Dilations

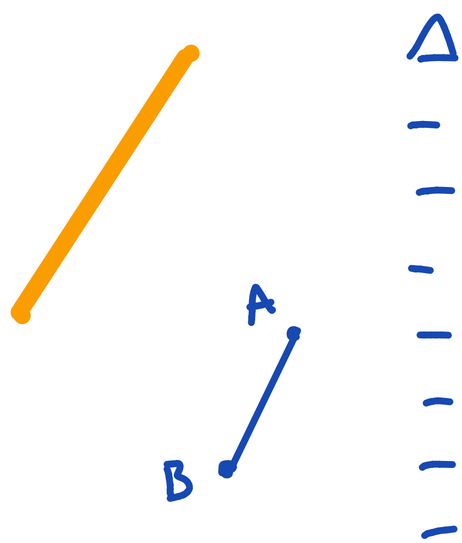
- In a dilation, we are enlarging and reducing the pre-image
- Dilations are not isometric.
- When we dilate an image, the size changes, the angles do not.
- This is the one transformation where the pre-image and image are similar, but not congruent.

Scale factor:

- We use "k" to represent scale factor.
- We multiply by k to find the image.

$$K = \frac{\text{image}}{\text{preimage}}$$

Ex.1 Dilate the image by k=2. enlargement



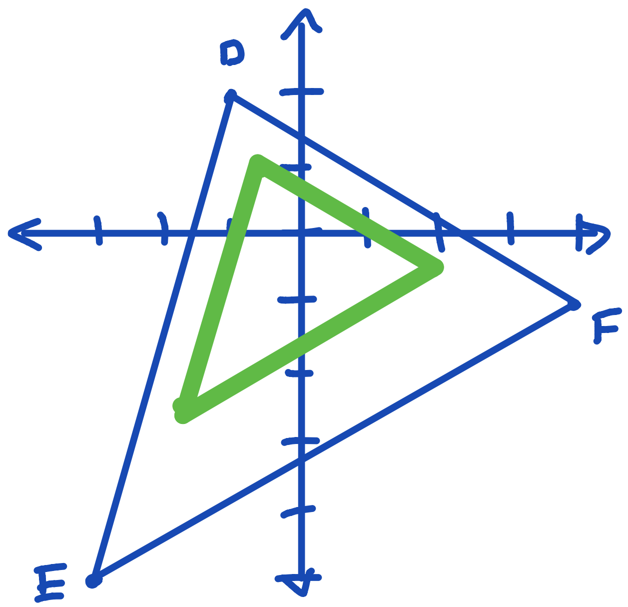
$A(-2,4) \rightarrow A'(-4,8)$

$B(-3,2) \rightarrow B'(-6,4)$

$C(0,0) \rightarrow C'(0,0)$

Ex.2 Dilate the image by k=1/2.

reduction



$D(-1,2) \rightarrow D'(-\frac{1}{2}, 1)$

$E(-3,-5) \rightarrow E'(-1.5,-2.5)$

$F(4,-1) \rightarrow F'(2,-.5)$

Similarity

Angle Angle (AA)

- Is one statement that allows us to prove triangles are similar.

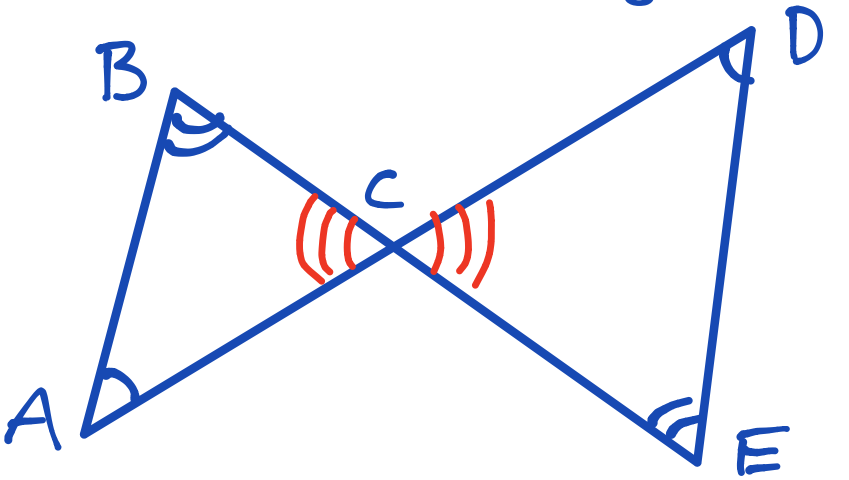
Side Angle Side (SAS)

- If the measures of two sides of a triangle are proportional to the measures of two corresponding sides of another triangle and the included angles are congruent, then the triangles are similar.

