7-4

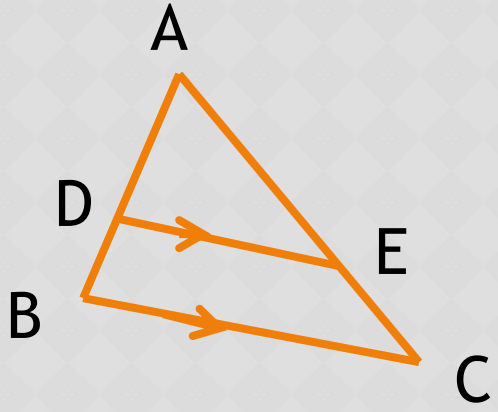
Proportions in Triangles

OBJECTIVE

To use both the Triangle Proportionality Theorem and the Triangle-Angle-Bisector Theorem

VOCABULARY

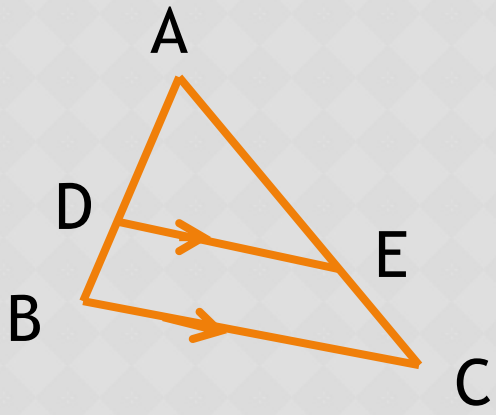
Triangle Proportionality Theorem (Side-Splitter Theorem) – If a line is parallel to one side of a triangle and intersects the other two sides, then it divides those sides proportionally.



If $\overline{DE} \parallel \overline{BC}$,
then $\frac{AD}{DB} = \frac{AE}{EC}$

VOCABULARY

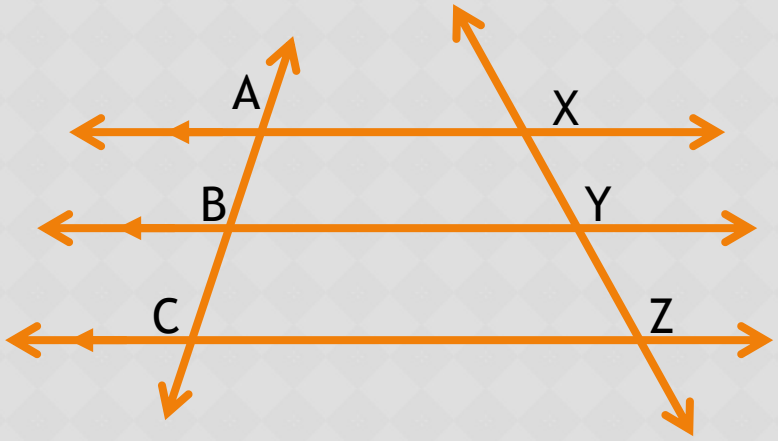
Converse of Triangle Proportionality Theorem – If a line divides two sides of a triangle proportionally, then it is parallel to the third side.



If $\frac{AD}{DB} = \frac{AE}{EC}$, then $\overline{DE} \parallel \overline{BC}$.

VOCABULARY

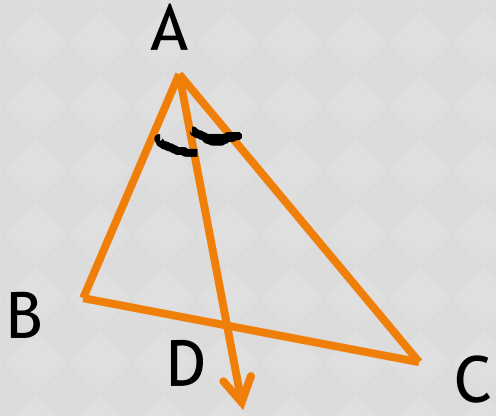
Corollary to the Triangle Proportionality Theorem – If three (or more) parallel lines intersect two transversals, then they divide the transversals proportionally.



