

Name _____

6.3 Right Triangles and the Tangent Ratio

MATHPOWER™ Nine, pp. 236–238

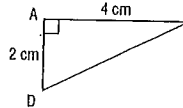
One example of a trigonometric ratio is the tangent ratio.

In a right triangle, the tangent ratio of an acute angle is defined as

$$\frac{\text{side opposite the angle}}{\text{side adjacent to the angle}}$$

In $\triangle FGH$, the tangent ratio of $\angle H$ is $\frac{FG}{GH}$.

In $\triangle FGH$, the tangent ratio of $\angle F$ is $\frac{GH}{FG}$.



Use a calculator to find the tangent of each angle, to three decimal places.

1. 37° 0.754 2. 84° 9.514
 3. 15° 0.268 4. 45° 1
 5. 60° 1.732 6. 72° 3.078

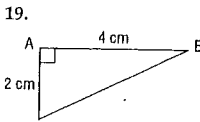
Find $\angle K$, to the nearest degree.

7. $\tan K = 0.575$ 30° 8. $\tan K = 0.243$ 14°
 9. $\tan K = 1.925$ 63° 10. $\tan K = 2.750$ 70°
 11. $\tan K = 3.198$ 73° 12. $\tan K = 50.375$ 89°

Find $\angle Q$, to the nearest degree.

13. $\tan Q = \frac{1}{3}$ 18° 14. $\tan Q = \frac{5}{8}$ 32°
 15. $\tan Q = \frac{5}{4}$ 51° 16. $\tan Q = \frac{12}{5}$ 67°
 17. $\tan Q = \frac{49}{9}$ 80° 18. $\tan Q = \frac{89}{2}$ 89°

Calculate $\tan D$ and $\angle D$ and $\tan E$ and $\angle E$. Round each angle measure, to the nearest degree.



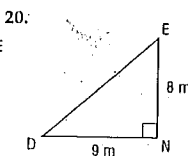
$$\tan D = \frac{2}{4} = \frac{1}{2}$$

$$\angle D = 63^\circ$$

$$\tan E = \frac{4}{2} = 2$$

$$\angle E = 27^\circ$$

72



$$\tan D = \frac{8}{9}$$

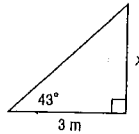
$$\angle D = 42^\circ$$

$$\tan E = \frac{9}{8}$$

$$\angle E = 48^\circ$$

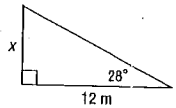
Calculate x , to the nearest tenth of a metre.

21.



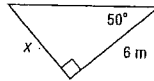
$$x = 2.8 \text{ m}$$

22.



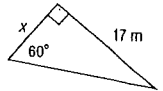
$$x = 6.4 \text{ m}$$

23.



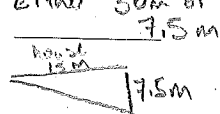
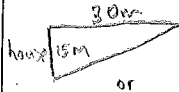
$$x = 7.2 \text{ m}$$

24.



$$x = 9.8 \text{ m}$$

25. The backyard of a home is in the shape of a right triangle in which one leg is twice as long as the other leg. If one of the legs is the side of the house, and it is 15 m long, find the length of the other leg. Draw a diagram to show the backyard.



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6.4 Right Triangles and the Sine Ratio

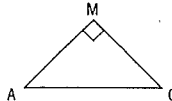
MATHPOWER™ Nine, pp. 239–241

A second example of a trigonometric ratio is the sine ratio.
 In a right triangle, the sine ratio of an acute angle is defined as

$$\frac{\text{side opposite the angle}}{\text{hypotenuse}}$$

In $\triangle MAC$, the sine ratio of $\angle A$ is $\frac{MC}{AC}$.

In $\triangle MAC$, the sine ratio of $\angle C$ is $\frac{AM}{AC}$.



Use a calculator to find the sine of each angle, to three decimal places.

1. 62° 0.883 2. 21° 0.358
 3. 85° 0.996 4. 45° 0.707
 5. 5° 0.087 6. 70° 0.940

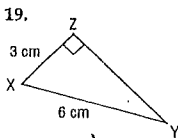
Find $\angle B$, to the nearest degree.

7. $\sin B = 0.990$ 82° 8. $\sin B = 0.208$ 12°
 9. $\sin B = 0.500$ 30° 10. $\sin B = 1.000$ 90°
 11. $\sin B = 0.345$ 20° 12. $\sin B = 0.755$ 49°

Find $\angle G$, to the nearest degree.

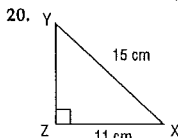
13. $\sin G = \frac{1}{2}$ 30° 14. $\sin G = \frac{2}{5}$ 24°
 15. $\sin G = \frac{4}{5}$ 53° 16. $\sin G = \frac{5}{8}$ 39°
 17. $\sin G = \frac{1}{11}$ 5° 18. $\sin G = \frac{8}{9}$ 63°

Calculate $\sin Y$. Then, find $\angle Y$, to the nearest degree.



$$\sin Y = \frac{3}{6}$$

$$\angle Y = 30^\circ$$

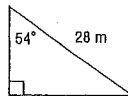


$$\sin Y = \frac{11}{15}$$

$$\angle Y = 47^\circ$$

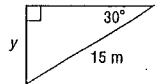
Calculate y , to the nearest hundredth of a metre.

21.



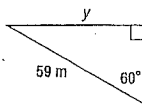
$$y = 22.7 \text{ m}$$

22.



