Key

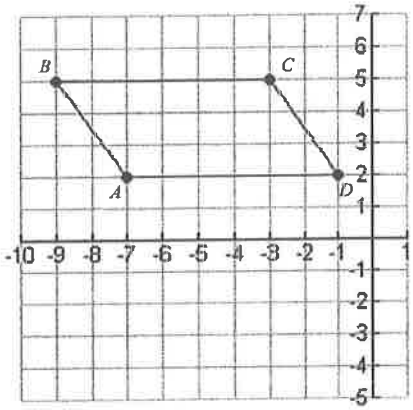
Math 1

Name Key

Lesson 5-6 *Proofs with Coordinate Geometry*

- *I can prove or disprove a figure defined by given coordinates.*

1. Prove that the figure **is or is not** a *parallelogram*. To prove this fact, we will need to prove that opposite sides are parallel.

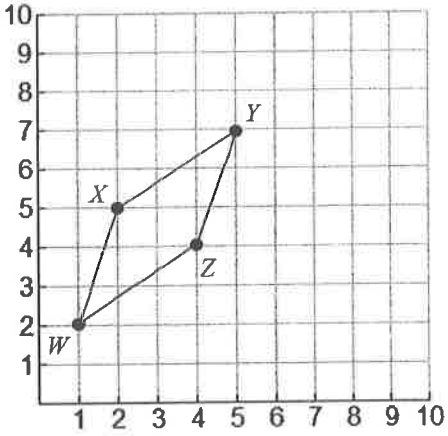


$\overline{AB} \rightarrow \frac{5-2}{-9+7} = \frac{3}{-2}$ $BC \rightarrow 0$

$\overline{CD} \rightarrow \frac{5-2}{-3+1} = \frac{3}{-2}$ $AD \rightarrow 0$

Note: $\overline{AB}$ is the same segment as AB

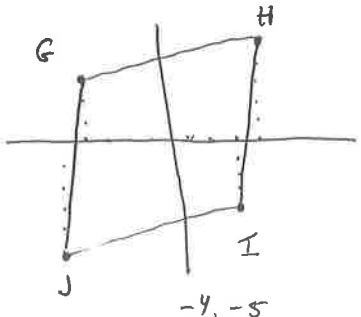
2. Prove that the figure **is or is not** a *parallelogram*.



$\overline{WX} \rightarrow \frac{5-2}{2-1} = 3$ $\overline{XY} \rightarrow \frac{7-5}{5-3} = \frac{2}{3}$

$\overline{YZ} \rightarrow \frac{7-4}{5-4} = 3$ $\overline{WZ} \rightarrow \frac{4-2}{4-1} = \frac{2}{3}$

3. Prove that the figure *GHIJ* **is or is not** a *parallelogram*. $G(-4, 3)$ $H(4, 5)$ $I(3, -4)$ $J(-5, -5)$



$GH \rightarrow \frac{5-3}{4+4} = \frac{2}{8} = \frac{1}{4}$

$JI \rightarrow \frac{-5+4}{-5-3} = \frac{-1}{-8} = \frac{1}{8}$

-4, -5

4. Find a fourth point that will make a parallelogram. $A(-3, 1)$ $B(4, 3)$ $C(3, -3)$ $D(?, ?)$

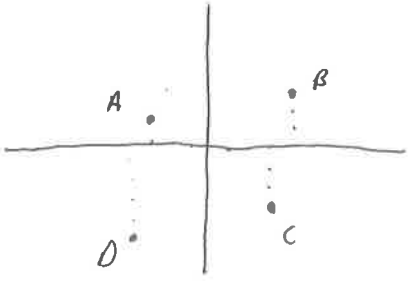
Must be the same!