Side Side Side (SSS)

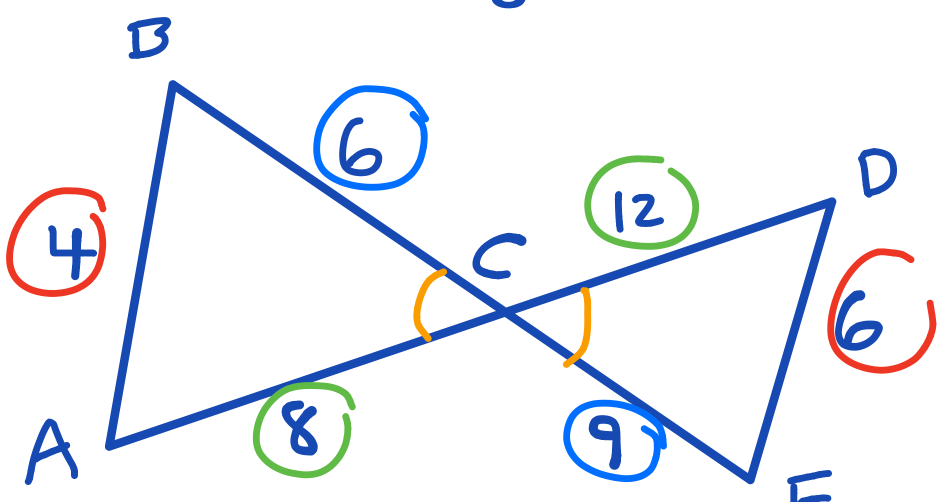
- If the measures of the corresponding sides of two triangles are proportional, then the triangles are similar.

Ex.1 Determine if the triangles are similar



$\boxed{\triangle ABC \sim \triangle DEC \text{ by AA}}$

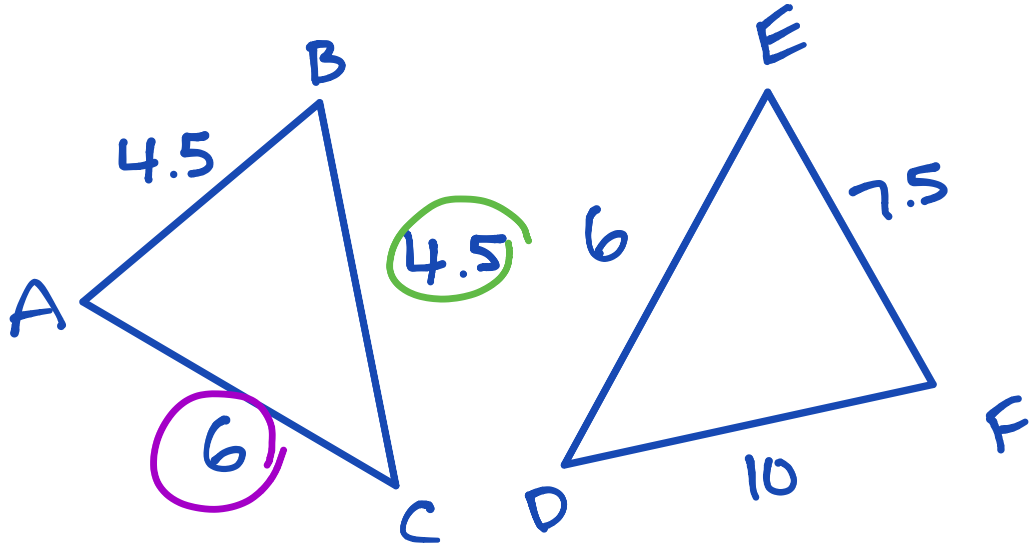
Ex.2 Prove the triangles are similar



$\frac{4}{6} = \boxed{\frac{2}{3}}$ $\quad \frac{8}{12} = \boxed{\frac{2}{3}}$ $\quad \frac{6}{9} = \boxed{\frac{2}{3}}$

$\boxed{\triangle ABC \sim \triangle DEC \text{ by SSS}}$

Ex.3 Determine whether the triangles are similar.

