

Name: _____

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LAW OF SINES

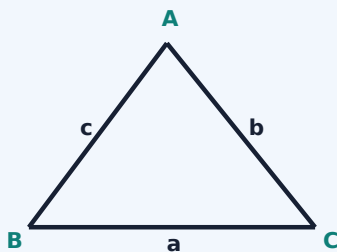
$$a / \sin A = b / \sin B = c / \sin C$$

Match opposite pairs: $A \leftrightarrow a$ $B \leftrightarrow b$ $C \leftrightarrow c$

LEVEL 1 - MATCH SIDES WITH OPPOSITE ANGLES

1 MATCH THE PAIRS

In triangle ABC, which side is opposite angle A?



2 MATCH THE PAIRS

Which side-angle pair is matched correctly?

 $A \leftrightarrow b$ $B \leftrightarrow b$ $C \leftrightarrow a$

3 CHECK THE SETUP

Suppose $A = 40^\circ$, $a = 9$, and $B = 65^\circ$. Which proportion correctly uses the Law of Sines to find b ?

$$9 / \sin 40^\circ = b / \sin 65^\circ$$

$$9 / \sin 65^\circ = b / \sin 40^\circ$$

$$40 / \sin 9^\circ = 65 / \sin b$$

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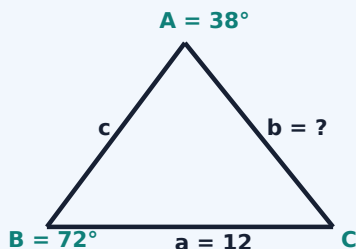
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LEVEL 2 - FIND MISSING SIDES

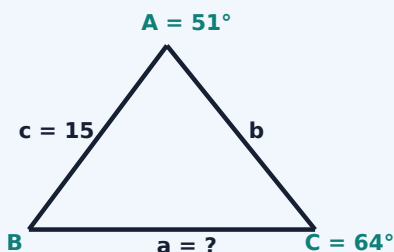
4 FIND A MISSING SIDE

In triangle ABC, $A = 38^\circ$, $B = 72^\circ$, and $a = 12$. Find b to the nearest hundredth.



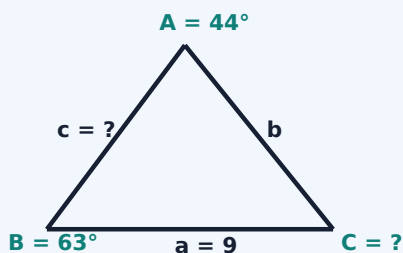
5 FIND A MISSING SIDE

In triangle ABC, $A = 51^\circ$, $C = 64^\circ$, and $c = 15$. Find a to the nearest hundredth.



6 FIND THE THIRD ANGLE FIRST

In triangle ABC, $A = 44^\circ$, $B = 63^\circ$, and $a = 9$. Find side c to the nearest hundredth.



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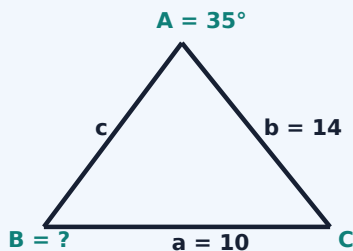
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LEVEL 3 - FIND MISSING ANGLES

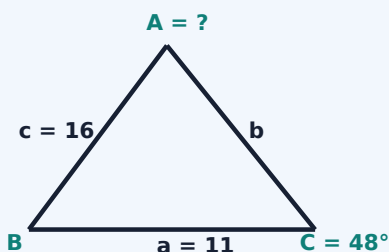
7 FIND A MISSING ANGLE

In triangle ABC, $A = 35^\circ$, $a = 10$, and $b = 14$. Find angle B to the nearest tenth.



