

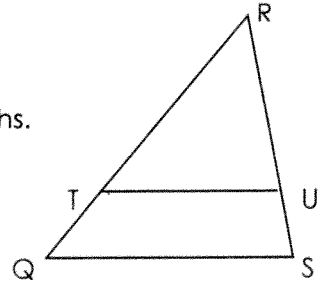
7-4 Parallel Lines & Proportional Parts

Name Master E
Date _____ Block _____

Triangle Proportionality Theorem:

If a line is parallel to one side of a triangle and intersects the other two sides, then it divides the sides into segments of proportional lengths.

$$\text{If } \overline{TU} \parallel \overline{QS}, \text{ then } \frac{RT}{TQ} = \frac{RU}{US}.$$



Converse of the Triangle Proportionality Theorem:

If a line intersects two sides of a triangle and separates the sides into proportional corresponding segments, then the line is parallel to the third side of the triangle.

$$\text{If } \frac{RT}{TQ} = \frac{RU}{US}, \text{ then } \overline{TU} \parallel \overline{QS}.$$

1-3: True or False:

1. $\frac{RT}{TQ} = \frac{RU}{US}$ True

2. $\frac{RT}{TQ} = \frac{TU}{QS}$ False

3. $\frac{TU}{QS} = \frac{RU}{RS}$ True

4-5: In $\triangle QRS$, $\overline{TU} \parallel \overline{QS}$. Use the given information to find each value.

4. $RT = t - 2$, $TQ = t + 1$, $RU = 2$, and $RS = 10$

$$\frac{2}{8} = \frac{t-2}{t+1} \quad 2t+2 = 8t-16 \quad 18 = 6t \quad 3 = t$$

$t = \underline{3}$ $RT = \underline{1}$

5. $RU = 7$, $RS = a$, $RT = 6$, and $TQ = a - 9$

$$\frac{6}{a-9} = \frac{7}{a} \quad 6a - 63 = 7a - 63 \quad a = 21$$

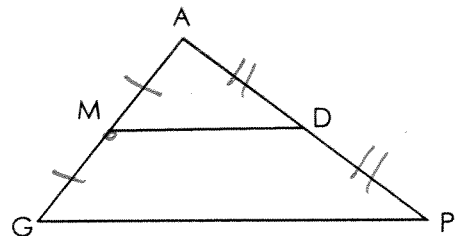
$a = \underline{21}$ $TQ = \underline{12}$

Definition of Midsegment:

A midsegment of a triangle is a segment with endpoints that are the midpoints of two sides of the triangle.

Triangle Midsegment Theorem:

A midsegment of a triangle is parallel to one side of the triangle, and its length is one-half the length of that side. In $\triangle AGP$, if M and D are midpoints of \overline{AG} and \overline{AP} respectively, then \overline{MD} and \overline{GP} are parallel and MD is one-half of GP.



6-8: Given each midsegment for each triangle, find x. Write an equation and show work to get x!

6. $x = \frac{1}{2}(3x-10)$
 $2x = 3x - 10$
 $0 = x - 10$
 $10 = x$
 $x = \underline{10}$

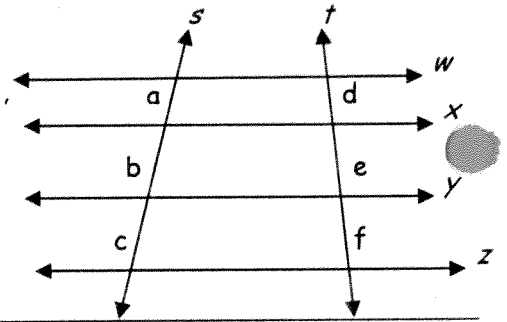
7. $2x+25 = \frac{1}{2}(8x)$
 $2x+25 = 4x$
 $25 = 2x$
 $12.5 = x$
 $x = \underline{12.5}$

8. $x = \frac{1}{2}(150)$
 $x = \underline{75}$

Proportional Parts of Parallel Lines:

If 3 or more parallel lines (w, x, y, and z) intersect 2 transversals (s and t), then they cut off the transversals proportionally.

$$\frac{a}{d} = \frac{b}{e} = \frac{c}{f} \text{ or } \frac{a}{b} = \frac{d}{e} \text{ or } \frac{b}{c} = \frac{e}{f} \text{ or } \frac{a}{a+b} = \frac{d}{d+e}$$



9-10: Given parallel lines w, x, y, and z and transversals s and t, use proportions to solve for each value.

