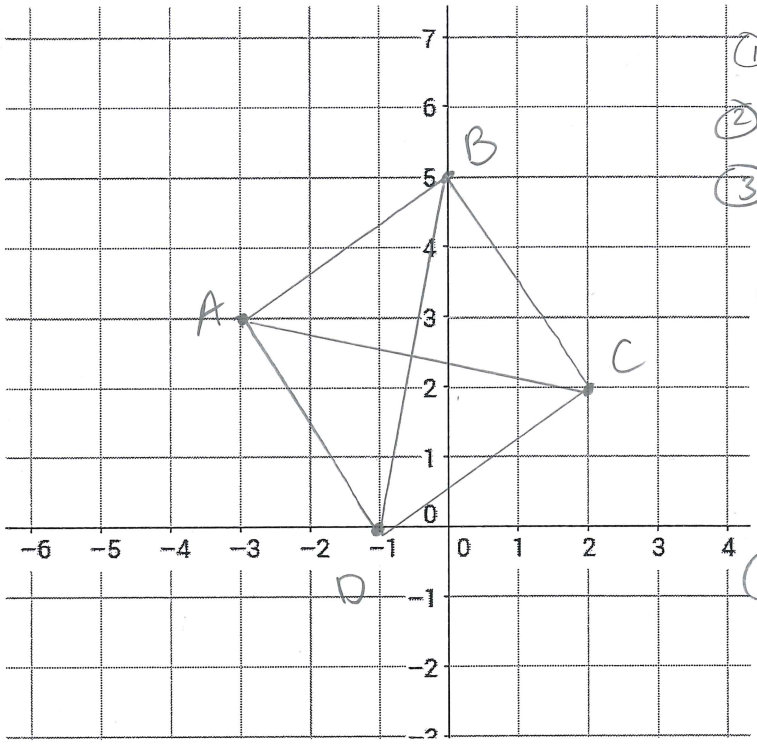
N. M

GPE-1: What quadrilateral is formed; Circle equation; Equation of Perpendicular Bisector

1. Show that the quadrilateral formed by the points A(-3,3) B(0,5) C(2,2), and D(-1,0) is a square.



Hints (won't be given on real thing)

- Show that each diagonal's midpoint is the same point [this implies a parallelogram] ①
- Show that diagonals are the same length (distance) [this shows the shape is a rectangle] ②
- Show that diagonals have opposite reciprocal slopes (perpendicular) [this shows the shape is a rhombus] ③
- A rectangular rhombus parallelogram must be a square.

① Midpoint of $\overline{AC} = \left(\frac{-3+2}{2}, \frac{3+2}{2}\right)$

$\left(-\frac{1}{2}, \frac{5}{2}\right)$

Midpoint of $\overline{BD}$: $\left(\frac{0+-1}{2}, \frac{5+0}{2}\right) = \left(-\frac{1}{2}, \frac{5}{2}\right)$ ← SAME!

So, parallelogram.

② Length of AC:

$\sqrt{(-3-2)^2+(3-2)^2} = \sqrt{(-5)^2+(1)^2} = \sqrt{25+1} = \sqrt{26}$

Length of $\overline{BD}$: $\sqrt{(-1-0)^2+(0-5)^2} = \sqrt{(-1)^2+(-5)^2} = \sqrt{26}$

Same!! So, rectangle.

③ Slope of $\overline{AC}$: $\frac{3-2}{-3-2} = \frac{1}{-5}$

Slope of $\overline{BD}$: $\frac{5-0}{0--1} = \frac{5}{1} = 5$

opposite reciprocals! So, Rhombus.

2. Does the point $(2, \sqrt{12})$ lie on a centered at the origin $(0,0)$ with radius 4? Show the calculations that lead to your conclusion.

$(x-h)^2+(y-k)^2 = r^2$

Simplify $(x-0)^2+(y-0)^2 = 4^2$

$x^2+y^2 = 16$

Plug in point. $(2, \sqrt{12}) \Rightarrow 2^2+\sqrt{12}^2 = 16$

$2^2+\sqrt{12}^2 = 16$

$4+12 = 16$

$16 = 16$ true!

Yes it does.

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3. Write the equation of the perpendicular bisector of a line segment with endpoints A(4,3) and ~~B(-1,0)~~ B(-2,1).

opp. slope midpoint

Slope:

$$m = \frac{1-3}{-2-4} = \frac{-2}{-6} \quad \frac{1}{3} \Longrightarrow \text{opposite reciprocal} \Rightarrow m_{\perp} = -\frac{3}{1} = -3$$

Midpoint

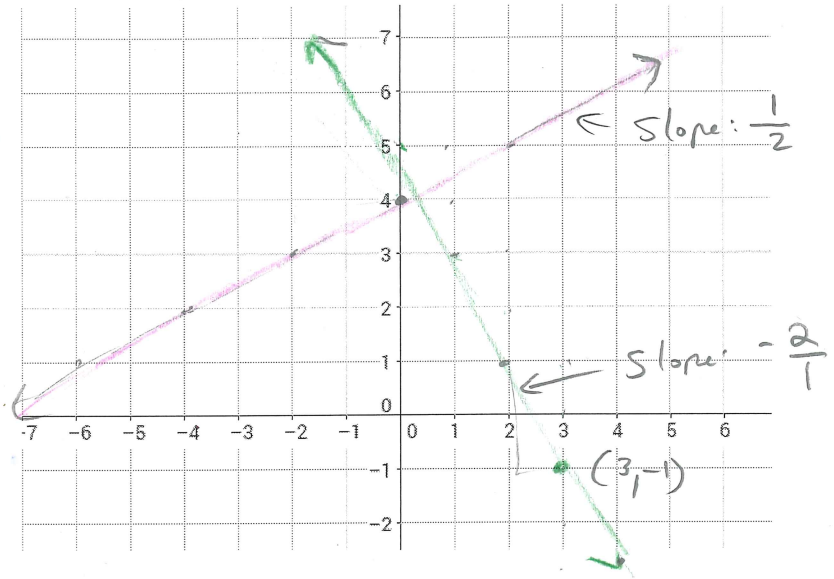
$$\left(\frac{4+-2}{2}, \frac{3+1}{2}\right) = \left(\frac{2}{2}, \frac{4}{2}\right) = (1, 2)$$

