

Similarity and Dilations: math practice, Grade 10 – download the PDF

21 problems graded by difficulty (★ easy, ★★ medium, ★★★ hard). Try first, without looking at the solutions!

1 Dilating a segment from the origin

★ ★ ★

Dilate $P(1, 2)$ and $Q(4, -1)$ from the origin with scale factor $k = 3$.

- Find P' and Q' .
- Compare the lengths PQ and $P'Q'$.

2 Find the scale factor

★ ★ ★

A segment is dilated. Find the scale factor and say whether it is an enlargement or a reduction.

- 5 cm becomes 12.5 cm.
- 18 in becomes 6 in.

3 Missing sides of similar triangles

★ ★ ★

$\triangle ABC \sim \triangle DEF$ with $AB = 4$, $BC = 7$, $AC = 6$, and $DE = 10$. Find EF and DF .

4**Always similar? True or false**

Decide whether each statement is true or false and justify it.

- a. Any two squares are similar.
- b. Any two rectangles are similar.
- c. Any two equilateral triangles are similar.
- d. Any two rhombuses are similar.

5**AA with computed angles**

Triangle 1 has angles 52° and 71° . Triangle 2 has angles 71° and 57° . Are the triangles similar? Explain.

6**Enlarging a photo**

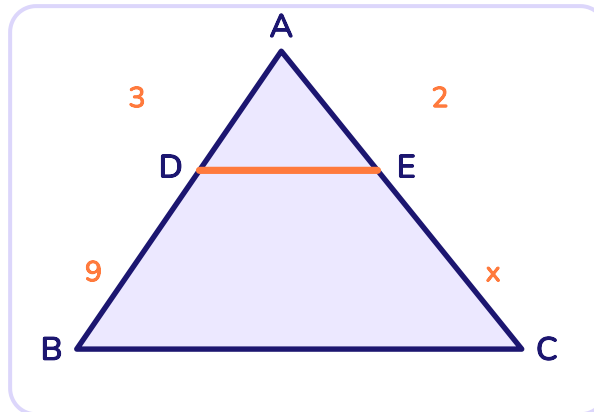
A photo is 4 in by 6 in. It is enlarged to a poster whose short side is 30 in.

- a. Find the scale factor and the long side of the poster.
- b. Give the short side in feet.

7 A line parallel to the base



In the figure, $DE \parallel BC$, $AD = 3$, $DB = 9$, and $AE = 2$.



- Find EC .
- If $BC = 20$, find DE .

8 SSS or not?



Decide whether the triangles are similar. If so, give the scale factor.

- Sides 9, 12, 18 and sides 12, 16, 24.
- Sides 5, 7, 9 and sides 10, 14, 20.

9 SAS and a missing side



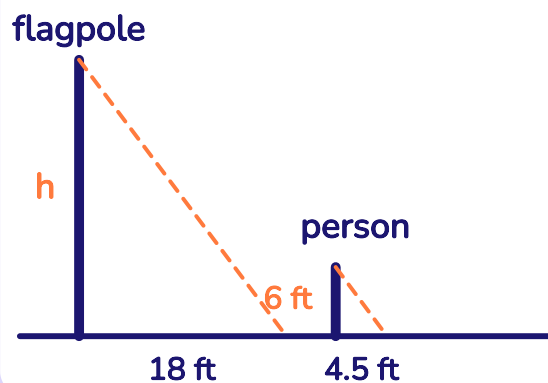
In triangles PQR and XYZ : $PQ = 6$, $PR = 9$, $XY = 8$, $XZ = 12$, and $\angle P = \angle X = 48^\circ$. Also $QR = 7.5$.

- Show that $\triangle PQR \sim \triangle XYZ$.
- Find YZ .

10 Height of a flagpole



At noon a 6 ft person casts a shadow of 4.5 ft. A flagpole casts a shadow of 18 ft.



How tall is the flagpole in feet and in meters? (1 ft = 0.3048 m)

11 Splitting a side with a bisector



In triangle ABC , $AB = 10$, $AC = 14$, and $BC = 18$. The bisector of $\angle A$ meets BC at D . Find BD and DC .

12 Perimeters and areas



Two similar triangular sails have perimeters 24 ft and 36 ft. The larger sail has area 81 ft^2 . Find the scale factor and the area of the smaller sail.

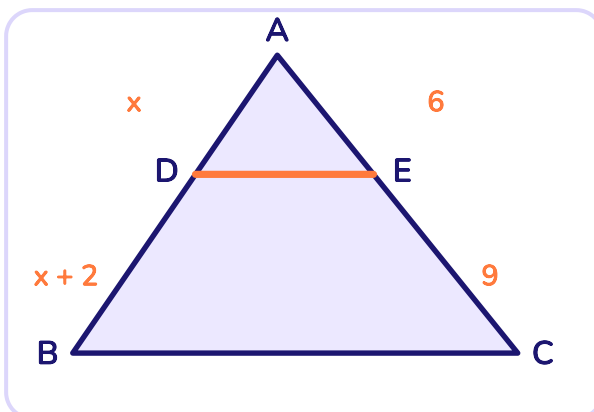
13 Dilation with a center other than the origin



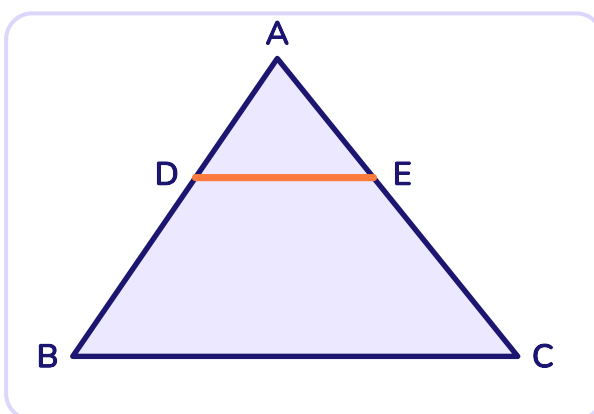
Dilate $A(3, 2)$ and $B(-1, 4)$ with center $C(1, 1)$ and scale factor 2.

