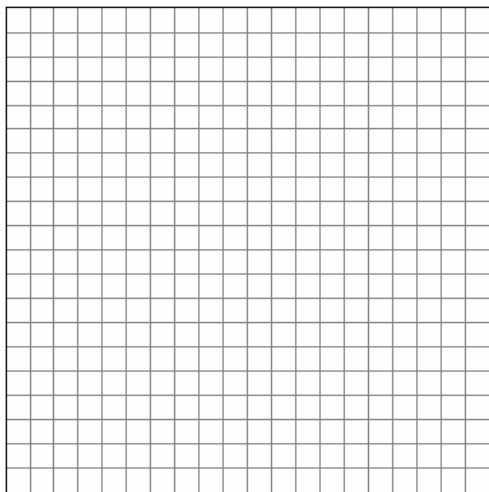


NAME: \_\_\_\_\_

*G.G.69: Investigate, justify, and apply the properties of triangle and quadrilaterals in the coordinate plane, using the distance, midpoint, and slope formulas*

1. 060936ge, P.I. G.G.69

Triangle  $ABC$  has coordinates  $A(-6,2)$ ,  $B(-3,6)$ , and  $C(5,0)$ . Find the perimeter of the triangle. Express your answer in simplest radical form. [The use of the grid below is optional.]

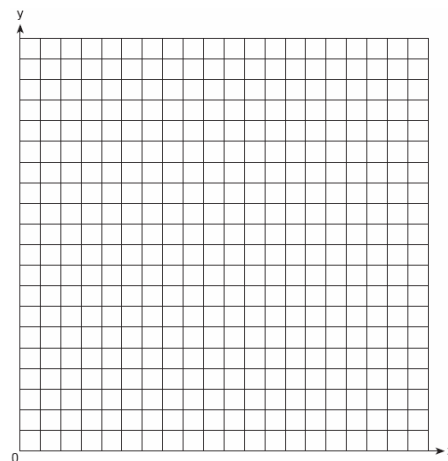


2. 060824b, P.I. G.G.69

The coordinates of quadrilateral  $PRAT$  are  $P(a,b)$ ,  $R(a,b+3)$ ,  $A(a+3,b+4)$ , and  $T(a+6,b+2)$ . Prove that  $\overline{RA}$  is parallel to  $\overline{PT}$ .

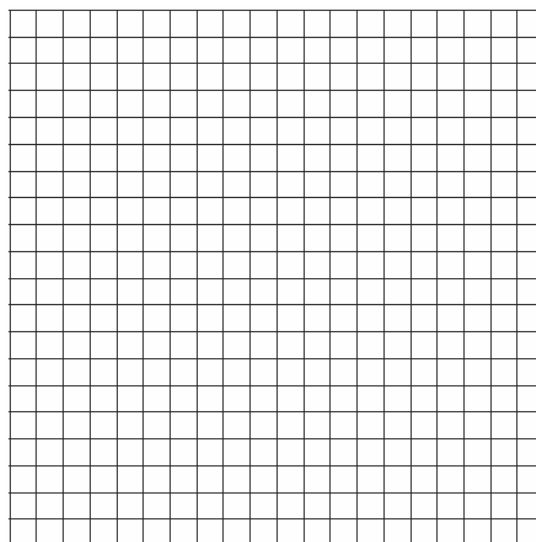
3. 080032a, P.I. G.G.69

Ashanti is surveying for a new parking lot shaped like a parallelogram. She knows that three of the vertices of parallelogram  $ABCD$  are  $A(0,0)$ ,  $B(5,2)$ , and  $C(6,5)$ . Find the coordinates of point  $D$  and sketch parallelogram  $ABCD$  on the accompanying set of axes. Justify mathematically that the figure you have drawn is a parallelogram.



4. 060327b, P.I. G.G.69

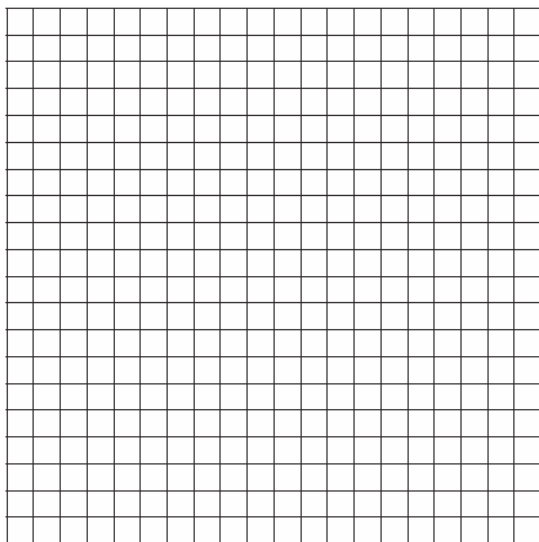
The coordinates of quadrilateral  $ABCD$  are  $A(-1,-5)$ ,  $B(8,2)$ ,  $C(11,13)$ , and  $D(2,6)$ . Using coordinate geometry, prove that quadrilateral  $ABCD$  is a rhombus. [The use of the grid is optional.]



