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Summer Edition

Geometry

Activity 3

knoxschools.org/kcsathome

This packet includes four sections that cover the major content of Geometry. Each section includes four pages of notes and practice for each topic. For additional support, visit KCS TV on YouTube for instructional videos that accompany each section.

The following content is included in this packet:

	Section			
	Section I **Similarity**	Section II **Quadrilaterals**	Section III **Trigonometry**	Section IV **Circles**
Problem Set 1	Ratios & Proportions	The Polygon Angle-Sum Theorems	The Pythagorean Theorem and Its Converse	Tangent Lines
Problem Set 2	Similar Polygons	Properties of Parallelograms	Special Right Triangles	Chords and Arcs
Problem Set 3	Proving Triangles Similar	Proving That a Quadrilateral is a Parallelogram	Trigonometry and Angles of Elevation & Depression	Inscribed Angles
Problem Set 4	N/A	Properties of Rhombuses, Rectangles, and Squares	Law of Sines and Cosines	Angle Measures and Segments

Geometry

SECTION III

Trigonometry
• The Pythagorean Theorem and Its Converse • Special Right Triangles • Trigonometry and Angles of Elevation & Depression • Law of Sines and Cosines

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III Trigonometry

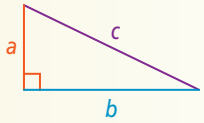
Connecting BIG ideas and Answering the Essential Questions

1 Measurement
Use the Pythagorean Theorem or trigonometric ratios to find a side length or angle measure of a right triangle. The Law of Sines and the Law of Cosines can be used to find missing side lengths and angle measures of any triangle.

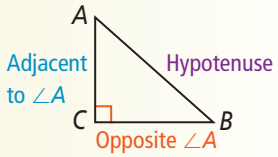
2 Similarity
A trigonometric ratio compares the lengths of two sides of a right triangle. The ratios remain constant within a group of similar right triangles.

The Pythagorean Theorem (Lesson 8-1)

$a^2 + b^2 = c^2$



Trigonometry (Lesson 8-3)

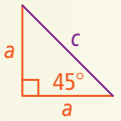


$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$$

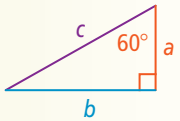
$$\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan A = \frac{\text{opposite}}{\text{adjacent}}$$

Special Triangles (Lesson 8-2)

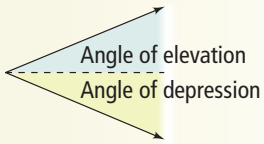


$c = a\sqrt{2}$



$c = 2a$
$b = a\sqrt{3}$

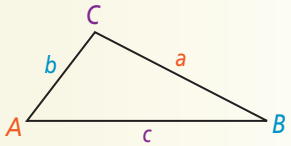
Angles of Elevation and Depression (Lesson 8-4)



Law of Sines and Law of Cosines (Lessons 8-5 and 8-6)

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$
$$b^2 = a^2 + c^2 - 2ac\cos B$$
$$c^2 = a^2 + b^2 - 2ab\cos C$$



Chapter Vocabulary

- angle of depression (p. 516)
- angle of elevation (p. 516)
- cosine (p. 507)
- Law of Cosines (p. 526)
- Law of Sines (p. 522)
- Pythagorean triple (p. 492)
- sine (p. 507)
- tangent (p. 507)
- trigonometric ratios (p. 507)

Choose the correct term to complete each sentence.

1. ? are equivalent ratios for the corresponding sides of two triangles.
2. A(n) ? is formed by a horizontal line and the line of sight above that line.
3. A set of three nonzero whole numbers that satisfy $a^2 + b^2 = c^2$ form a(n) ? .

8-1 The Pythagorean Theorem and Its Converse

Quick Review

The **Pythagorean Theorem** holds true for any right triangle.

$$(\text{leg}_1)^2 + (\text{leg}_2)^2 = (\text{hypotenuse})^2$$

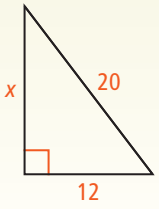
$$a^2 + b^2 = c^2$$

The Converse of the Pythagorean Theorem states that if $a^2 + b^2 = c^2$, where c is the greatest side length of a triangle, then the triangle is a right triangle.

Example

What is the value of x?

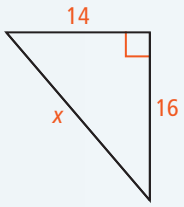
$a^2 + b^2 = c^2$	Pythagorean Theorem
$x^2 + 12^2 = 20^2$	Substitute.
$x^2 = 256$	Simplify.
$x = 16$	Take the square root.



Exercises

Find the value of x. If your answer is not an integer, express it in simplest radical form.

4.



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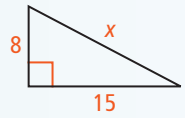

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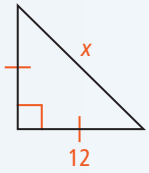

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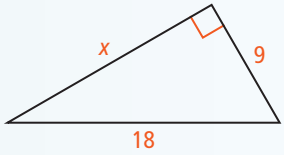


8-2 Special Right Triangles

Quick Review

45°-45°-90° Triangle

$$\text{hypotenuse} = \sqrt{2} \cdot \text{leg}$$

30°-60°-90° Triangle

$$\text{hypotenuse} = 2 \cdot \text{shorter leg}$$

$$\text{longer leg} = \sqrt{3} \cdot \text{shorter leg}$$

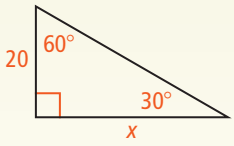
Example

What is the value of x?