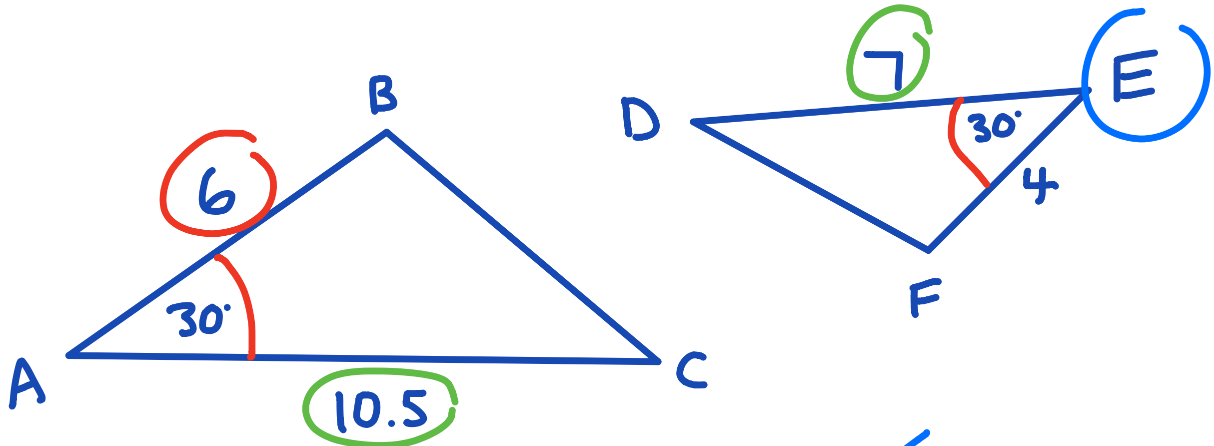


$\frac{6}{10} = \frac{3}{5} = \boxed{.6}$

$\frac{4.5}{6} = \frac{3}{4} = \boxed{.75}$

$\boxed{\text{not} \sim}$

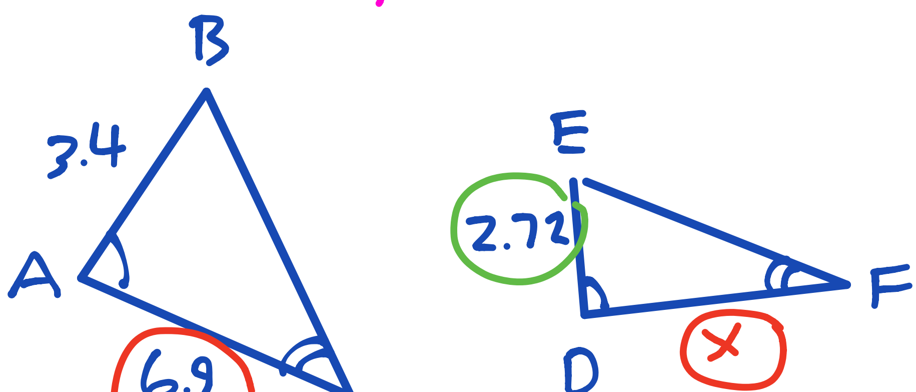
Ex.4 Determine whether the triangles are similar.



