Exam 4 – Part II: Chapters 8 & 9 **NAME** Answer Key

Math 97, Geometry, Section 3385

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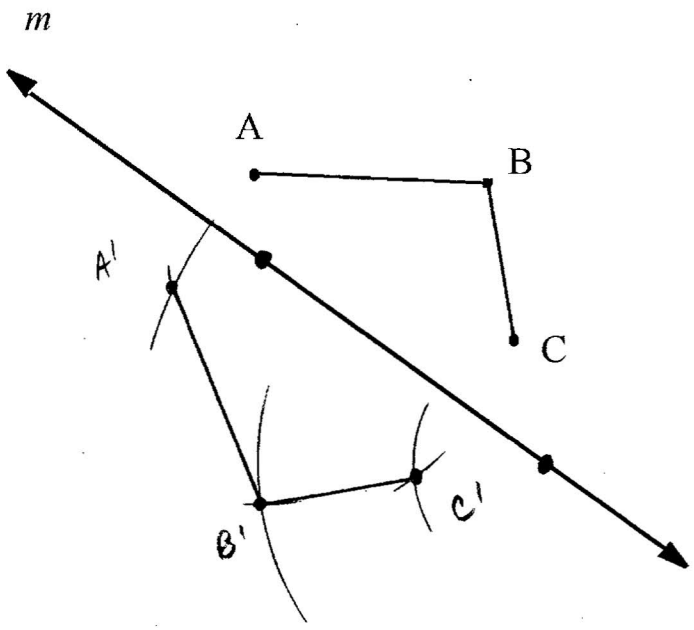
100 points total (30 pts Part I & 70 pts Part II)

Show all work to receive full credit. You may use a calculator. CHECK YOUR WORK!!!!

1. (10 pts) Reflect $\angle ABC$ over the given line m.



2. (12 pts) For the points $A(3,-2)$ and $B(9,4)$, find the following:

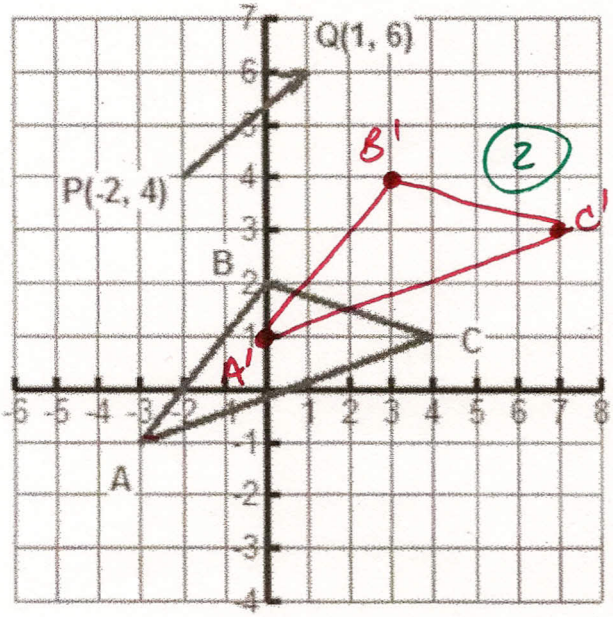
A. The midpoint of $\overline{AB}$. $M = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right) = \left(\frac{3+9}{2}, \frac{4-2}{2}\right) = \boxed{(6,1)}$

B. The exact distance AB.

$AB = \sqrt{(9-3)^2 + (4-(-2))^2} = \sqrt{36+36} = \boxed{6\sqrt{2}}$

C. The slope of $\overline{AB}$. $m = \frac{y_2-y_1}{x_2-x_1} = \frac{4-(-2)}{9-3} = \frac{6}{6} = \boxed{1}$

3. (8 pts) Find the coordinates of the vertices of $\triangle A'B'C'$, the image of $\triangle ABC$ under the translation $\overrightarrow{PQ}$. Graph the image.



