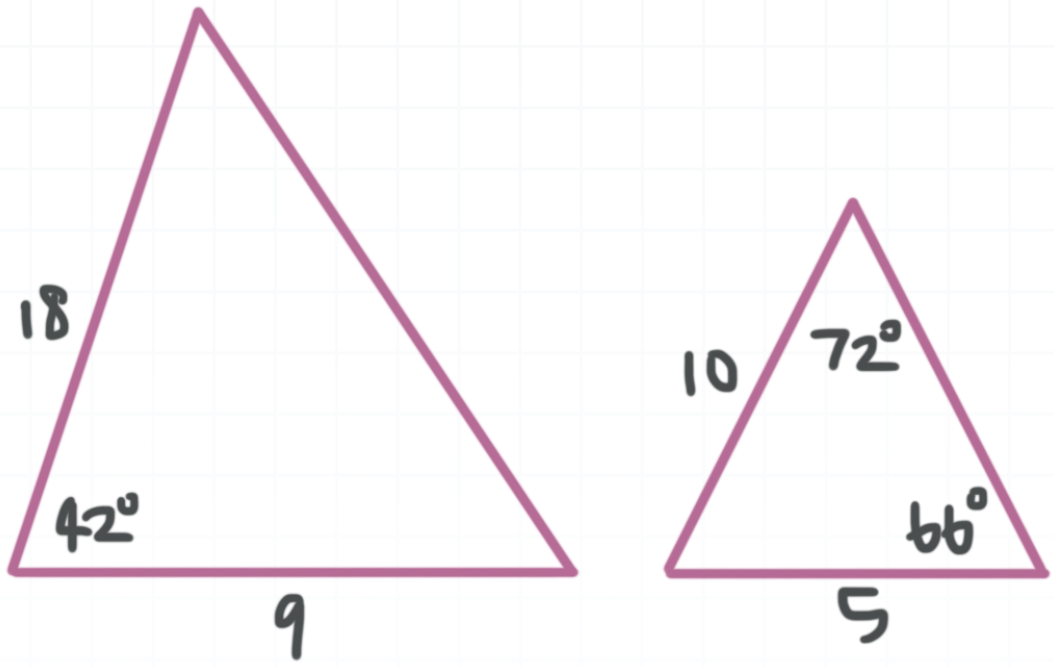
Topic: Triangle similarity theorems

Question: Can the two triangles in the figure be proven similar?



Answer choices:

A Yes, by AA

B Yes, by SAS

C Yes, by SSS

D No, they can't be proven similar.

Solution: B

The ratio of the lengths of one pair of sides of these two triangles is

$$\frac{10}{18} = \frac{5}{9}$$

The ratio of the lengths of a second pair of sides is also $5/9$. Therefore, the lengths of two pairs of sides are proportional.

The measure of the included angle of the sides of length 10 and 5 in the small triangle can be calculated as

$$180^\circ - 66^\circ - 72^\circ = 42^\circ$$

That matches the measure of the included angle of the sides of length 18 and 9 in the large triangle, so we have two pairs of sides whose lengths are proportional, and the corresponding pair of included angles are congruent.

The two triangles are similar by SAS.

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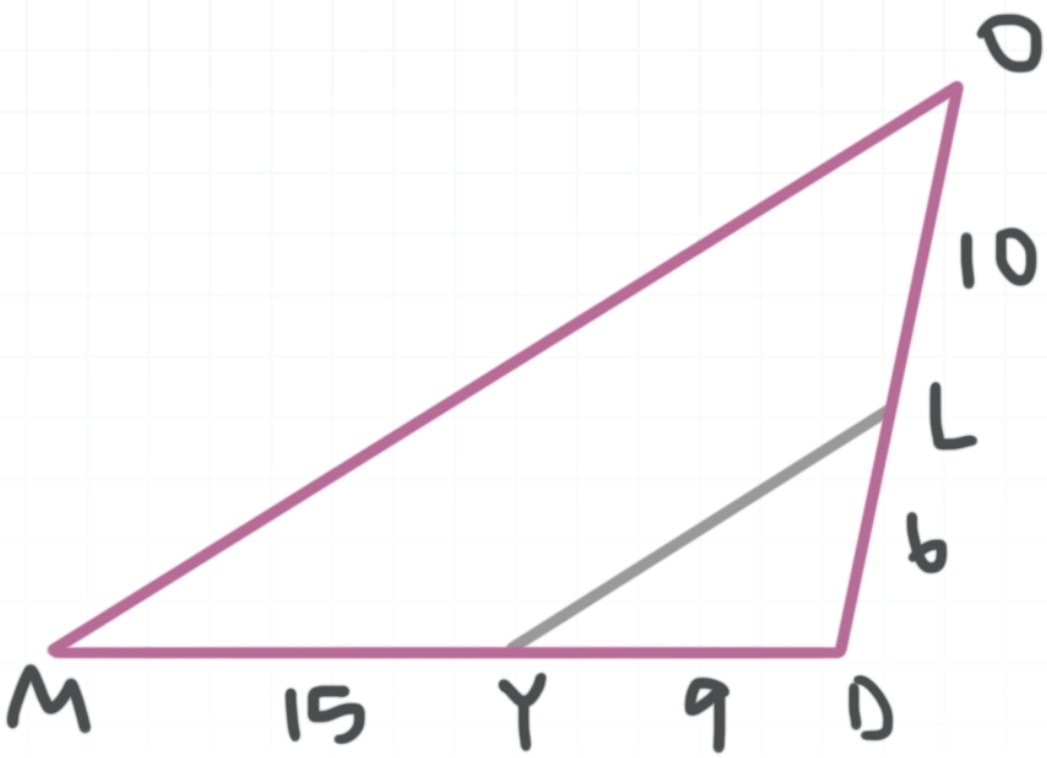

