RLP-GEOA · RLP Geometry A — Transformations, Congruence, Similarity and Trigonometry

Unit 4: Right-Triangle Trigonometry

Practice Workbook. The same problems, in the same order, as the Practice sections of the online lessons.

Name _____ Period _____

Lesson 4.1 — Trigonometric Ratios from Similar Right Triangles

FLUENCY

1. In a right triangle, an acute angle is 42° and the adjacent leg is 32. Find the opposite leg. Round to the nearest tenth.

2. In a right triangle, an acute angle is 24° and the hypotenuse is 32. Find the side adjacent to the angle. Round to the nearest tenth.

3. In a right triangle, an acute angle is 53° and the adjacent leg is 11. Find the opposite leg. Round to the nearest tenth.

4. In a right triangle, an acute angle is 32° and the hypotenuse is 32. Find the side opposite the angle. Round to the nearest tenth.

5. In a right triangle, an acute angle is $66°$ and the hypotenuse is 20. Find the side adjacent to the angle. Round to the nearest tenth.

6. In a right triangle, an acute angle is $52°$ and the side opposite it is 35. Find the hypotenuse. Round to the nearest tenth.

7. A right triangle has legs 8 and 15 and hypotenuse 17. For the angle A opposite the side 8, give $\sin A$, $\cos A$ and $\tan A$ as fractions.

8. In the same triangle, give $\sin B$ and $\cos B$ for the other acute angle. What do you notice?

9. $\sin 28° = \cos$?

10. If $\cos x = 0.42$ for an acute angle x, find $\sin(90° - x)$.

APPLICATION

11. A 6 m ladder leans against a wall at 70° to the ground. How high up the wall does it reach, to the nearest hundredth of a meter?

12. Two right triangles each have a 40° angle; one has hypotenuse 5, the other hypotenuse 12. Without a calculator, explain why (opposite ÷ hypotenuse) is the same in both. Then find each opposite side to the nearest hundredth.

13. A student says sin 50° = cos 50° because the angles are the same. Correct the claim and give the angle whose cosine equals sin 50°.

CHALLENGE

14. Prove that $(\sin A)^2 + (\cos A)^2 = 1$ for any acute angle A.

REVIEW

15. Triangle ABC is similar to triangle DEF. $AB = 24$ and the corresponding side $DE = 12$. If $BC = 24$, find EF, and the ratio of the triangles' areas.

16. Dilate $(-2, 7)$ from the origin with scale factor 3.

17. $DE \parallel BC$ with $AD = 2$, $DB = 5$ and $AE = 3$. Find EC.

Lesson 4.2 — Special Right Triangles and Solving Right Triangles

FLUENCY

1. A 30°-60°-90° triangle has shorter leg 6. Find the longer leg and the hypotenuse.

2. A 45°-45°-90° triangle has legs of length 10. Find the hypotenuse.

3. A 45°-45°-90° triangle has legs of length 6. Find the hypotenuse.

4. A 30°-60°-90° triangle has longer leg $4\sqrt{3}$. Find the shorter leg and the hypotenuse.

5. A 30°-60°-90° triangle has shorter leg 2. Find the longer leg and the hypotenuse.

6. A 30°-60°-90° triangle has hypotenuse 12. Find both legs.

7. A right triangle has hypotenuse 10 and the leg adjacent to angle A is 8. Find angle A. Round to the nearest tenth of a degree.

8. A right triangle has hypotenuse 10 and the leg adjacent to angle A is 3. Find angle A. Round to the nearest tenth of a degree.

9. A right triangle has hypotenuse 27 and the leg adjacent to angle A is 8. Find angle A. Round to the nearest tenth of a degree.

10. A right triangle has hypotenuse 29 and the leg opposite angle A is 12. Find angle A. Round to the nearest tenth of a degree.

APPLICATION

11. A square room is 12 ft on each side. How long is its diagonal, exactly and to the nearest tenth?

12. An A-frame tent's front is an equilateral triangle with sides 2.4 m. How tall is the tent, exactly and to the nearest hundredth?

13. *(Illustrative.)* A skate ramp rises 0.9 m over a horizontal run of 2.4 m. Find the angle it makes with the ground and the length of the ramp surface.

CHALLENGE

14. Find the exact area of a regular hexagon with side 6, then give a decimal to the nearest hundredth.

REVIEW

15. Triangle ABC is similar to triangle DEF. $AB = 8$ and the corresponding side $DE = 12$. If $BC = 14$, find EF, and the ratio of the triangles' areas.

