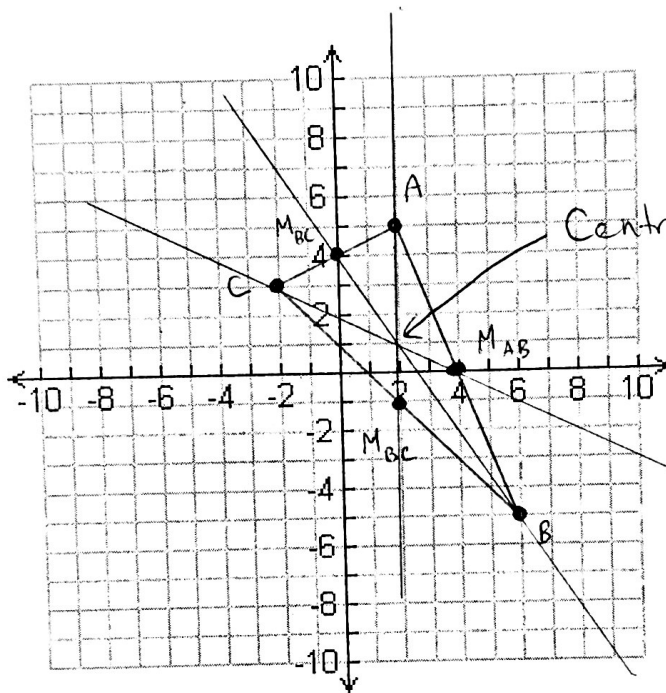


Median Task: Finding the Centroid | MPM2D

1) Consider the triangle formed by A(2, 5), B(6, -5), and C(-2, 3).

a) Graph the triangle on the provided grid.



Centroid is (2, 1)

b) Calculate the midpoint of each side in the space below:

i) Midpoint of AB

$$M_{AB} = \left(\frac{2+6}{2}, \frac{5+(-5)}{2} \right)$$

$$= (4, 0)$$

ii) Midpoint of BC

$$M_{BC} = \left(\frac{6+(-2)}{2}, \frac{-5+3}{2} \right)$$

$$= (2, -1)$$

iii) Midpoint of AC

$$M_{AC} = \left(\frac{2+(-2)}{2}, \frac{5+3}{2} \right)$$

$$= (0, 4)$$

c) Plot each midpoint, and draw the 3 medians of this triangle carefully.

d) The point where they meet is called the centroid. Verify (by looking at your graph) that D(2, 1) looks to be the centroid of this triangle. In this task, you will prove that the centroid is (2, 1) by using analytic geometry.

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e) Find the equation of the median from vertex A using the table below. You will need to be able to do this without the structure.

x_1, y_1 Point 1: A(2, 5)	x_2, y_2 Point 2: Midpoint of BC = (2, -1)
<p>Slope of Median:</p> $m = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{-1 - 5}{2 - 2}$ $= -6/0 \quad (\text{undefined})$	<p style="text-align: center;">$y = mx + b$</p> <p>* Vertical lines cannot be expressed in form *</p> <p>The equation of a vertical line is "x = a" where a is the x-int.</p>
Equation of the median from A: $x = 2$	

f) Find the equation of the median from vertex B using the table below.

x_1, y_1 Point 1: B(6, -5)	x_2, y_2 Point 2: Midpoint of AC = (0, 4)
<p>Slope of Median:</p> $m = \frac{4 - (-5)}{0 - 6}$ $= \frac{9}{-6}$ $= -\frac{3}{2}$	<p style="text-align: center;">$y = mx + b$</p> $y = \frac{-3}{2}x + b$ $4 = \frac{-3}{2}(0) + b$ $4 = b$
Equation of the median from B: $y = \frac{-3}{2}x + 4$	

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g) Find the equation of the median from vertex C using the table below.

Point 1: $C(2, 5)$ $C(-2, 3)$	Point 2: Midpoint of AB = $(4, 0)$
Slope of Median: $m = \frac{0 - 3}{4 - (-2)}$ $= \frac{-3}{6}$ $= -\frac{1}{2}$	$y = mx + b$ $y = -\frac{1}{2}x + b$ $0 = -\frac{1}{2}(4) + b$ $0 = -2 + b$ $b = 2$
Equation of the median from C: $y = -\frac{1}{2}x + 2$	

h) Now that you have the equation of all 3 medians, we will show that they meet at $(2, 1)$. Here, we will use the first two medians you found.

Equation of Median from A: $x = 2$ (1) Equation of Median from B: $y = -\frac{3}{2}x + 4$ (2)

Find the intersection point of these two lines using your linear systems skills.

Sub (1) in (2)

$$y = -\frac{3}{2}(2) + 4$$

$$y = -3 + 4$$

$$\boxed{y = 1}$$

These lines meet at $(2, 1)$
as expected.

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i) We will now show that this point actually also lies on the third median!

Median from C: $y = -\frac{1}{2}x + 2$

Substitute the point (2, 1) into the equation for the median from C to show that the point (2, 1) lies on this line too.

LS	RS
1	$-\frac{1}{2}(2) + 2$
\neq	$-1 + 2$
\neq	1

$LS = RS!$

(2, 1) is on the 3rd line too. They all meet at (2, 1)

j) You've proved that the centroid is (2, 1). Nice job! There is a cool formula for the centroid as well. Since the centroid is like a centre of gravity, you can calculate it using the formula:

$$\text{Centroid} = \left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3} \right)$$

Use the formula with the three original points A, B, and C to verify your answer one more time!

$$= \left(\frac{2 + 6 + (-2)}{3}, \frac{5 + (-5) + 3}{3} \right)$$

$$= (2, 1) \quad \underline{\underline{\text{cool}}}$$

Level R	Level 1	Level 2	Level 3	Level 4
Task is incomplete. Work is very unorganized and hard to follow. Mr. Smith may ask you to redo it.	Calculations have major errors. Work is somewhat organized, proper notation not used. Instructions were not followed.	Calculations have minor errors. Work is somewhat organized and proper notation is used most of the time. Instructions were followed for the most part.	Calculations have minor errors. Work is organized and proper notation is used most of the time. Instructions were properly followed.	All calculations are correct. Work is well organized and proper notation is used. Instructions were followed meticulously.