If $\overleftrightarrow{AX} \parallel \overleftrightarrow{BY} \parallel \overleftrightarrow{CZ}$, then $\frac{AB}{BC} = \frac{XY}{YZ}$

VOCABULARY

Triangle-Angle-Bisector Theorem – If a ray bisects an angle of a triangle, then it divides the opposite side into two segments that are proportional to the other two sides of the triangle.

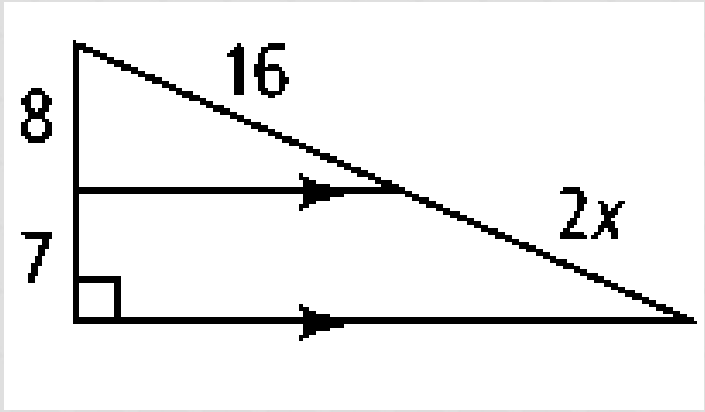


If $\overrightarrow{AD}$ bisects $\angle BAC$, then $\frac{BD}{DC} = \frac{AB}{AC}$

CLASS WORK

Solve for x.

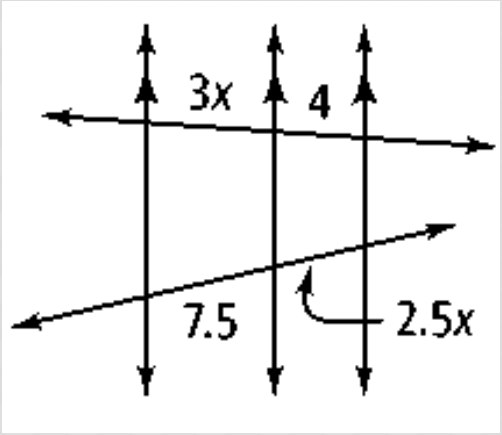
1.



$$\frac{8}{7} = \frac{16}{2x}$$

$$16x = 112$$
$$x = 7$$

2.



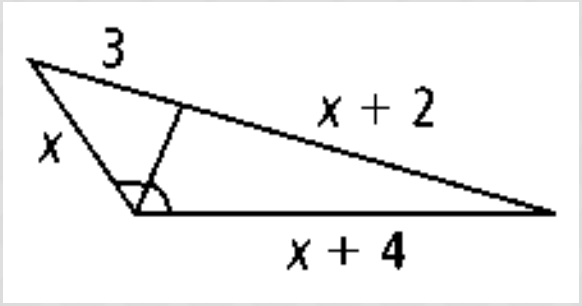
$$\frac{3x}{4} = \frac{7.5}{2.5x}$$

$$7.5x^2 = 30$$
$$x^2 = 4$$
$$x = \pm 2$$
$$x = 2$$

CLASS WORK

Solve for x.

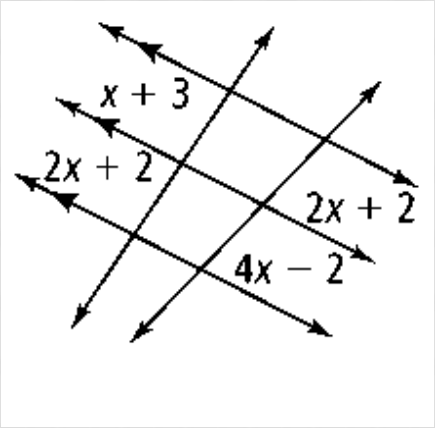
3.



$$\frac{3}{x+2} = \frac{x}{x+4}$$

$$3(x+4) = x(x+2)$$
$$3x + 12 = x^2 + 2x$$
$$x^2 - x - 12 = 0$$
$$(x-4)(x+3) = 0$$
$$x = 4 \text{ or } \cancel{-3}$$

4.