$AB \rightarrow \frac{3-1}{4+3} = \frac{2}{7}$

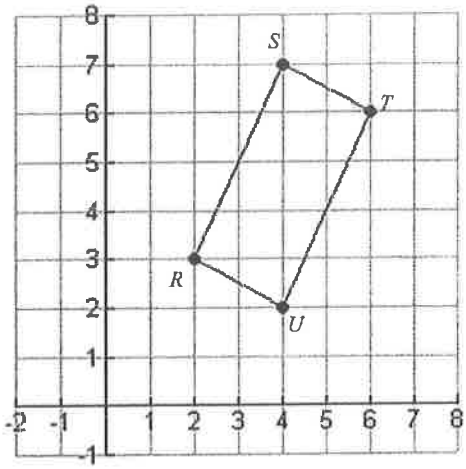
$CB \rightarrow \frac{-3-3}{3-4} = \frac{-6}{-1} = 6$

$DC \rightarrow \frac{2}{7}$

$D = (-4, -5)$



5. Prove that the figure **is or is not** a *rectangle*. To prove this, we will have to use the slopes of the sides to prove that all consecutive sides are perpendicular **OR** prove that the figure is a parallelogram and then use the slopes of the sides to prove one pair of consecutive sides are perpendicular.



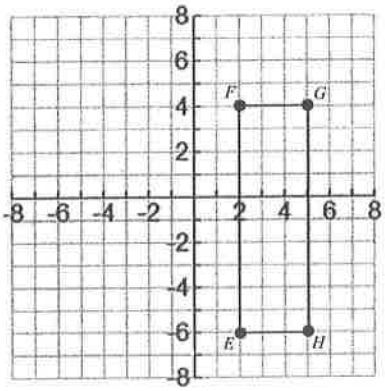
$\overline{RS} \rightarrow \frac{7-3}{4-2} = \frac{4}{2} = 2$

$ST \rightarrow \frac{7-6}{4-6} = \frac{1}{-2}$

$RU \rightarrow \frac{3-2}{2-4} = \frac{1}{-2}$

$TU \rightarrow \frac{6-2}{6-4} = \frac{4}{2} = 2$

6. Prove that the figure **is or is not** a *rectangle*.



$FG \rightarrow \frac{4-4}{5-2} = \frac{0}{3}$ ← horizontal

$EF \rightarrow \frac{4+6}{2-2} = \frac{10}{0}$ ← vertical

$GH \rightarrow \frac{4+6}{5-5} = \frac{10}{0}$ ← vertical

$EH \rightarrow \frac{-6+6}{5-2} = \frac{0}{3}$ ← horizontal

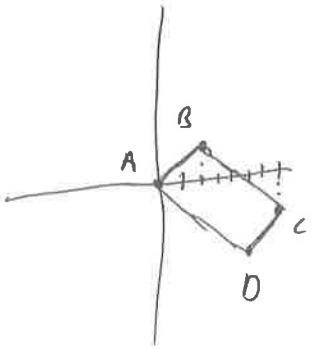
7. Prove that the figure $ABCD$ **is or is not** a *rectangle*. $A(0, 0)\ B(2, 2)\ C(7, -3)\ D(5, -5)$

$AB \rightarrow \frac{2-0}{2-0} = 1$

$BC \rightarrow \frac{-3-2}{7-2} = \frac{-5}{5} = -1$

$AD \rightarrow \frac{-5-0}{5-0} = -1$

$CD \rightarrow \frac{-5+3}{5-7} = \frac{-2}{-2} = 1$



8. Find a point K that makes the figure a *rectangle*, then prove that the figure **is** a *rectangle*.

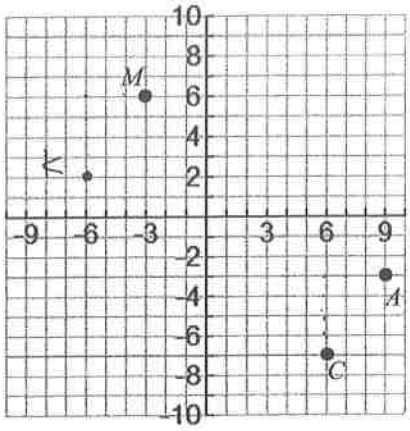
$KM \rightarrow \frac{6-2}{-3+6} = \frac{4}{3}$

$MA \rightarrow \frac{6+3}{-3-9} = \frac{9}{-12} = \frac{3}{-4}$

$KC \rightarrow \frac{2+7}{-6-6} = \frac{9}{-12} = \frac{3}{-4}$

$AC \rightarrow \frac{-3+7}{9-6} = \frac{4}{3}$

$K = (-6, 2)$



9. Prove that the figure **is or is not** a *rhombus*. To prove this, show that that all sides are (congruent) same length

OR prove that it is a parallelogram and one set of consecutive sides are (congruent) the same length.