A' (0,1) 2

B' (3,4) 2

C' (7,3) 2

4. (8 pts) Find value of x such that the line passing through points $(-3,12)$ and $(x,7)$ is perpendicular to a line having a slope of $-\frac{5}{4}$.

$m_{\perp} = \frac{4}{5}$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4}{5} = \frac{7-12}{x-(-3)} = \frac{-5}{x+3}$

$\frac{4}{5} = \frac{-5}{x+3}$

$4(x+3) = -25$

$4x + 12 = -25$

$-12 \quad -12$

$\frac{4x}{4} = \frac{-37}{4}$

$\boxed{x = \frac{-37}{4} = -9.25}$

5. (8 pts) Which of the following points are collinear with $A(-5,-7)$ and $B(10,3)$?

A. $(1,3)$ NO

B. $(-2,-5)$ YES

C. $(-17,-15)$

D. $(9,4)$ NO

$M_{AB} = \frac{3-(-7)}{10-(-5)} = \frac{10}{15} = \frac{2}{3}$

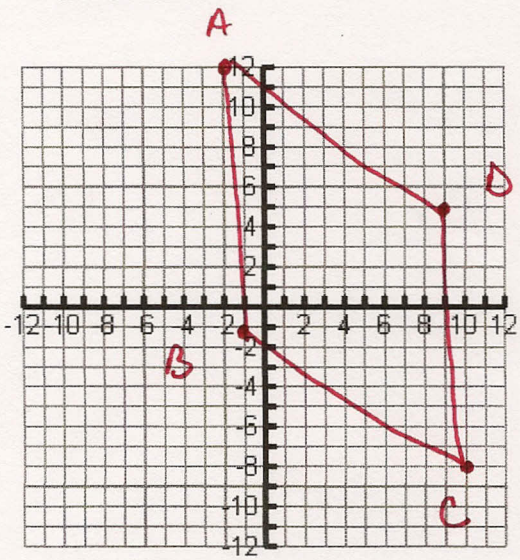
A.) $M = \frac{3-3}{10-1} = 0$ NO

B.) $M = \frac{3-(-5)}{10-(-2)} = \frac{8}{12} = \frac{2}{3}$ YES

C.) $M = \frac{3-(-15)}{10-(-17)} = \frac{18}{27} = \frac{2}{3}$ YES

D.) $M = \frac{3-4}{10-9} = \frac{-1}{1} = -1$ NO

6. (12 pts) A quadrilateral has vertices $A(-2,12)$, $B(-1,-1)$, $C(10,-8)$, and $D(9,5)$. Show that it is a rhombus.



FOR RHOMBUS, PARALLEL SIDES & DIAGONALS ⊥,

$M_{BD} = \frac{5-(-1)}{9-(-1)} = \frac{6}{10} = \frac{3}{5}$

$M_{AC} = \frac{12-(-8)}{-2-10} = \frac{20}{-12} = \frac{-5}{3}$

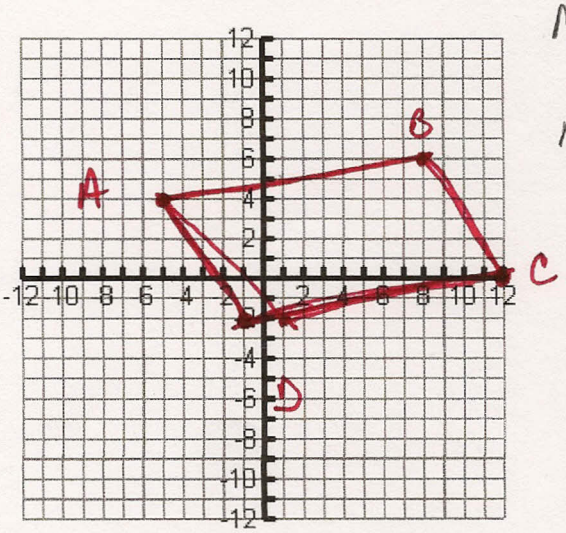
$M_{AB} = \frac{12-(-1)}{-2-(-1)} = \frac{13}{-1} = -13$