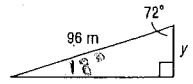
$$y = 7.5 \text{ m}$$

23.



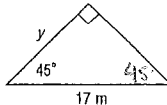
$$y = 51 \text{ m}$$

24.



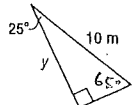
$$y = 29.7 \text{ m}$$

25.



$$y = 12 \text{ m}$$

26.



$$y = 9.1 \text{ m}$$

27. $\triangle KLM$ is an equilateral triangle. The length of each side of the triangle is 15 cm. Find the height of the triangle, to the nearest tenth of a centimetre.



$$h = 13.0 \text{ cm}$$

$$\sin 60^\circ = \frac{h}{15}$$

$$h = (15) \sin 60^\circ$$

$$= 13.0 \text{ cm}$$

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6.5 Right Triangles and the Cosine Ratio

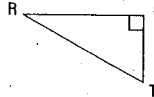
MATHPOWER™ Nine, pp. 242-244

A third example of a trigonometric ratio is the cosine ratio.

In a right triangle, the cosine ratio of an acute angle is defined as $\frac{\text{side adjacent to the angle}}{\text{hypotenuse}}$.

In $\triangle RST$, the cosine ratio of $\angle R$ is $\frac{RS}{RT}$.

In $\triangle RST$, the cosine ratio of $\angle T$ is $\frac{ST}{RT}$.



Use a calculator to find the cosine of each angle, to three decimal places.

1. 23° 0.921 2. 79° 0.191
 3. 30° 0.866 4. 50° 0.643
 5. 43° 0.731 6. 7° 0.993

Find $\angle E$, to the nearest degree.

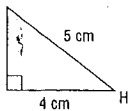
7. $\cos E = 0.982$ 11° 8. $\cos E = 0.174$ 80°
 9. $\cos E = 0.454$ 63° 10. $\cos E = 0.777$ 39°
 11. $\cos E = 0.999$ 3° 12. $\cos E = 0.009$ 89°

Find $\angle V$, to the nearest degree.

13. $\cos V = \frac{1}{4}$ 76° 14. $\cos V = \frac{7}{8}$ 29°
 15. $\cos V = \frac{2}{3}$ 48° 16. $\cos V = \frac{1}{11}$ 85°
 17. $\cos V = \frac{14}{15}$ 21° 18. $\cos V = \frac{6}{13}$ 63°

Calculate $\cos H$. Then, find $\angle H$, to the nearest degree.

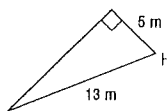
19.



$$\cos H = \frac{4}{5}$$

$$\angle H = 37^\circ$$

20.

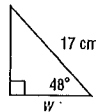


$$\cos H = \frac{5}{13}$$

$$\angle H = 67^\circ$$

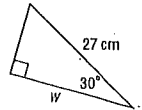
Calculate w , to the nearest tenth of a centimeter.

21.



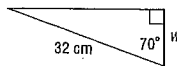
$$w = 11.4 \text{ cm}$$

22.



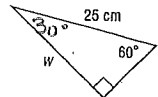
$$w = 23.4 \text{ cm}$$

23.



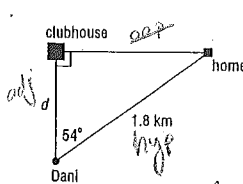
$$w = 10.9 \text{ cm}$$

24.



$$w = 21.7 \text{ cm}$$

25. Find the distance from Dani to the clubhouse.



$$\cos 54 = \frac{d}{1.8}$$

$$d = 1.8 \cos 54$$

$$= 1.1 \text{ km}$$

The distance is 1.1 km.

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6.6 Solving Right Triangles

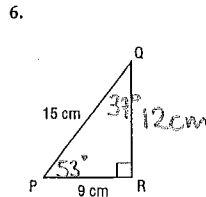
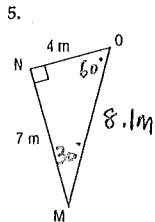
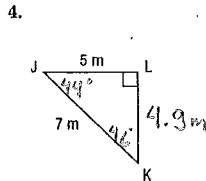
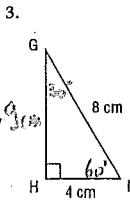
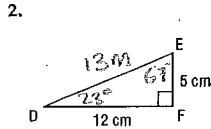
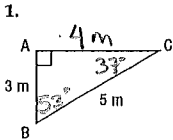
MATHPOWER™ Nine, pp. 245–247

To solve a right triangle means to find all the unknown sides and all the unknown angles.

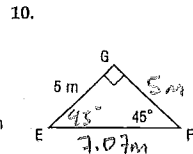
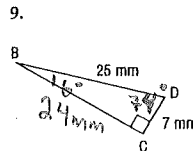
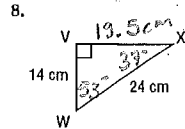
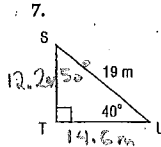
In order to solve a right triangle, you may use

- the Pythagorean Theorem
- the three trigonometric ratios, tangent, sine, and cosine
- the fact that the sum of the angles in a triangle is 180°

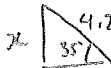
Find all the unknown angles, to the nearest degree, and all the unknown sides; to the nearest tenth of a unit.



Solve each triangle. Round each side length, to the nearest tenth of a unit, and each angle, to the nearest degree.



11. A slide that is 4.2 m long makes an angle of 35° with the ground. How high is the top of the slide above the ground?



12. A 1.4 m stake is driven into the ground at an angle of 60° to the horizontal. What is the length of its shadow at 12:00?