16. The altitude to the hypotenuse cuts it into segments 5 and 20. Find the altitude.

17. Which criterion shows two triangles with angles 35°, 80° and 35°, 65° are similar?

Lesson 4.3 — Area with Sine and the Law of Sines

FLUENCY

1. Find the area of a triangle with sides 9 and 14 and an included angle of 35°. Round to the nearest tenth.

2. Find the area of a triangle with sides 12 and 12 and an included angle of 120°. Round to the nearest tenth.

3. Find the area of a triangle with sides 7 and 10 and an included angle of 58°. Round to the nearest tenth.

4. In $\triangle ABC$, $A = 35°$, $B = 80°$ and $a = 12$. Find C, b and c to the nearest tenth.

5. In $\triangle ABC$, $A = 48°$, $B = 62°$ and $a = 20$. Find C, b and c to the nearest tenth.

6. In $\triangle ABC$, $A = 25°$, $B = 110°$ and $a = 9$. Find C, b and c to the nearest tenth.

APPLICATION

7. *(Illustrative.)* A triangular lot has two sides of 40 m and 55 m meeting at a 72° corner. Find its area to the nearest square meter.

8. Two lookout towers 8 km apart both see a fire. The angle at tower A between the line to tower B and the fire is $52°$; at tower B it is $61°$. How far is the fire from tower A?

9. A triangle has $A = 30°$, $a = 5$ and $b = 8$. How many triangles are possible? Explain with the height from C.

CHALLENGE

10. Derive the Law of Sines for $\triangle ABC$ with acute angles A and B, using the altitude from C.

REVIEW

11. Triangle ABC is similar to triangle DEF. $AB = 24$ and the corresponding side $DE = 12$. If $BC = 18$, find EF, and the ratio of the triangles' areas.

12. A 30-60-90 triangle has shorter leg 7. Find the hypotenuse and the longer leg.

Lesson 4.4 — Ramps, Heights and Surveys: Trigonometry Applied

FLUENCY

1. In a right triangle, an acute angle is 40° and the hypotenuse is 7. Find the side opposite the angle. Round to the nearest tenth.

2. In a right triangle, an acute angle is 27° and the hypotenuse is 17. Find the side adjacent to the angle. Round to the nearest tenth.

3. In a right triangle, an acute angle is 59° and the hypotenuse is 35. Find the side opposite the angle. Round to the nearest tenth.

4. A right triangle has legs 12 (opposite angle A) and 16 (adjacent to A). Find angle A. Round to the nearest tenth of a degree.

5. A right triangle has legs 5 (opposite angle A) and 17 (adjacent to A). Find angle A. Round to the nearest tenth of a degree.

6. Two sides of a triangle are 8 and 11 with an included angle of 50°. Find the third side to the nearest tenth.

7. Two sides of a triangle are 15 and 20 with an included angle of 100°. Find the third side to the nearest tenth.

8. Two sides of a triangle are 6 and 9 with an included angle of 35°. Find the third side to the nearest tenth.

9. A triangle has sides 7, 9 and 12. Find its largest angle to the nearest tenth of a degree.

APPLICATION

10. Under the 2010 ADA Standards a ramp's running slope may be at most 1:12. A school stage is 18 inches high. Find the minimum horizontal run (in feet) and the ramp length to the nearest inch.

11. From 25 m away on level ground, the angle of elevation to the top of a water tower is 57°, measured at an eye height of 1.5 m. How tall is the tower?

12. A surveyor at C measures CA = 210 m, CB = 165 m and angle ACB = 48° to points on opposite sides of a pond. Find AB.

CHALLENGE

13. Prove the Law of Cosines for acute angle C using the altitude from B to side AC.

REVIEW

14. Triangle ABC is similar to triangle DEF. AB = 15 and the corresponding side DE = 20. If BC = 30, find EF, and the ratio of the triangles' areas.

15. A 45-45-90 triangle has hypotenuse 10. Find each leg exactly.

Unit 4 checkpoint

1. In a right triangle with legs 7 and 24 and hypotenuse 25, what is sin A for the angle opposite 7?
   A. 7/24
   B. 24/25
   C. 7/25
   D. 25/7
2. sin 33° = cos _____°.
3. True or false: The ratio opposite/hypotenuse for a 40° angle is the same in every right triangle with a 40° angle.
4. A 30-60-90 triangle has hypotenuse 18. The longer leg is:
   A. 9
   B. 9√3
   C. 18√3
   D. 9√2
5. A 45-45-90 triangle has legs 11. Its hypotenuse is 11√_____.
6. A right triangle has legs 9 and 12. What is the angle opposite the side 9, to the nearest tenth?
   A. 36.9°
   B. 53.1°
   C. 41.4°
   D. 48.6°
7. The area of a triangle with sides 10 and 6 and an included angle of 30° is _____.
8. Which law starts a triangle with two sides and the included angle?
   A. Law of Sines
   B. Law of Cosines
   C. Pythagorean Theorem only
   D. AA
9. True or false: When C = 90°, the Law of Cosines becomes the Pythagorean Theorem.
10. In △ABC, A = 40°, B = 60° and a = 10. Which is b, to the nearest tenth?
    A. 13.5
    B. 7.4
    C. 15.3
    D. 11.1
11. Under a 1:12 slope limit, a 24-inch rise needs at least _____ inches of run.

12. True or false: Your calculator must be in degree mode for sin 30° to give 0.5.