$\frac{6}{4} = 1.5$ ✓ $\quad \frac{10.5}{7} = 1.5$ ✓

$\boxed{\triangle ABC \sim \triangle EFD \text{ by SAS}}$

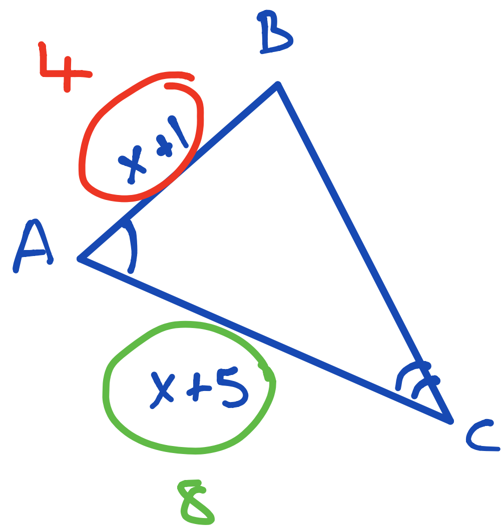
Ex.5 Find $\overline{DF}$ AA

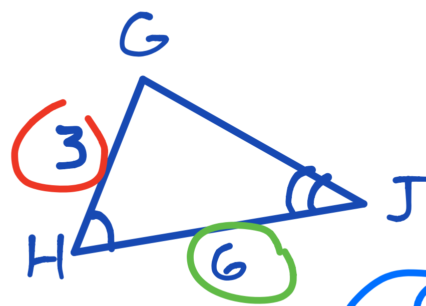


$\cancel{6.9}\left(\frac{x}{\cancel{6.9}}\right) = \left(\frac{2.72}{3.4}\right)6.9$

$\boxed{x = 5.52}$

Ex.6 Solve for x. AA





$$\cancel{3}\left(\frac{x+1}{\cancel{3}}\right) = \left(\frac{x+5}{6}\right)3$$

$$6(x+1) = \left(\frac{3x+15}{\cancel{6}}\right)\cancel{6}$$

$$6x+\cancel{6} = 3\cancel{x}+15$$

$$-3x\ \cancel{-6} \qquad -3x\ \cancel{-6}$$

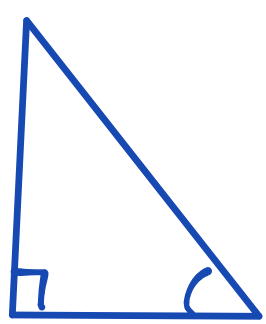
$$\frac{\cancel{3}x}{\cancel{3}} = \frac{9}{3} \qquad \boxed{x=3}$$

Ex.6 Find x

5ft 10in

5(12) +10

70in

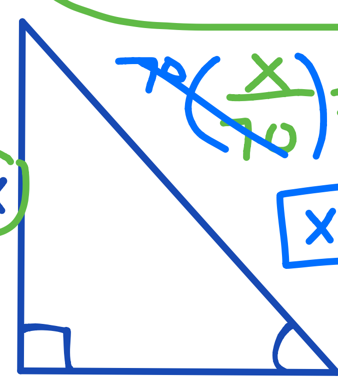


3ft 6in

3(12)+6

42in

x



12ft

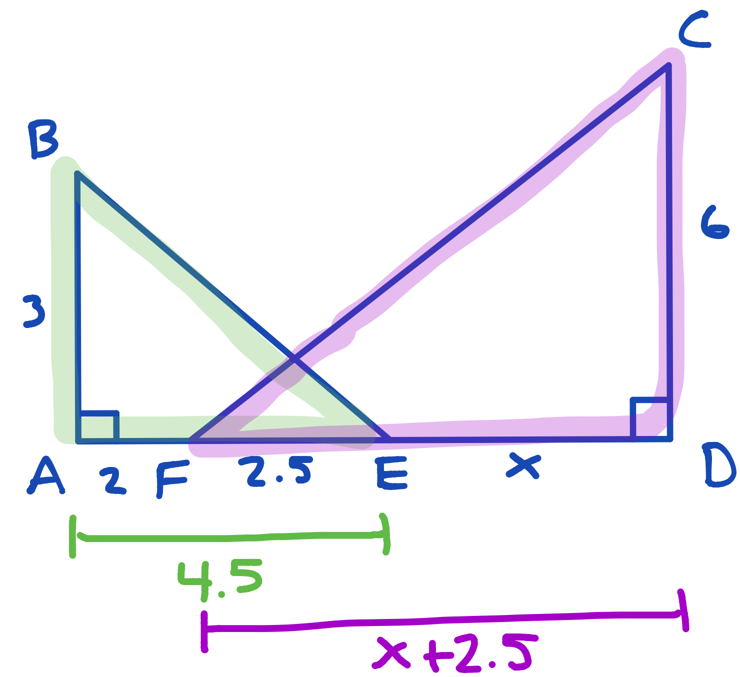
12(12)

