

Geometry · Law of Sines, Law of Cosines and Triangle Area · Test Answer Key

Common Core G-SRT.D.9, G-SRT.D.10, G-SRT.D.11 · mathovore.fr

Use this answer key to score the Law of Sines and Law of Cosines test. Each solution shows the setup, the rounded answer and the scoring guide. Award partial credit for a correct method with a small rounding slip, and total the points out of 20.

GeometryCommon Core: G-SRT.D.9 · G-SRT.D.10 · G-SRT.D.11

Question 1: Area of a triangle (2 points)

$$\text{Area} = \frac{1}{2}(14)(20)\sin 38^\circ = 140\sin 38^\circ \approx 86.2.$$

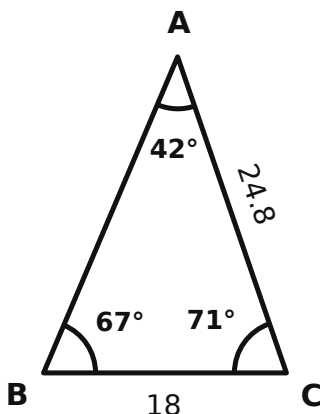
$$\approx 86.2 \text{ ft}^2$$

Scoring: 1 point for the correct formula setup, 1 point for the correct area.

Question 2: Law of Sines, find a side (2 points)

$$\frac{b}{\sin 67^\circ} = \frac{18}{\sin 42^\circ}, \text{ so } b = \frac{18\sin 67^\circ}{\sin 42^\circ} \approx 24.8.$$

$$b \approx 24.8$$



Third angle 71 degrees; b is about 24.8.

Scoring: 1 point for a correct proportion, 1 point for the correct side.

Question 3: Law of Sines, find angles (2 points)

$$\sin B = \frac{16\sin 75^\circ}{22} \approx 0.7025, \text{ so } B \approx 44.6^\circ \text{ (side } b \text{ is shorter than side } a, \text{ so } B \text{ is acute).}$$

$$C = 180^\circ - 75^\circ - 44.6^\circ \approx 60.4^\circ.$$

$$B \approx 44.6^\circ, C \approx 60.4^\circ$$

Scoring: 1 point for each angle.

Question 4: Law of Cosines, find a side (2 points)

$$c^2 = 13^2 + 17^2 - 2(13)(17)\cos 105^\circ \approx 458 + 114.4 \approx 572.4.$$

$$c \approx 23.9.$$

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Scoring: 1 point for the correct setup (a positive result from the obtuse cosine), 1 point for c .

Question 5: Largest angle of a triangle (2 points)

The largest angle is opposite 17.

$$\cos C = \frac{9^2 + 12^2 - 17^2}{2(9)(12)} = \frac{-64}{216} \approx -0.2963.$$

$$C = \cos^{-1}(-0.2963) \approx 107.2^\circ.$$

$$\approx 107.2^\circ$$

Scoring: 1 point for the Law of Cosines setup, 1 point for the angle.

Question 6: Choosing a law (2 points)

- Law of Cosines:** the information is SAS, and the Law of Cosines gives the side opposite the included angle.
- Law of Sines:** the known angle and its opposite side form a ratio that matches the unknown side and its opposite angle.

Scoring: 1 point for each correct law with a reason that names the given information.

Question 7: Proof of the area formula (3 points)

Step	Statements	Reasons
1	Draw altitude $\overline{AD}$ to $\overline{BC}$, with $AD = h$	Through a point not on a line, there is exactly one perpendicular to the line
2	$\text{Area} = \frac{1}{2}ah$	Area of a triangle is one half base times height
3	$\sin C = \frac{h}{b}$	Definition of sine in right triangle ADC

Step	Statements	Reasons
4	$h = b \sin C$	Multiplication property of equality (multiply both sides by b)
5	$\text{Area} = \frac{1}{2}ab \sin C$	Substitution (replace h in step 2 with $b \sin C$)

Scoring: 1 point for reasons (a) and (b), 1 point for reasons (c) and (d), 1 point for reason (e).
Accept equivalent wording.

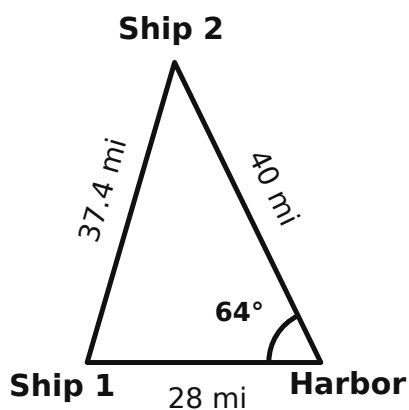
Question 8: Two ships (3 points)

The courses are two sides and the included angle, so use the Law of Cosines.

$$d^2 = 28^2 + 40^2 - 2(28)(40)\cos 64^\circ = 2384 - 982.0 \approx 1402.0.$$

$$d \approx 37.4.$$

$$\approx 37.4 \text{ mi}$$



Distance between the ships.

Scoring: 1 point for choosing the Law of Cosines with correct substitution, 1 point for the correct value of d^2 , 1 point for d with units.

Question 9: Area of a lot (2 points)

$$\text{Area} = \frac{1}{2}(85)(110)\sin 52^\circ = 4675\sin 52^\circ \approx 3684.0.$$

About 3684 square feet

Scoring: 1 point for the setup, 1 point for the rounded area.

Total

20 points