14 Solve for x 

In the figure, $DE \parallel BC$, $AD = x$, $DB = x + 2$, $AE = 6$, and $EC = 9$. Find x .

**15 A similarity proof**

In the figure, $DE \parallel BC$.

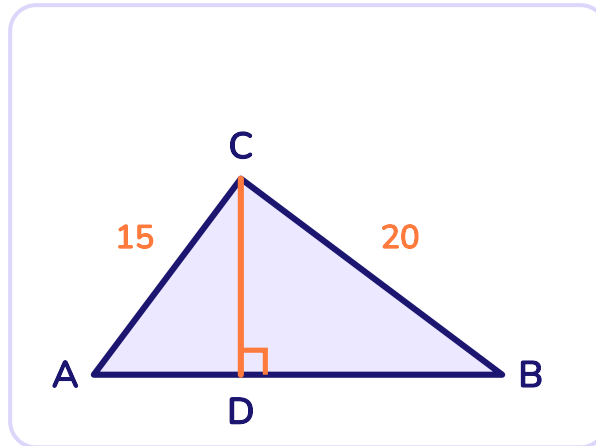


Write a two-column proof that $\triangle ADE \sim \triangle ABC$, then explain why $\frac{DE}{BC} = \frac{AD}{AB}$.

16 Altitude to the hypotenuse

★★★

Triangle ABC has a right angle at C , with $AC = 15$, $BC = 20$, and $AB = 25$. The altitude CD meets AB at D .

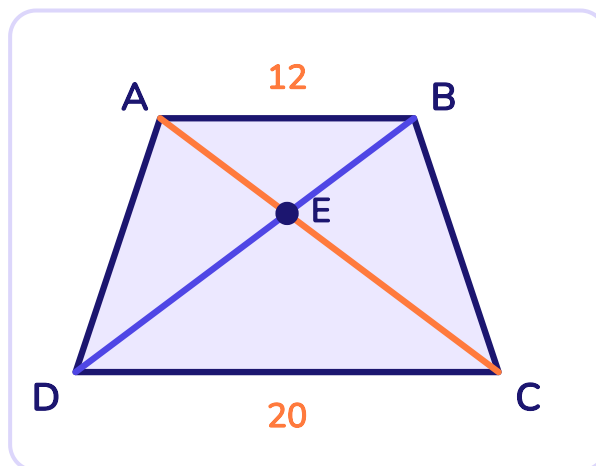


- Prove that $\triangle ACD \sim \triangle ABC$.
- Find AD and CD .

17 Diagonals of a trapezoid

★★★

In trapezoid $ABCD$, $AB \parallel CD$, $AB = 12$, $CD = 20$, and the diagonal $AC = 24$. The diagonals meet at E .



- Prove that $\triangle ABE \sim \triangle CDE$.
- Find AE and EC .
- Find the ratio of the areas of the two triangles.

18 Reading a map

★★★

On a map, 1 inch represents 2 miles. A reservoir has area 3.5 in^2 on the map and perimeter 8 in.

- What is the scale factor from the map to real life?
- Find the real perimeter and the real area.

19 Similar triangles with algebra

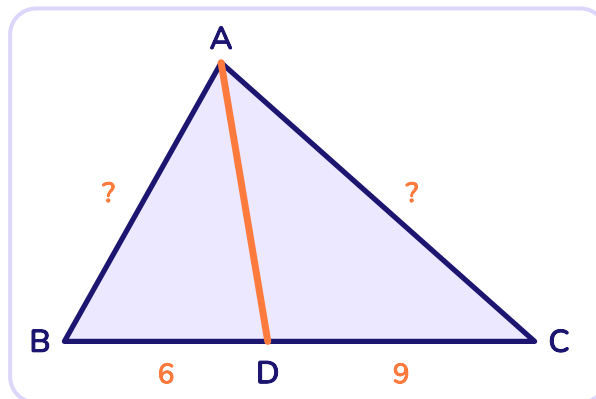
★★★

$\triangle ABC \sim \triangle DEF$ with $AB = x + 3$, $BC = 2x$, $DE = 10$, and $EF = 12$. Find x and the lengths AB and BC .

20 Bisector and perimeter

★★★

In triangle ABC , the bisector of $\angle A$ meets BC at D with $BD = 6$ and $DC = 9$. The perimeter of the triangle is 50. Find AB and AC .



21 Similar tanks

★★★

Two cylindrical water tanks are similar. The heights are 2 ft and 5 ft, and the small tank holds 16 gallons.

- Find the scale factor.
- How many gallons does the large tank hold?



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