144in

$$\cancel{70}\left(\frac{x}{\cancel{70}}\right) = \left(\frac{144}{42}\right)70$$

$$\boxed{x=240in}$$

Ex.7 $\overline{AB}$ and $\overline{DC}$ are corresponding sides, and $\overline{AE}$ and $\overline{DF}$ are corresponding sides. Find x.



$$\frac{x+2.5}{4.5} = \frac{6}{3}$$

$$\cancel{4.5}\left(\frac{x+2.5}{\cancel{4.5}}\right) = (2)4.5$$

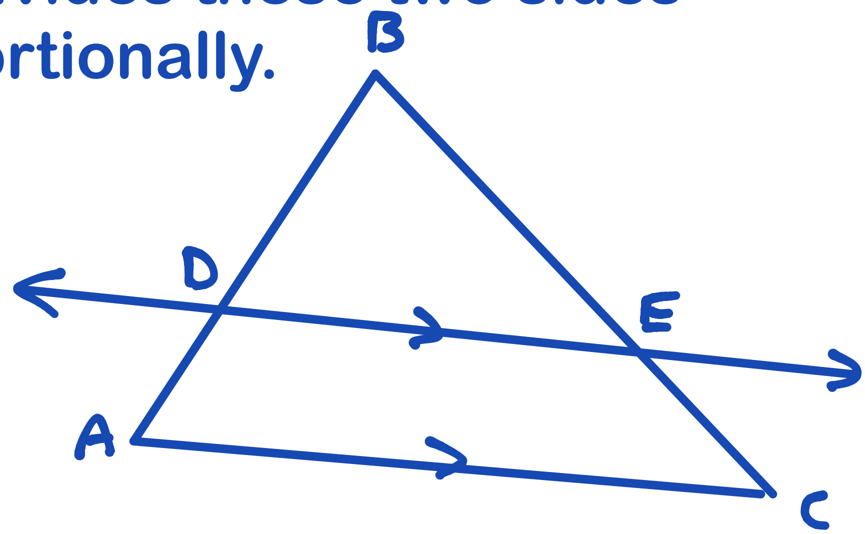
$$x+\cancel{2.5} = 9$$

$$-\cancel{2.5} \quad -2.5$$

$$\boxed{x=6.5}$$

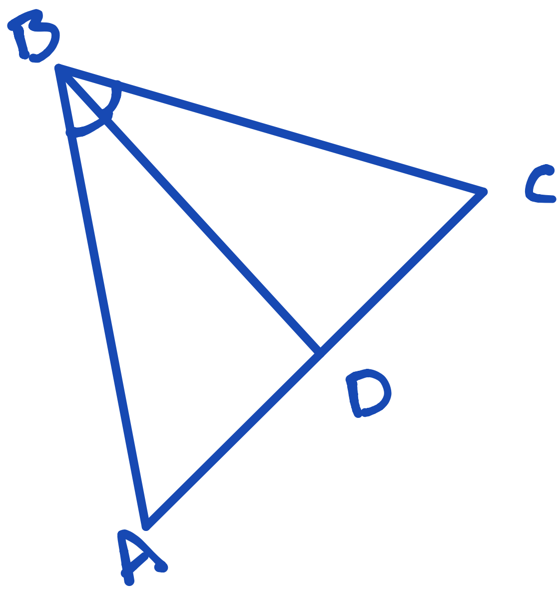
Proving Similarity

- Triangle Proportionality Theorem- If a line parallel to one side of the triangle intersects the other two sides of the triangle, then the parallel line divides these two sides proportionally.



