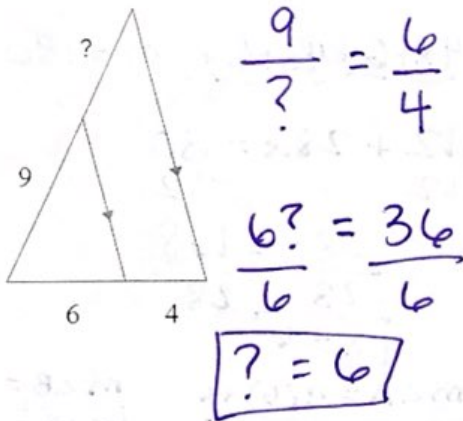Objectives:
- I know how to apply the Triangle Proportionality theorem and the Angle Bisector theorem.

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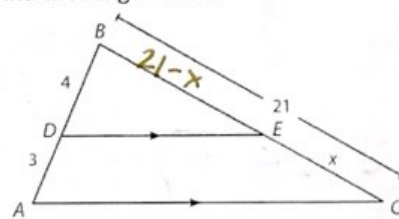- **Triangle Proportionality Theorem:**
  If a line parallel to one side of a triangle intersects the other two sides of the triangle, then the line divides these two sides proportionally.

- **Angle Bisector Theorem:**
  An angle bisector of an angle of a triangle divides the opposite side in two segments that are proportional to the other two sides of the triangle.
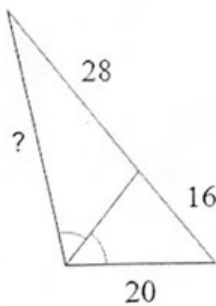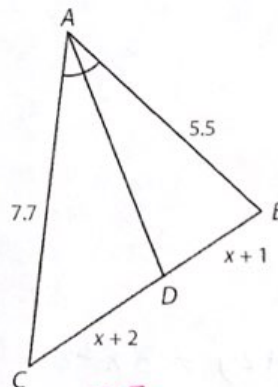
Example Set 1:

1.

$$\frac{9}{?} = \frac{6}{4}$$

$$\frac{6?}{6} = \frac{36}{6}$$

$$\boxed{? = 6}$$

(figure: triangle with sides labeled ?, 9, 6, 4)

2. Find the length of $\overline{EC}$

(figure: triangle with labels B, 4, $21-x$, 21, D, E, 3, x, A, C)

$$\frac{4}{3} = \frac{21-x}{x}$$

$$4x = 63 - 3x$$

$$7x = 63$$

$$\boxed{x = 9}$$

Example Set 2:

1.

(figure: triangle with sides 28, ?, 16, 20 and angle bisector)

$$\frac{?}{28} = \frac{20}{16}$$

$$\frac{16?}{16} = \frac{560}{16}$$

$$\boxed{? = 35}$$

2.

(figure: triangle with A at top, 5.5, 7.7, B, $x+1$, D, $x+2$, C)

$$\frac{7.7}{x+2} \times \frac{5.5}{x+1}$$

$$7.7x + 7.7 = 5.5x + 11$$
$$-5.5x \quad -7.7 \qquad -5.5x \quad -7.7$$
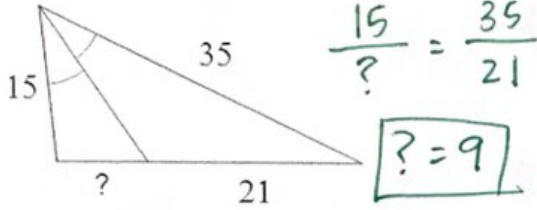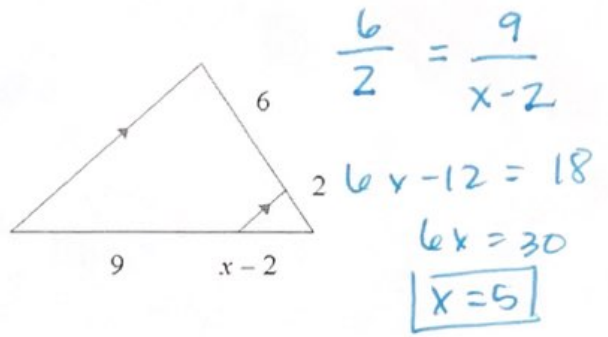
$$\frac{2.2x}{2.2} = \frac{3.3}{2.2} \qquad \boxed{x = 1.5}$$

Practice Problems: Solve for the missing variable

1.

