, B, C, or D

1. For $\triangle PQR$, how many of these statements are true?

$\tan Q = \frac{3}{4}$ $\quad \sin P = \frac{3}{5}$

$\sin Q = \frac{3}{5}$ $\quad \tan P = \frac{4}{3}$



A. All are true. **B.** 3 are true. **C.** 2 are true. **D.** 1 is true.

2. In right $\triangle PQR$, with $\angle Q = 90°$, which statement is true?
As $\angle P$ increases:

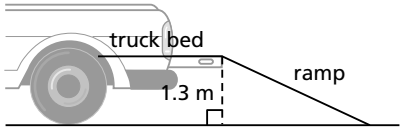
A. tan P decreases **B.** sin P decreases

C. cos P decreases **D.** cos P increases

3. Triangle ABC is similar to $\triangle XYZ$ and $\angle A = \angle X = 90°$.
Use a diagram to explain why sin B = sin Y.

4. In right $\triangle DEF$, $\angle E = 90°$, $\angle F = 63°$, and DF = 7.8 cm. Solve this triangle. State the measures to the nearest tenth.

5. A ramp is used to load a snowmobile onto the back of a pickup truck. The truck bed is 1.3 m above the ground. For safety, the angle of inclination of the ramp should be less than 40°. What is the shortest possible length of the ramp to the nearest centimetre? Explain why.



6. A student uses a clinometer to measure the angle of elevation of a sign that marks the point on a tower that is 50 m above the ground. The angle of elevation is 37° and the student holds the clinometer 1.5 m above the ground. She then measures the angle of elevation of the top of the tower as 49°. Determine the height of the tower to the nearest tenth of a metre. The diagram is *not* drawn to scale.