$AT = 8 - 3 = 5$

$MH = 5 - 0 = 0$

Length of MA

$(MA)^2 = 3^2 + 4^2$

$(MA)^2 = 9 + 16$

$(MA)^2 = 25$

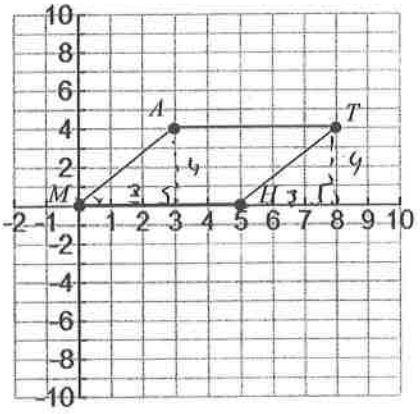
$MA = 5$

$(TH)^2 = 3^2 + 4^2$

$(TH)^2 = 9 + 16$

$(TH)^2 = 25$

$TH = 5$



10. Prove that the figure **is or is not** a *rhombus*.

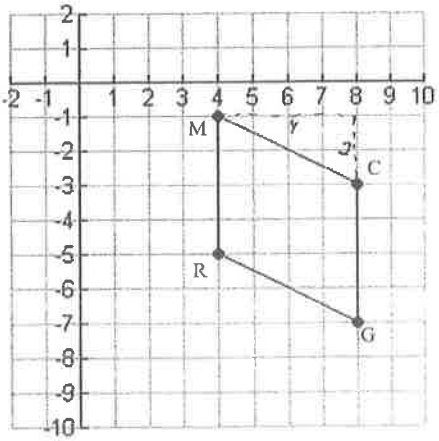
$(MC)^2 = 4^2 + 2^2$

$(MC)^2 = 16 + 4$

$(MC)^2 = 20$

$MC = \sqrt{20}$

$MR = -1 + 5 = 4$



11. Prove that the figure *CATS* **is or is not** a *rhombus*. $C(-3, 2)\ A(-2, 6)\ T(2, 7)\ S(1, 3)$

$(CA)^2 = 1^2 + 4^2$

$(CA)^2 = 1 + 16$

$CA = \sqrt{17}$

$(AT)^2 = 4^2 + 1^2$

$(AT)^2 = 17$

$AT = \sqrt{17}$

$(TS)^2 = 1 + 4^2$

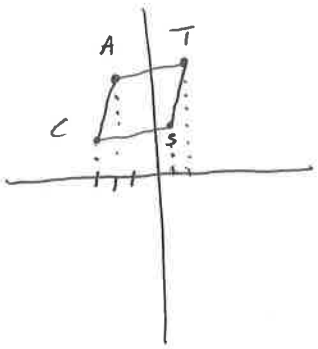
$(TS)^2 = 17$

$TS = \sqrt{17}$

$(CS)^2 = 4^2 + 1^2$

$(CS)^2 = 17$

$CS = \sqrt{17}$



12. Find a point *D* that makes the figure a *rhombus*, then prove that the figure **is** a *rhombus*.
$A(2, 5)\ B(6, 3)\ C(4, -1)\ D(?, ?)$

$D(0, 1)$

$(AB)^2 = 4^2 + 2^2$

$(AB)^2 = 16 + 4$

$AB = \sqrt{20}$

$(BC)^2 = 2^2 + 4^2$

$(BC)^2 = 20$

$BC = \sqrt{20}$

$(CD)^2 = 4^2 + 2^2$

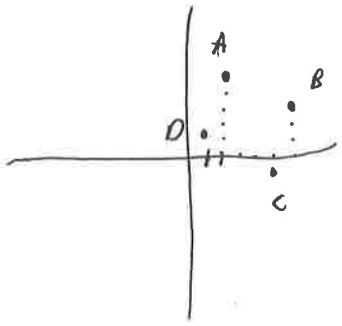
$(CD)^2 = 20$

$CD = \sqrt{20}$

$(AD)^2 = 2^2 + 4^2$

$(AD)^2 = 20$

$AD = \sqrt{20}$



13. Prove that the figure **is or is not** a *square*. To prove this, show that all sides are

congruent and ***adjacent*** sides are perpendicular.

