

Honors Geometry:

Finding the Center of Mass of a Triangle

You will need construction paper, scissors, ruler, and ~~string~~. You may work with a partner.

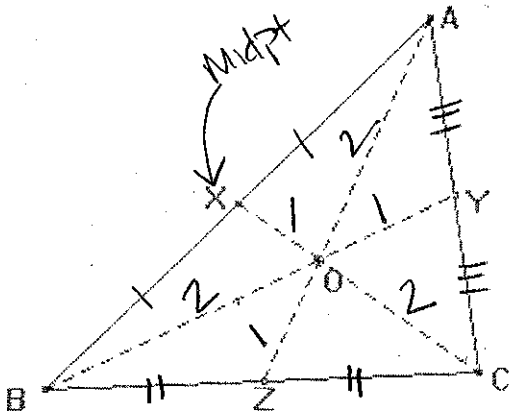
1. Draw Triangle ABC. Use as much of the construction paper as you want. Don't be afraid to make an unusual triangle. **HOWEVER USE A STRAITEDGE.**

2. Use a ruler to mark the midpoint of all three sides of the triangle and label them X, Y, and Z as shown on the triangle below.

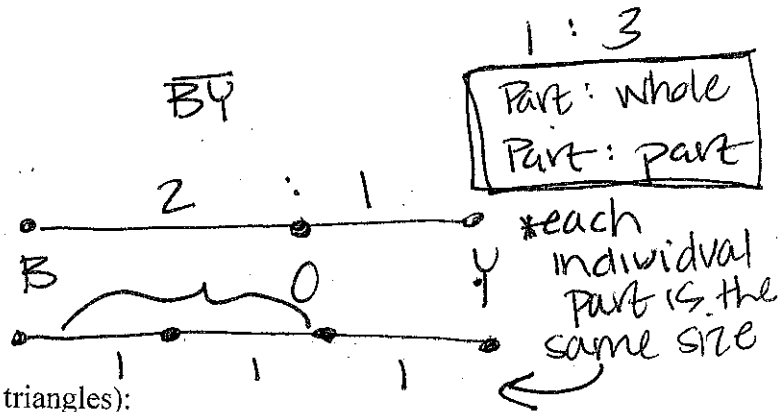
3. Take the ruler and draw a segment from each midpoint to the opposite vertex. These three segments are called **MEDIANS**. Define Median:

Segment that connects the vertex to midpt of opposite side.

4. The medians should meet at a point inside the triangle. Call this point O. This point is called the **CENTROID** of the triangle.



*Label the Δ the same way.



Measure in centimeters the following (from your triangles):

AO = _____ OZ = _____ AZ = _____

BO = _____; OY = _____; BY = _____

CO = _____; OX = _____; XC = _____

Look at all of your measurements. Look at your partners measurements. Do you see a pattern? yes (hopefully the answer is yes)

Conjecture: The centroid divides each median of a triangle into a ratio of 1 : 2 with the longer segments being the one starting at the vertex.

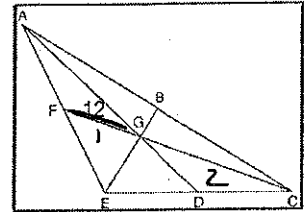
TO HANG YOUR TRIANGLE ABOVE YOUR DESK:

1. Cut a tiny hole at the intersection of all three segments and tie a string through the hole. Then tie a knot at the end of the string so that it does not pull back through the hole. (you may also tape your string to the centroid, this is not quite as effective.)
2. Lift the triangle by the string. What do you notice about the balance of the triangle?
3. The centroid of the triangle is sometimes called the center of the triangle. Why do you think that is?

* Determine Ratio of Median First

Class Practice:

1. In the diagram below of $\triangle ACE$, medians \overline{AD} , \overline{EB} , and \overline{CF} intersect at G . The length of \overline{FG} is 12 cm. What is the length, in centimeters, of \overline{GC} ?



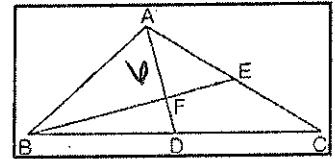
Part FG = 1
Part FC = 2

$$\frac{1}{2} = \frac{12}{x}$$

$$24 = x$$

1:2
12:x

2. In the diagram of $\triangle ABC$ medians \overline{AD} and \overline{BE} intersect at point F . If $AF = 6$, what is the length of \overline{FD} ?



$$\frac{1}{2} = \frac{x}{6}$$

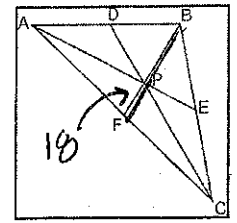
$$2x = 6$$

$$x = 3$$

Part
Part

$$\frac{FD}{AF} = \frac{1}{2}$$

3. In $\triangle ABC$ shown below, P is the centroid and $BF = 18$. What is the length of \overline{BP} ?

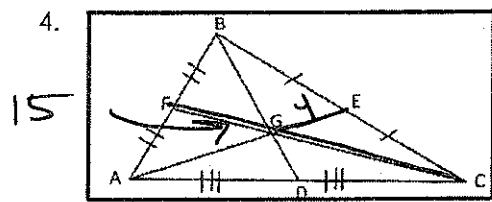


7 part $\rightarrow \frac{1}{3} = \frac{x}{18}$ ← 1 part

Three Whole parts in segment. $3x = 18$
 $x = 6$

Whole segment $\frac{2}{3} = \frac{x}{18}$

$$BP = 12$$



- a. If $GE = 4$, find AE and AG .
 $\downarrow 12$ $\downarrow 8$
- b. If $CF = 15$, find FG and CG .
 $FG = 5$ $CG = 10$
- c. If $BG = 14$, find BD .