The triangle is a 30°-60°-90° triangle, and x represents the length of the longer leg.

$$\text{longer leg} = \sqrt{3} \cdot \text{shorter leg}$$

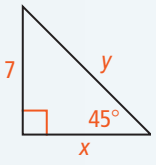
$$x = 20\sqrt{3}$$



Exercises

Find the value of each variable. If your answer is not an integer, express it in simplest radical form.

8.



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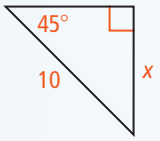

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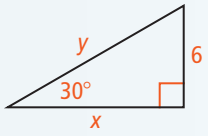

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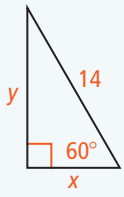


12. A square garden has sides 50 ft long. You stretch a hose from one corner of the garden to another corner along the garden's diagonal. To the nearest tenth, how long is the hose?

8-3 and 8-4 Trigonometry and Angles of Elevation and Depression

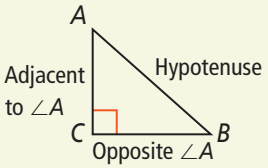
Quick Review

In right $\triangle ABC$, C is the right angle.

$$\sin \angle A = \frac{\text{leg opposite } \angle A}{\text{hypotenuse}}$$

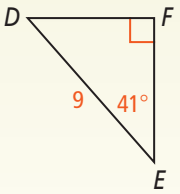
$$\cos \angle A = \frac{\text{leg adjacent to } \angle A}{\text{hypotenuse}}$$

$$\tan \angle A = \frac{\text{leg opposite } \angle A}{\text{leg adjacent to } \angle A}$$



Example

What is *FE* to the nearest tenth?



You know the length of the hypotenuse, and $\overline{FE}$ is the side adjacent to $\angle E$.

$\cos 41° = \frac{FE}{9}$ Use cosine.

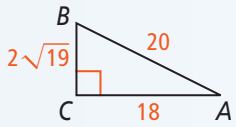
$FE = 9(\cos 41°)$ Multiply each side by 9.

$FE \approx 6.8$ Use a calculator.

Exercises

Express $\sin A$, $\cos A$, and $\tan A$ as ratios.

13.



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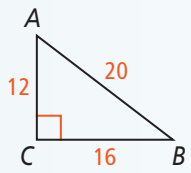
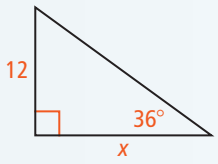


Find the value of x to the nearest tenth.

15.



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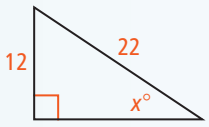


17. While flying a kite, Linda lets out 45 ft of string and anchors it to the ground. She determines that the angle of elevation of the kite is 58°. What is the height of the kite from the ground? Round to the nearest tenth.

8-5 and 8-6 Law of Sines and Law of Cosines

Quick Review

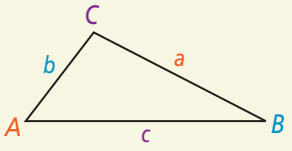
In $\triangle ABC$, a, b, and c are the lengths of the sides opposite $\angle A$, $\angle B$, and $\angle C$, respectively. The Law of Sines and the Law of Cosines are summarized below.

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$



Example

What is *GH*?

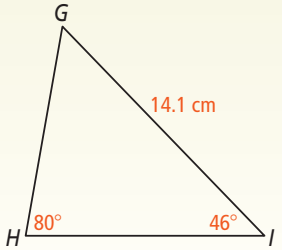
Use the Law of Sines to find GH.

$$\frac{\sin 46°}{GH} = \frac{\sin 80°}{14.1}$$

$$GH \sin 80° = 14.1 \sin 46°$$

$$0.9848\,GH = 10.1427$$

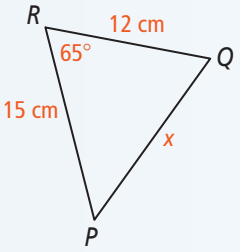
$$GH \approx 10.3$$



Exercises

Find the value of x to the nearest tenth.

18.



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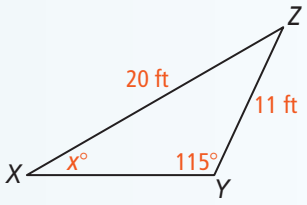

20. In $\triangle DEF$, sides d, e, and f are opposite $\angle D$, $\angle E$, and $\angle F$ respectively. The side lengths are $d = 25$ in., $e = 18$ in., and $f = 20$ in. Find the $m\angle D$ to the nearest tenth.

21. In $\triangle LMN$, sides ℓ, m, and n are opposite $\angle L$, $\angle M$, and $\angle N$ respectively. You know that $m = 3$ cm, $n = 8$ cm, and $m\angle L = 72°$. Find the $m\angle N$ to the nearest tenth.

Section III - Trigonometry

1. Trigonometric ratios
2. Angle of elevation
3. Pythagorean Triple
4. $x = 2\sqrt{113}$
5. $x = 17$
6. $x = 12\sqrt{2}$
7. $x = 9\sqrt{3}$
8. x = 7, $y = 7\sqrt{2}$
9. $x = 5\sqrt{2}$
10. y = 12, x = $6\sqrt{3}$
11. x = 7, y = $7\sqrt{3}$
12. $d \approx 70.7\ ft$
13. $\sin A = \frac{\sqrt{19}}{10}, \cos A = \frac{9}{10}, \tan A = \frac{\sqrt{19}}{9}$
14. $\sin A = \frac{4}{5}, \cos A = \frac{3}{5}, \tan A = \frac{4}{3}$
15. $x \approx 16.5$
16. $x \approx 33$
17. $h \approx 38.2\ ft$
18. $x \approx 17.43$
19. $x \approx 29.898$
20. $D \approx 82.097\ degrees$
21. N≈ $85.69\ degrees$