Distance

$(ST)^2 = 1^2 + 4^2$

$(ST)^2 = 1 + 16$

$ST = \sqrt{17}$

$(TO)^2 = 1^2 + 4^2$

$(TO)^2 = 17$

$TO = \sqrt{17}$

$(OP)^2 = 1^2 + 4^2$

$(OP)^2 = 17$

$OP = \sqrt{17}$

$(PS)^2 = 1^2 + 4^2$

$(PS)^2 = 17$

$PS = \sqrt{17}$

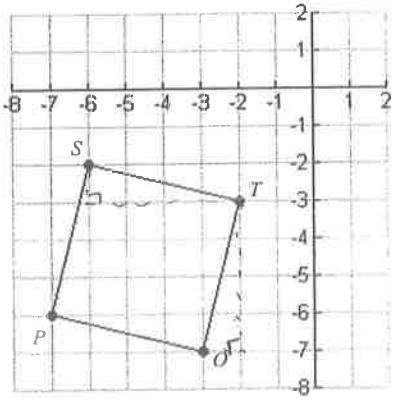
Slope

$PS = \frac{-2+6}{-6+7} = \frac{4}{1} = 4$

$TO = \frac{-3+7}{-2+3} = \frac{4}{1} = 4$

$ST = \frac{-2+3}{-6+2} = \frac{1}{-4}$

$PO = \frac{-6+7}{-7+3} = \frac{1}{-4}$



14. Prove that the figure *VEST* **is or is not** a *square*. $V(-2, 8)\ E(5, 7)\ S(4, 0)\ T(-3, 1)$

→ 4 congruent sides + 90° angles

Distance

$(VE)^2 = 7^2 + 1^2$

$(VE)^2 = 50$

$VE = \sqrt{50}$

$(TS)^2 = 7^2 + 1^2$

$(TS)^2 = 50$

$TS = \sqrt{50}$

$(ES)^2 = 1^2 + 7^2$

$(ES)^2 = 50$

$ES = \sqrt{50}$

$(VT)^2 = 1^2 + 7^2$

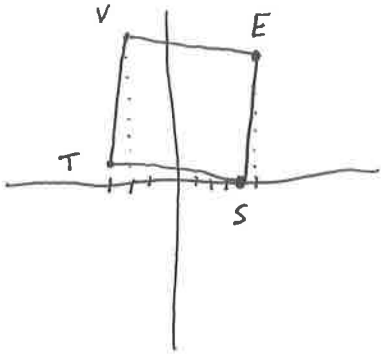
$(VT)^2 = 50$

$VT = \sqrt{50}$

Slope

$VE \rightarrow \frac{8-7}{-2-5} = \frac{1}{-7}$ ✓

$SE \rightarrow \frac{7-0}{5-4} = \frac{7}{1} = 7$

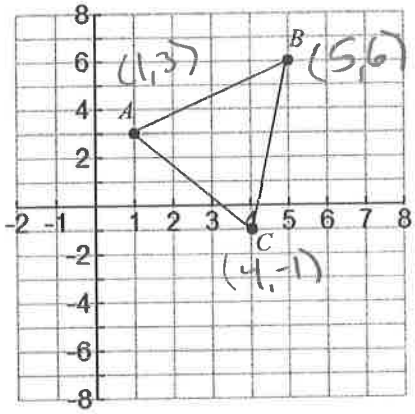


15. Prove that the figure **is or is not** a *right triangle*. To prove this, show that one pair of consecutive sides are perpendicular.

$AC \rightarrow \frac{-1-3}{4-1} = \frac{-4}{3}$

$AB \rightarrow \frac{6-3}{5-1} = \frac{3}{4}$

> opposite reciprocals



16. Prove that the figure *CAT* **is or is not** a *right triangle*. $C(-6, 4)\ A(2, 1)\ T(-3, -2)$

$CT \rightarrow \frac{-2-4}{-3+6} = \frac{-6}{3} = -2$

$AT \rightarrow \frac{-2-1}{-3-2} = \frac{-3}{-5} = \frac{3}{5}$

$CA \rightarrow \frac{1-4}{2+6} = \frac{-3}{8}$