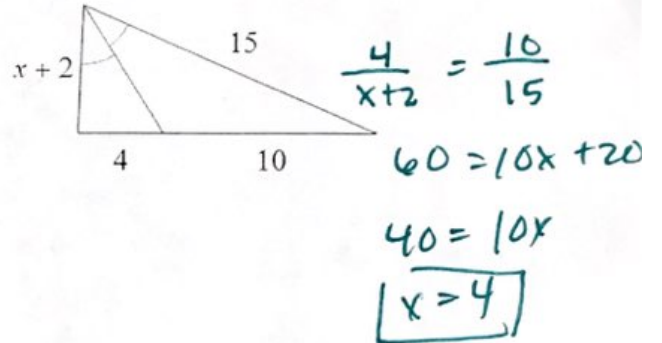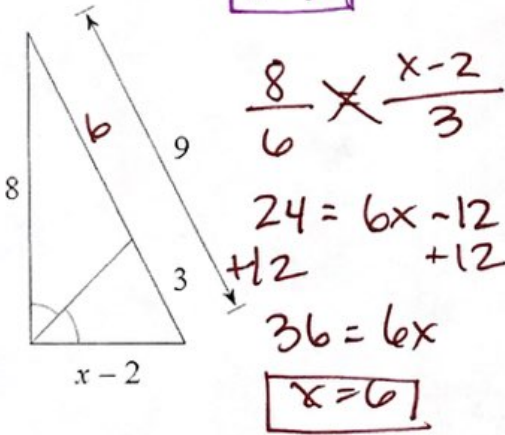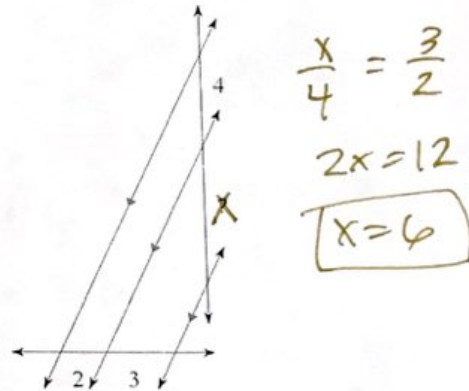$\dfrac{15}{?} = \dfrac{35}{21}$

$\boxed{? = 9}$

Triangle labeled 15, 35, ?, 21

2.

$\dfrac{6}{2} = \dfrac{9}{x-2}$

$6x - 12 = 18$

$6x = 30$

$\boxed{x = 5}$

Triangle labeled 6, 2, 9, $x-2$

3.

Triangle labeled 2, 3, 6, $x+4$

$\dfrac{6}{2} = \dfrac{x+4}{3}$

$18 = 2x + 8$

$\boxed{x = 5}$

4.

Triangle labeled $x+2$, 15, 4, 10

$\dfrac{4}{x+2} = \dfrac{10}{15}$

$60 = 10x + 20$

$40 = 10x$

$\boxed{x = 4}$

5.

Triangle labeled 8, 6, 9, 3, $x-2$

$\dfrac{8}{6} \times \dfrac{x-2}{3}$

$24 = 6x - 12$

$+12 \qquad\qquad +12$

$36 = 6x$

$\boxed{x = 6}$

6.

$\dfrac{x}{4} = \dfrac{3}{2}$

$2x = 12$

$\boxed{x = 6}$

Figure labeled 4, x, 2, 3

7.

Triangle labeled 2, 6, 4, 8, x

$\dfrac{x}{2} = \dfrac{8}{4}$

$4x = 16$

$\boxed{x = 4}$
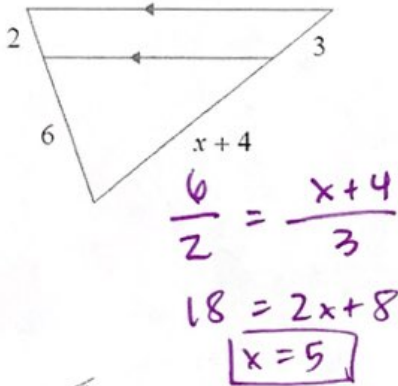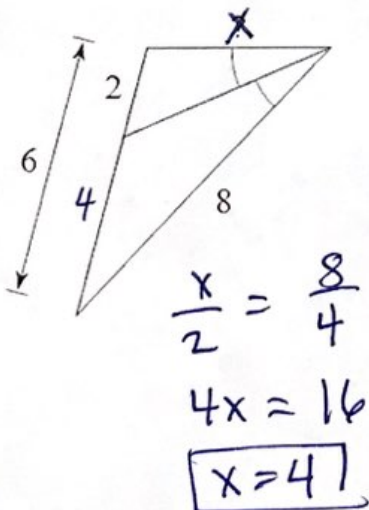
8. If $\overline{AC} = 60$ units and $\overline{EC} = 36$ units, is $\overline{AE} \parallel \overline{BD}$?

Triangle with points C, B, D, A, E; labels 60, 42, 12, 36, 18, 24

$\dfrac{42}{18} \neq \dfrac{12}{24}$

$\underline{\text{NOT PARALLEL}}$