$$\frac{1}{2} = \frac{4}{x} \quad 8 = x$$

$$\frac{1}{3} = \frac{x}{15} \quad 3x = 15 \quad x = 5$$

$$\frac{2}{3} = \frac{14}{x}$$

$$2x = 42$$

$$x = 21$$

$$BD = 21$$

each part is 7
1:2
7:14

*Determine Ratio

Geometry Honors

Name Answer Key

ID: 1

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Medians and Centroids

Date _____ Period _____

Each figure shows a triangle with one or more of its medians.

1) Find ES if $EA = 6.6$

Part
Whole
b.6

$$\frac{EA}{ES} = \frac{2}{3}$$

$$\frac{6.6}{x} = \frac{2}{3}$$

$$ES = x = 9.9$$

2) Find RW if $UR = 10.6$

$$\frac{10.6}{2} = 5.3$$

$$RW = 5.3$$

3) Find WR if $WA = 10.8$

Part
Whole
10.8

$$\frac{WA}{WR} = \frac{2}{3}$$

$$\frac{10.8}{x} = \frac{2}{3}$$

$$x = 16.2$$

4) Find CT if $CE = 1$

Part
Whole

$$\frac{CE}{CT} = \frac{2}{3}$$

$$\frac{1}{x} = \frac{2}{3}$$

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

$$2x = 3$$

5) Find IH if $UH = 10$

$$IH = 20$$

6) Find KT if $TX = 3.4$

Part
Part
3.4

$$\frac{1}{2} = \frac{3.4}{x}$$

$$6.8 = x$$

$$KT = 6.8$$

7) Find ZG if $ZA = 18.2$

Part
Whole
18.2

$$\frac{2}{3} = \frac{18.2}{x}$$

$$2x = 91.6$$

$$x = 27.3$$

8) Find XJ if $JS = 1.35$

Part
Part
13.5

$$\frac{1}{2} = \frac{13.5}{x}$$

$$x = 27$$

9) Find YW if $LW = 1.5$

$$YW = 3$$

10) Find LQ if $LG = 15$

Part
Whole
15

$$3x = 30$$

$$\frac{2}{3} = \frac{x}{15}$$

$$x = 10$$

11) Find x if $MY = 2x - 12$ and $MJ = x - 2$

Part
Whole $2x-12$

$$\frac{MY}{MJ} = \frac{2}{3}$$

$$\frac{2x-12}{x-2} = \frac{2}{3}$$

$$4x = 32 \quad 3(2x-12) = 2(x-2)$$

$$6x - 36 = 2x - 4 \quad \boxed{x=8}$$

12) Find x if $HY = 3x - 3$ and $NY = 2x - 4$

Part
Whole

$$\frac{NY}{HY} = \frac{1}{3}$$

$$\frac{2x-4}{3x-3} = \frac{1}{3} \quad \boxed{x=3}$$

$$6x - 12 = 3x - 3$$

$$3x = 9$$

13) Find x if $UK = x$ and $UJ = 2x - 9$

$$2x - 9 = x$$

$$-9 = -x$$

$$\boxed{x=9}$$

* 14) Find x if $EP = \frac{7x-4}{5}$ and $PR = \frac{3x}{5}$

Part
Part

$$\frac{PR}{EP} = \frac{1}{2}$$

$$2\left(\frac{3x}{5}\right) = \frac{7x-4}{5}$$

$$\frac{3x}{5} = \frac{1}{2} \quad 6x = 7x - 4$$

$$\boxed{x=4}$$

15) Find x if $FA = 2x - 2$ and $FB = x + 4$

$$2x - 2 = x + 4$$

$$\boxed{x=6}$$

16) Find x if $JD = x - 4$ and $JB = -9 + 2x$

$$x - 4 = -9 + 2x$$

$$-x = -5$$

$$\boxed{x=5}$$

17) Find x if $FE = x - 8$ and $RE = x - 9$

$$2(RE) = FE$$

$$2(x-9) = x-8$$

$$2x - 18 = x - 8$$

$$\boxed{x=10}$$

18) Find x if $XE = 2x - 2$ and $XL = 2x - 1$

Part
Whole

$$\frac{XE}{XL} = \frac{2}{3}$$

$$\frac{2x-2}{2x-1} = \frac{2}{3}$$

$$3(2x-2) = 2(2x-1)$$

$$6x - 6 = 4x - 2$$

$$2x = 4$$

$$\boxed{x=2}$$