point-slope $y - y_1 = m(x - x_1)$

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

GPE-2: Graphing Lines, Segment Partitioning, Area and Perimeter

4. Graph the line that passes through $(3,-1)$ and is perpendicular to $y=\frac{1}{2}x+4$



Given line has slope $\frac{1}{2}$.

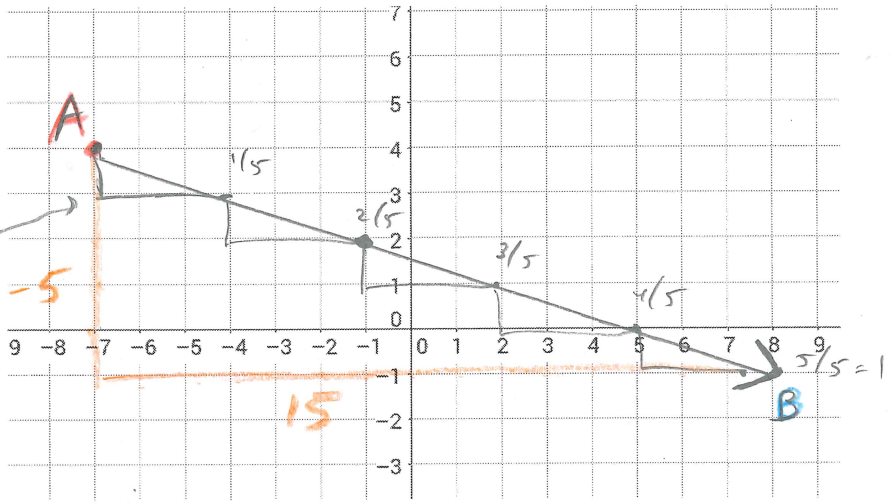
So, $\perp$ line has slope $-\frac{2}{1}$

[opposite reciprocal]

① go to $(3,-1)$

② $\frac{-2}{1}$ ← down 2
← right 1

5. Find the coordinates of the point that is 2/5 of the way from A to B if A(−7,4) and B(8,−1)



Direction is important!

Slope: $\frac{-5}{15}=\frac{-1}{3}$

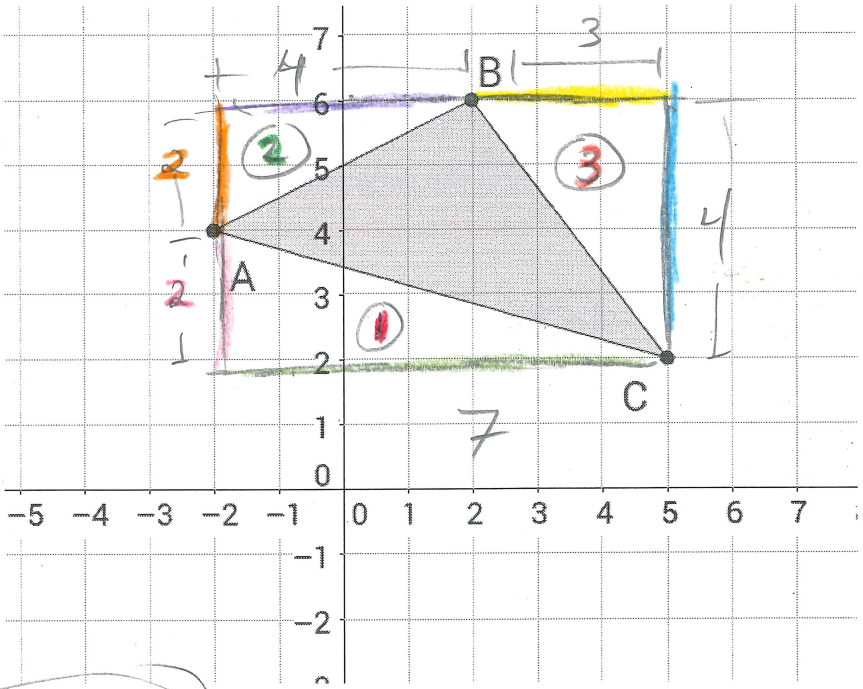
repeat slope twice for 2/5.

$(-1,2)$

6. Find the area of ΔABC.

① make rectangle, find Area

② use $A=\frac{1}{2}\cdot b\cdot h$ to find Area of negative space



total: $A=7\cdot 4=28$ units^2

$A_1=\frac{1}{2}\cdot 7\cdot 2=7$

$A_2=\frac{1}{2}\cdot 2\cdot 4=4$

$A_3=\frac{1}{2}\cdot 3\cdot 4=6$

$28-7-4-6=$ 11 units^2 left for ΔABC.