$M_{DC} = \frac{5-(-8)}{9-10} = \frac{13}{-1} = -13$

$\overline{BD} \perp \overline{AC}$

$\overline{AB} \parallel \overline{CD}$

7. (12 pts) Quadrilateral $ABCD$ has vertices $A(-5,4)$, $B(8,6)$, $C(12,0)$, and $D(-1,-2)$. What type of quadrilateral is $ABCD$? Justify your answer.



$M_{AB} = \frac{6-4}{8-(-5)} = \frac{2}{13}$

$M_{CD} = \frac{-2-0}{-1-12} = \frac{-2}{-13} = \frac{2}{13}$

$M_{BC} = \frac{6-0}{8-12} = \frac{6}{-4} = \frac{-3}{2}$

$M_{AD} = \frac{4-(-2)}{-5-(-1)} = \frac{6}{-4} = \frac{-3}{2}$

$m_{BD} = \frac{6-(-2)}{8-(-1)} = \frac{8}{9}$

$M_{AC} = \frac{0-4}{12-(-5)} = \frac{-4}{17}$

NOT ⊥

$\overline{AB} \parallel \overline{CD}$

$\overline{BC} \parallel \overline{AD}$

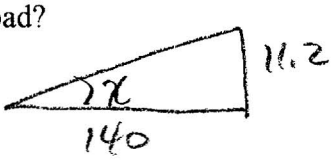
PARALLELOGRAM

EXTRA CREDIT ON BACK

BONUS (total of **10** extra points)

A road rises 11.2 feet in a horizontal distance of 140 feet.

(3 pts) What is the slope of the road?



$m = \frac{11.2}{140} = \boxed{0.08} = 8\%$

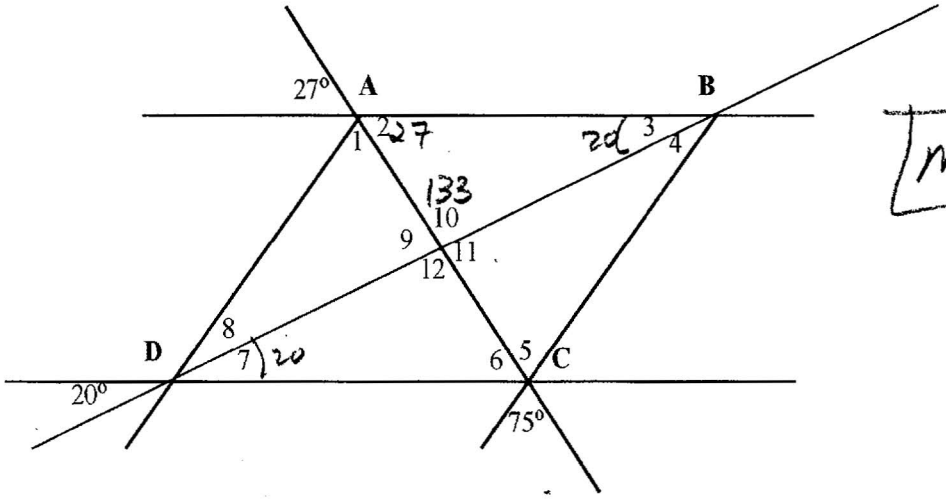
(4 pts) What is its angle of inclination (the angle formed with the horizontal)?

$\tan x^\circ = \frac{11.2}{140}$

$x^\circ = \tan^{-1}\left(\frac{11.2}{140}\right)$

$x^\circ = 4.574 \approx \boxed{4.57^\circ}$

(3 pts) Given the figure shown below with $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$ and $\overleftrightarrow{AD} \parallel \overleftrightarrow{BC}$. What is $m\angle 11$?



$\boxed{m\angle 11 = 47^\circ}$