9. $b = 12, c = 15, d = 1,$ and $e = 4.$

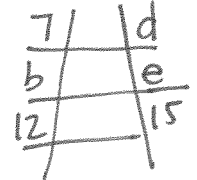


$a = \underline{3}$ $f = \underline{5}$

$$\frac{a}{12} = \frac{1}{4} \quad \frac{12}{15} = \frac{4}{f}$$

$$4a = 12 \quad 12f = 60$$

10. $a = 7, c = 12, f = 15$



$d = \underline{8.75}$

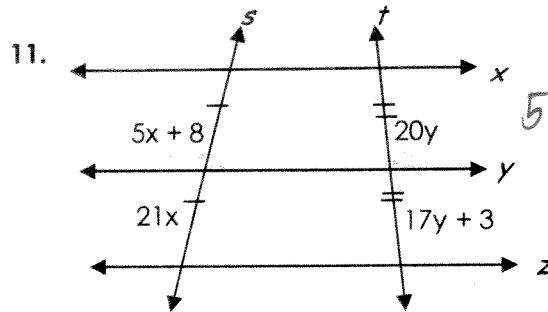
$$\frac{7}{12} = \frac{d}{15} \quad 12d = 105$$

$$d = \underline{8.75}$$

Congruent Parts of Parallel Lines:

If three or more parallel lines (w, x, y, and z) cut off congruent segments on one transversal (s), then they cut off congruent segments on every transversal (s and t).

11-12: Given parallel lines w, x, y, and z and transversals s and t, use proportions to solve for each value.



$$5x+8 = 21x$$

$$8 = 16x$$

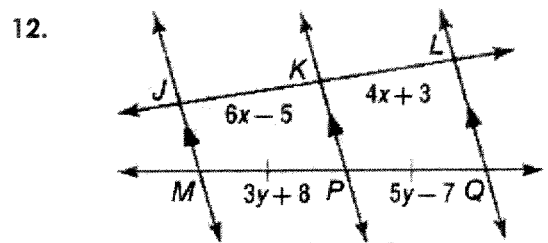
$$\underline{.5 = x}$$

$$20y = 17y+3$$

$$3y = 3$$

$$\underline{1 = y}$$

$x = \underline{.5}$ $y = \underline{1}$



$$6x-5 = 4x+3$$

$$2x = 8$$

$$\underline{4 = x}$$

$$3y+8 = 5y-7$$

$$15 = 2y$$

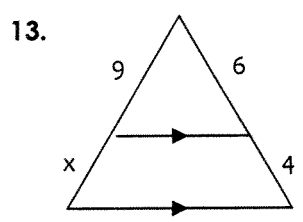
$$\underline{7.5 = y}$$

$x = \underline{4}$ $y = \underline{7.5}$

REMEMBER: In similar triangles, keep the ratios consistent when setting up proportions.

$$\frac{\text{part}}{\text{part}} = \frac{\text{part}}{\text{part}} \quad \text{or} \quad \frac{\text{side}\Delta}{\text{side}\Delta} = \frac{\text{side}\Delta}{\text{side}\Delta} = \frac{\text{side}\Delta}{\text{side}\Delta}$$

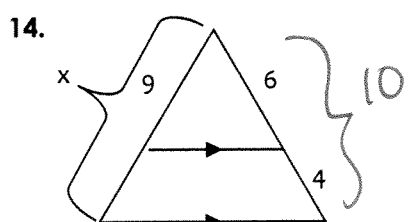
13-15 What is the difference between these problems? Write an equation for each and solve for x.



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

$$6x = 36$$

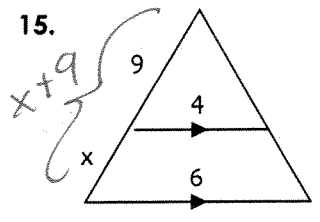
$$\underline{x = 6}$$



$$\frac{9}{x} = \frac{6}{10}$$

$$6x = 90$$

$$\underline{x = 15}$$



$$\frac{4}{x} = \frac{9}{x+9}$$

$$4x+36 = 54$$

$$4x = 18$$

$$\underline{x = 4.5}$$