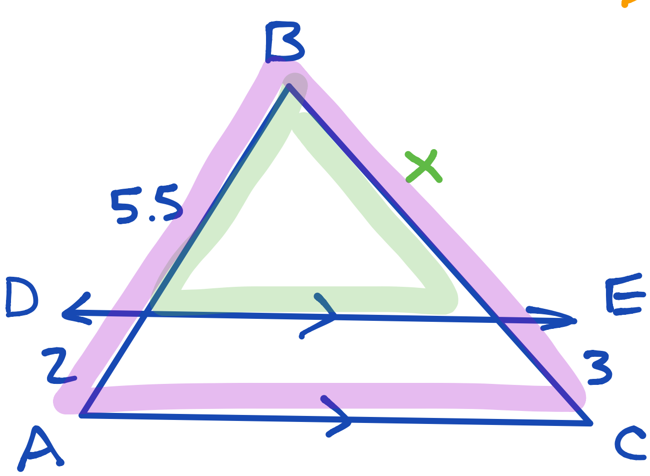
$\overline{AC} \parallel \overline{DE}$ therefore $\frac{AD}{DB} = \frac{CE}{EB}$

- Triangle Bisector Theorem- if one angle of a triangle is bisected, or cut in half, then the angle bisector of the triangle divides the opposite side of the triangle into two segments that are proportional to the other two sides of the triangle.



$\angle ABD \cong \angle DBC$ therefore $\frac{AD}{DC} = \frac{BA}{BC}$

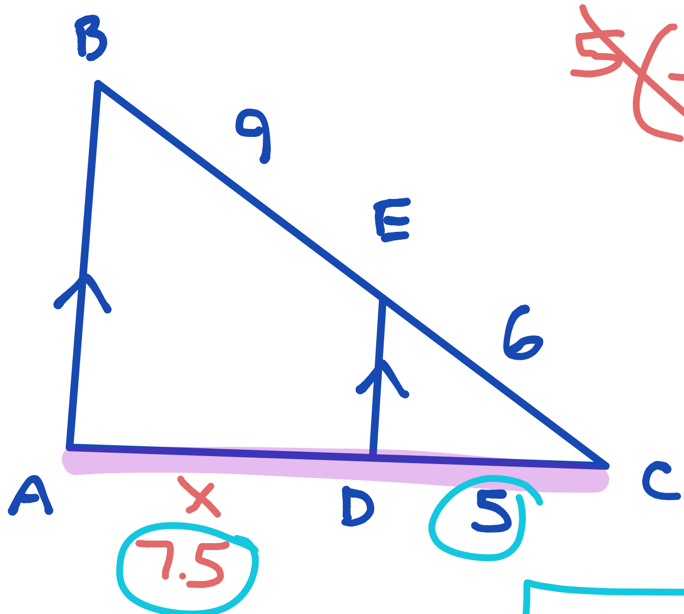
Ex.1 Find $\overline{BE}$.



$3\left(\frac{x}{3}\right) = \left(\frac{5.5}{2}\right)3$

$\boxed{x = 8.25}$

Ex.2 Find $\overline{CA}$ using two methods.