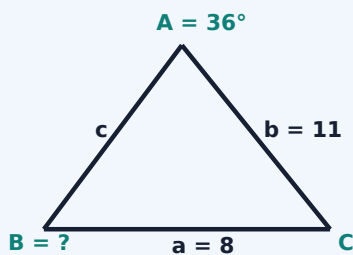
8 FIND A MISSING ANGLE

In triangle ABC, $C = 48^\circ$, $c = 16$, and $a = 11$. Find angle A to the nearest tenth.



9 SSA CHECK

In triangle ABC, $A = 36^\circ$, $a = 8$, and $b = 11$. Find the first possible value of angle B.



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LEVEL 4 - THE SSA AMBIGUOUS CASE

10 TWO TRIANGLES

In triangle ABC, $A = 36^\circ$, $a = 8$, and $b = 11$. Determine all possible values of angle B.

11 ONE TRIANGLE

In triangle ABC, $A = 50^\circ$, $a = 14$, and $b = 10$. Determine how many triangles are possible and find angle B.

12 NO TRIANGLE

In triangle ABC, $A = 30^\circ$, $a = 4$, and $b = 10$. Determine whether a triangle is possible.

SSA REMINDER

After inverse sine, check the supplementary angle: $180^\circ - \theta$.

1 Match the pairs

Side a is directly opposite angle A.

Answer: a

2 Match the pairs

Matching letters form opposite pairs:

A ↔ a, B ↔ b, C ↔ c

Answer: B ↔ b

3 Check the setup

Keep each side with its opposite angle.

$$9 / \sin 40^\circ = b / \sin 65^\circ$$

Answer: $9 / \sin 40^\circ = b / \sin 65^\circ$

4 Find a missing side

$$12 / \sin 38^\circ = b / \sin 72^\circ$$

$$b = 12 \sin 72^\circ / \sin 38^\circ$$

$$b \approx 18.54$$

5 Find a missing side

$$a / \sin 51^\circ = 15 / \sin 64^\circ$$

$$a = 15 \sin 51^\circ / \sin 64^\circ$$

$$a \approx 12.97$$

6 Find the third angle first

$$C = 180^\circ - 44^\circ - 63^\circ = 73^\circ$$

$$9 / \sin 44^\circ = c / \sin 73^\circ$$

$$c = 9 \sin 73^\circ / \sin 44^\circ$$

$$c \approx 12.39$$

7 Find a missing angle

$10 / \sin 35^\circ = 14 / \sin B$
 $\sin B = 14 \sin 35^\circ / 10$
 $B = \sin^{-1}(14 \sin 35^\circ / 10)$
First answer: $B \approx 53.4^\circ$

8 Find a missing angle

$11 / \sin A = 16 / \sin 48^\circ$
 $\sin A = 11 \sin 48^\circ / 16$
 $A = \sin^{-1}(11 \sin 48^\circ / 16)$
 $A \approx 30.7^\circ$

9 SSA check

$8 / \sin 36^\circ = 11 / \sin B$
 $\sin B = 11 \sin 36^\circ / 8$
 $B_1 = \sin^{-1}(11 \sin 36^\circ / 8)$
 $B_1 \approx 53.9^\circ$
Because this is SSA, continue by checking the supplement.

10 Two triangles

$B_1 \approx 53.9^\circ$
 $B_2 = 180^\circ - 53.9^\circ = 126.1^\circ$
 $36^\circ + 126.1^\circ = 162.1^\circ < 180^\circ$
Answers: $B \approx 53.9^\circ$ or 126.1°

11 One triangle

$14 / \sin 50^\circ = 10 / \sin B$
 $B_1 \approx 33.2^\circ$
 $B_2 = 180^\circ - 33.2^\circ = 146.8^\circ$
 $50^\circ + 146.8^\circ = 196.8^\circ > 180^\circ$
Answer: one triangle, $B \approx 33.2^\circ$

12 No triangle

$4 / \sin 30^\circ = 10 / \sin B$
 $\sin B = 10 \sin 30^\circ / 4 = 1.25$
A sine value cannot be greater than 1.
Answer: no triangle