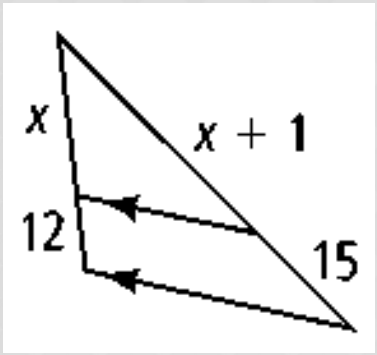
$$\frac{x+3}{2x+2} = \frac{2x+2}{4x-2}$$

$$(x+3)(4x-2) = (2x+2)(2x+2)$$
$$4x^2 - 2x + 12x - 6 = 4x^2 + 4x + 4x + 4$$
$$10x - 6 = 8x + 4$$
$$2x = 10$$
$$x = 5$$

CLASS WORK

Solve for x.

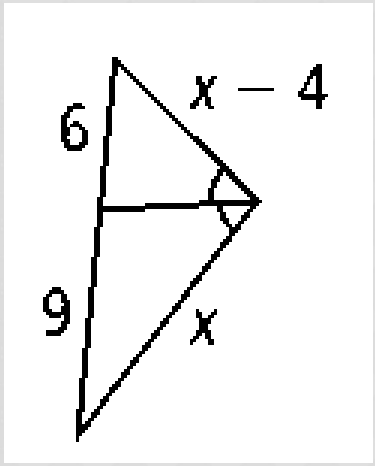
5.



$$\frac{x}{12} = \frac{x+1}{15}$$

$$15x = 12(x+1)$$
$$15x = 12x + 12$$
$$3x = 12$$
$$x = 4$$

6.



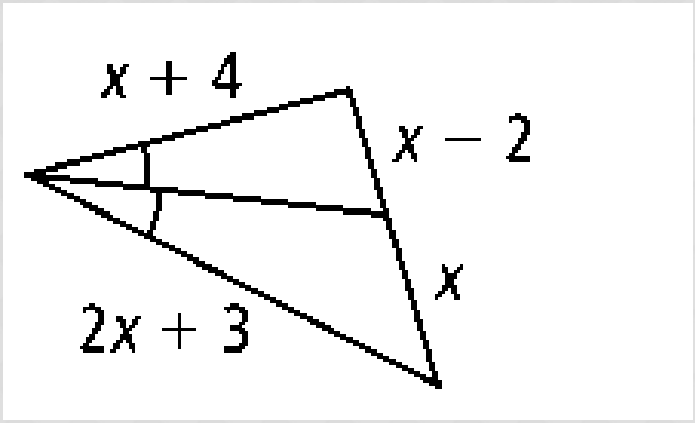
$$\frac{6}{9} = \frac{x-4}{x}$$

$$6x = 9(x-4)$$
$$6x = 9x - 36$$
$$-3x = -36$$
$$x = 12$$

EXIT PROBLEM

Solve for x.

7.



$$\frac{x-2}{x} = \frac{x+4}{2x+3}$$

$$(x-2)(2x+3) = x(x+4)$$
$$2x^2 + 3x - 4x - 6 = x^2 + 4x$$
$$x^2 - 5x - 6 = 0$$
$$(x-6)(x+1) = 0$$
$$x = 6 \text{ or } \cancel{-1}$$

SUMMARY

Two more Theorems that create proportions in triangles are the following:

- Side-Splitter Theorem
- Triangle-Angle-Bisector Theorem

HOMEWORK

Pages 499 – 501

8 – 20 even; 21

26 – 36 even