Law of Sines and Law of Cosines Worksheet

Geometry · Common Core HSG-SRT.D.11

> Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

Practice

Builds the skill step by step.

1. Which equation is the Law of Sines?

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

   B. $a \div A = b \div B$

   C. $\sin A + \sin B + \sin C = 1$

   D. $a \div \sin A = b \div \sin B = c \div \sin C$

2. Which equation is the Law of Cosines?

   A. $c = a + b - \cos C$

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

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

   D. $c \div \cos C = a \div \cos A$

3. In $\triangle ABC$, $A = 30°$, $B = 45°$ and $a = 10$. Use $\sin 30° \approx 0.5000$ and $\sin 45° \approx 0.7071$. Use the Law of Sines to find b, rounded to the nearest tenth.

4. In $\triangle ABC$, $A = 40°$, $B = 60°$ and $a = 10$. Use $\sin 40° \approx 0.6428$ and $\sin 60° \approx 0.8660$. Use the Law of Sines to find b, rounded to the nearest tenth.

5. In $\triangle ABC$, $a = 5$, $b = 7$ and $C = 60°$. Use $\cos 60° \approx 0.5000$. Use the Law of Cosines to find c, rounded to the nearest tenth.

6. In $\triangle ABC$, $a = 3$, $b = 4$ and $C = 90°$. Use the Law of Cosines ($\cos 90° = 0$). What is c?

7. You know two angles and one side of a triangle. Which law should you use first?

   A. the Law of Sines

   B. the Law of Cosines

   C. the Pythagorean Theorem

   D. neither; you can't solve it

8. You know two sides and the included angle. Which law finds the third side?

   A. the triangle angle sum

   B. the Law of Sines

   C. the Law of Cosines

   D. AA similarity

9. In $\triangle ABC$, $a = 8$, $b = 6$ and $C = 40°$. Use $\cos 40° \approx 0.7660$. Use the Law of Cosines to find c, rounded to the nearest tenth.

10. In $\triangle ABC$, $A = 50°$ and $B = 70°$. What is C?

ALBERT

Name _____ Date _____

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On Level

Grade-level practice.

1. In △ABC, A = 35°, B = 80° and a = 12. Use sin 35° ≈ 0.5736 and sin 80° ≈ 0.9848. Use the Law of Sines to find b, rounded to the nearest tenth.

2. In △ABC, a = 10, b = 12 and C = 110°. Use cos 110° ≈ -0.3420. Use the Law of Cosines to find c, rounded to the nearest tenth.

3. In △ABC, a = 7, b = 8 and c = 9. Find cos C as a fraction in simplest form.

4. In △ABC, A = 25°, B = 105° and a = 20. Use sin 25° ≈ 0.4226 and sin 105° ≈ 0.9659. Use the Law of Sines to find b, rounded to the nearest tenth.

5. You know all three sides of a triangle. Which law finds an angle?

   A. the Law of Cosines

   B. the Law of Sines

   C. AA similarity

   D. the angle sum alone

6. In $\triangle ABC$, $a = 15$, $b = 9$ and $C = 35°$. Use $\cos 35° \approx 0.8192$. Use the Law of Cosines to find c, rounded to the nearest tenth.

7. Two hikers leave camp. One walks 3 km and the other 5 km, on paths 60° apart. Use $\cos 60° = 0.5$. How far apart are they? Give the exact value.

8. In $\triangle ABC$, $A = 45°$, $B = 75°$ and $a = 14$. Use $\sin 45° \approx 0.7071$ and $\sin 75° \approx 0.9659$. Use the Law of Sines to find b, rounded to the nearest tenth.

9. In $\triangle ABC$, $a = 5$, $b = 5$ and $c = 5$. Find $\cos C$.

10. In $\triangle ABC$, $a = 20$, $b = 25$ and $C = 95°$. Use $\cos 95° \approx -0.0872$. Use the Law of Cosines to find c, rounded to the nearest tenth.

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Challenge

Multi-step and word problems that stretch it.

1. In $\triangle ABC$, $A = 40°$, $B = 65°$ and $a = 30$. Use $\sin 40° \approx 0.6428$ and $\sin 65° \approx 0.9063$. Use the Law of Sines to find b, rounded to the nearest tenth.

2. A surveyor stands at A, 200 m from point B across a pond. $\angle A = 70°$ and $\angle B = 60°$ in $\triangle ABC$, where C is a tree across the pond. Use $\sin 50° \approx 0.7660$ and $\sin 60° \approx 0.8660$. How far is the tree from A, to the nearest tenth?

3. Two forces of 30 N and 40 N act on an object with 60° between them. The size of the combined force is $\sqrt{(30^2 + 40^2 + 2(30)(40)\cos 60°)}$. Use $\cos 60° = 0.5$. What is it, to the nearest tenth?

4. In $\triangle ABC$ you know a, b and angle A, with A acute and $a < b$. Why might there be two different triangles?

   A. There is always exactly one triangle.

   B. The side opposite A can swing to meet the third side in two places (the SSA ambiguous case).

   C. Because angle A could be obtuse.

   D. Because the Law of Cosines always gives two answers.

5. In $\triangle ABC$, $a = 9$, $b = 14$ and $C = 120°$. Use $\cos 120° \approx -0.5000$. Use the Law of Cosines to find c, rounded to the nearest tenth.

6. In $\triangle ABC$, $a = 6$, $b = 10$ and $c = 14$. Find angle C. (Hint: compute cos C.)

7. In $\triangle ABC$, $A = 28°$, $B = 112°$ and $a = 15$. Use $\sin 28° \approx 0.4695$ and $\sin 112° \approx 0.9272$. Use the Law of Sines to find b, rounded to the nearest tenth.

8. In $\triangle ABC$, $A = 30°$, $a = 5$ and $b = 10$. Use $\sin 30° = 0.5$. What is B?

9. In $\triangle ABC$, $a = 30$, $b = 40$ and $C = 80°$. Use $\cos 80° \approx 0.1736$. Use the Law of Cosines to find c, rounded to the nearest tenth.

10. Explain why the Law of Cosines becomes the Pythagorean Theorem when $C = 90°$.