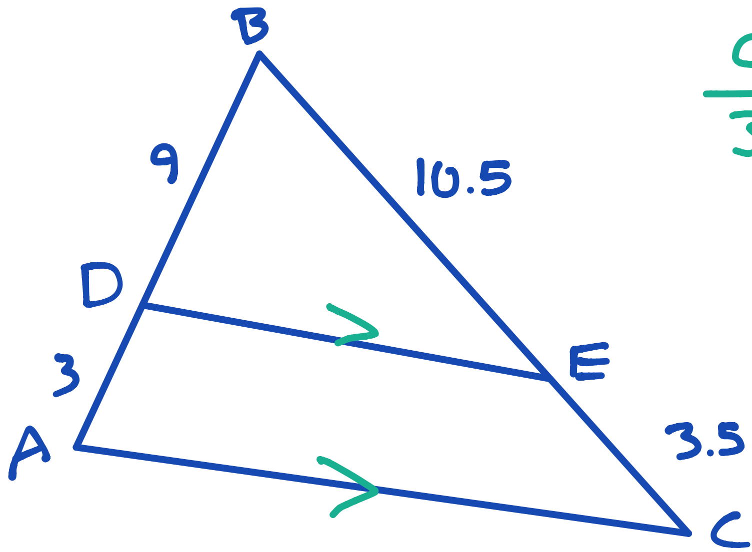


$$\cancel{5}\left(\frac{x}{\cancel{5}}\right) = \left(\frac{9}{6}\right)5$$

$$\boxed{x = 7.5}$$

$$\boxed{\overline{CA} = 12.5}$$

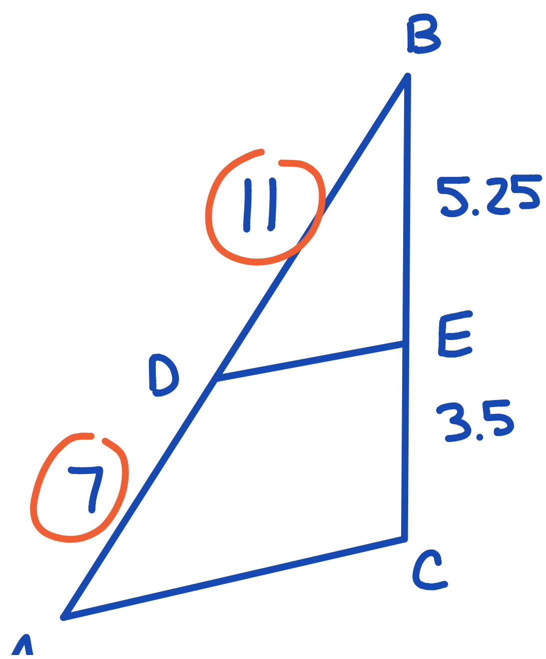
Ex.3 Prove DE // AC.



$$\frac{9}{3} = \frac{10.5}{3.5}$$

$3 = 3$ ✓

Ex.4 Is DE//AC?



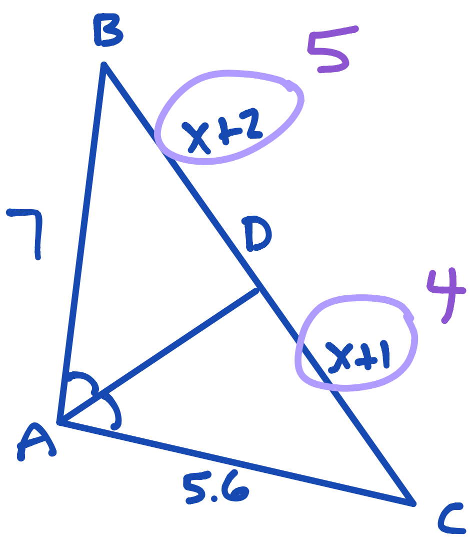
$$\frac{11}{7} = \frac{5.25}{3.5}$$

$1.57 \neq 1.5$

Not //

A

Ex.5 Find $\overline{BD}$ and $\overline{DC}$.



$$\frac{x+2}{x+1} = \frac{7}{5.6}$$

$$5.6(x+2) = 7(x+1)$$

$$\cancel{5.6x} + 11.2 = 7x + \cancel{7}$$

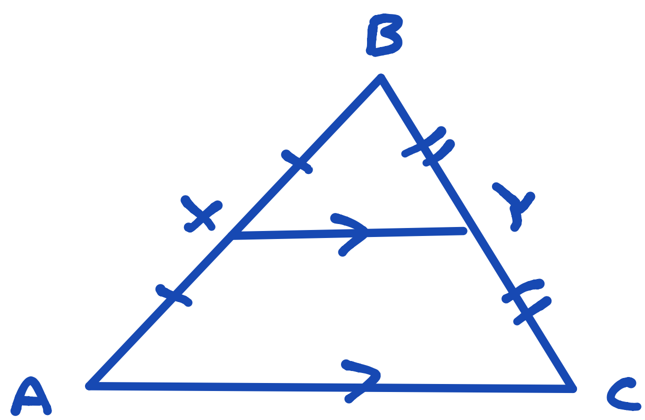
$$-5.6x \quad -7 \qquad -5.6x \quad -7$$

$$\frac{4.2}{1.4} = \frac{\cancel{1.4}x}{\cancel{1.4}}$$

$$\boxed{x=3}$$

Midsegment- is a line segment that joins the midpoints of two sides of a triangle.

- Triangle Midsegment Theorem- A Midsegment of a triangle is parallel to the third side and is half as long.



Ex.1 Find $\overline{BC}$ and $\overline{YZ}$ and angle AXZ.