Answer choices:

A Yes, $\triangle ODM \sim \triangle LDY$ by SAS.

B Yes, $\triangle OMD \sim \triangle DLY$ by SAS.

C Yes, $\triangle DOM \sim \triangle DLY$ by SSS.

D The triangles can’t be proven similar.

Solution: A

We see that

$$\frac{\overline{YD}}{\overline{MD}} = \frac{9}{24} = \frac{3}{8}$$

and

$$\frac{\overline{LD}}{\overline{OD}} = \frac{6}{16} = \frac{3}{8}$$

Therefore, the lengths of two pairs of sides are proportional. Also, $\angle D$ is the included angle of both of those pairs of sides, and by the reflexive property $\angle D \cong \angle D$.

The two triangles are similar by SAS.

Answer choice A shows SAS and a correct ordering of vertices in the similarity statement.

Answer choice B shows SAS, but the ordering of vertices in the similarity statement is incorrect. If you write $\triangle OMD$ for the large triangle, you need to write $\triangle LYD$ for the small triangle.

We can't prove similarity of these triangles by SSS, because we've been given the lengths of only two sides of each triangle - and no information that would enable us to determine the length of the third side of each of them.

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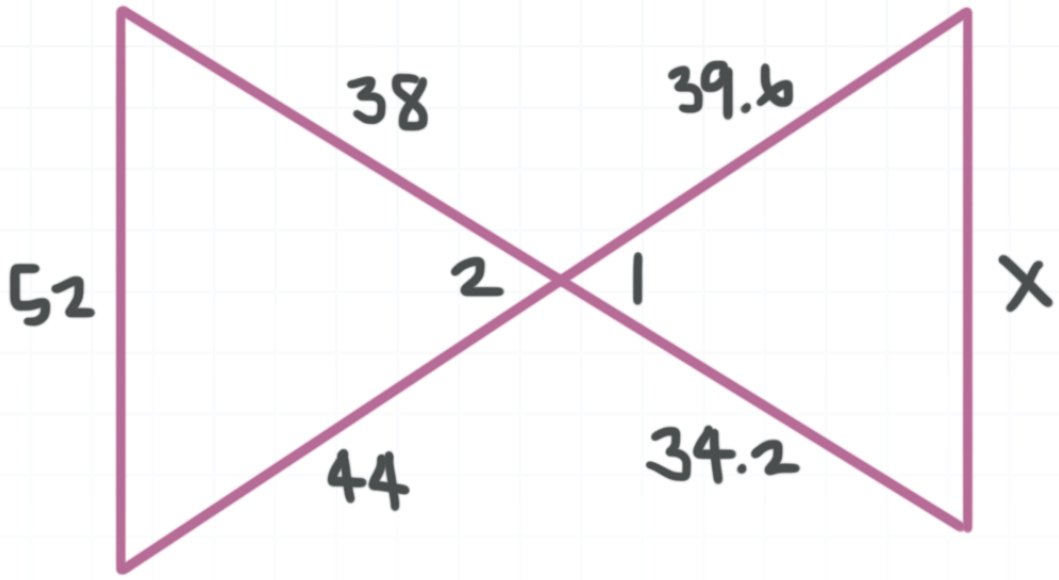
Question: Solve for x.



Answer choices:

A 44.2

B 48.4

C 46.8

D Impossible to determine

Solution: C

We see that the ratio of the length of one side of the triangle on the right to the length of one side of the triangle on the left is

$$\frac{39.6}{44} = 0.9$$

and that the ratio of the length of one side of the triangle on the right to the length of one side of the triangle on the left is

$$\frac{34.2}{38} = 0.9$$

Therefore, the lengths of two pairs of sides are proportional. Also, $\angle 1$ is the included angle of the pair of sides of length 39.6 and 34.2 in the triangle on the right, and $\angle 2$ is the included angle of the pair of sides of length 44 and 38 in the triangle on the left, and $\angle 1 \cong \angle 2$ because vertical angles are congruent.

The two triangles are similar by SAS.

Now that we know the two triangles are similar, we know that the ratio of the length of the third side of the triangle on the right to the length of the third side of the triangle on the left also has to be 0.9, so

$$\frac{x}{52} = 0.9$$

$$x = 52 \cdot 0.9$$

$$x = 46.8$$