NAME: \_\_\_\_\_

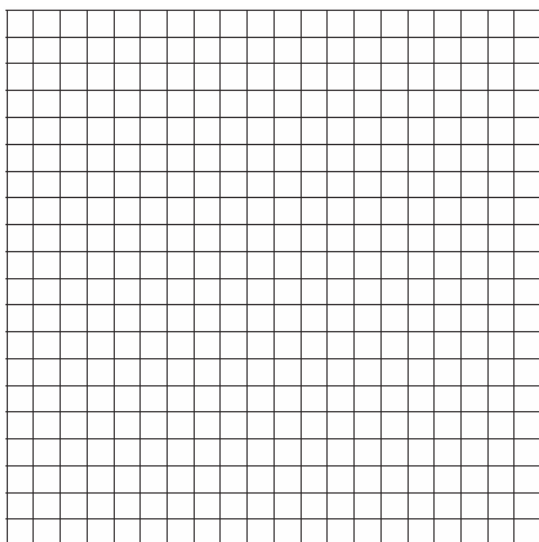
5. 010533b, P.I. G.G.69

Jim is experimenting with a new drawing program on his computer. He created quadrilateral  $TEAM$  with coordinates  $T(-2,3)$ ,  $E(-5,-4)$ ,  $A(2,-1)$ , and  $M(5,6)$ . Jim believes that he has created a rhombus but not a square. Prove that Jim is correct. [The use of the grid is optional.]



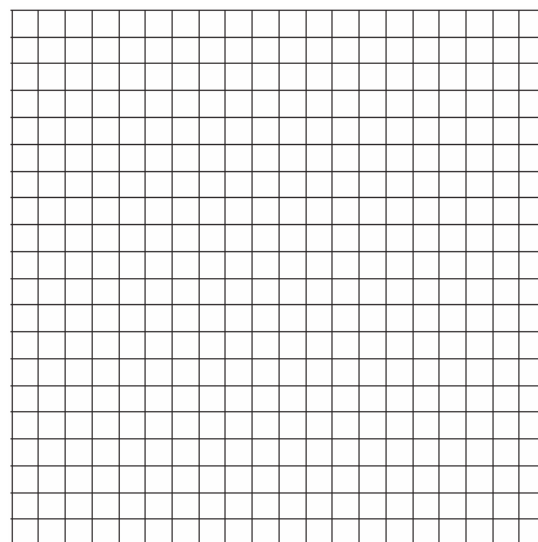
6. 060633b, P.I. G.G.69

Given:  $A(-2,2)$ ,  $B(6,5)$ ,  $C(4,0)$ ,  $D(-4,-3)$   
Prove:  $ABCD$  is a parallelogram but not a rectangle. [The use of the grid is optional.]



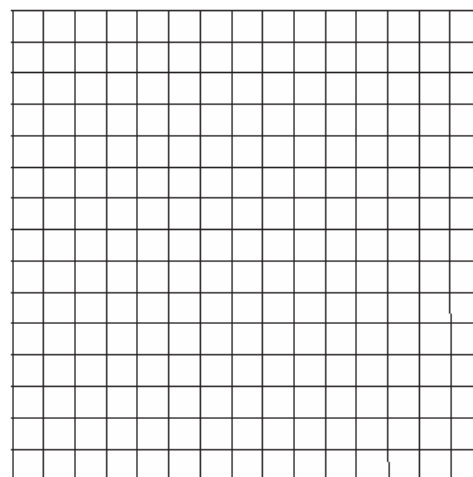
7. 060733b, P.I. G.G.69

Given: quadrilateral  $ABCD$  with vertices  $A(-2,2)$ ,  $B(8,-4)$ ,  $C(6,-10)$ , and  $D(-4,-4)$ . State the coordinates of  $A'B'C'D'$ , the image of quadrilateral  $ABCD$  under a dilation of factor  $\frac{1}{2}$ . Prove that  $A'B'C'D'$  is a parallelogram. [The use of the grid is optional.]



8. 080134b, P.I. G.G.69

Given:  $A(1,6)$ ,  $B(7,9)$ ,  $C(13,6)$ , and  $D(3,1)$   
Prove:  $ABCD$  is a trapezoid. [The use of the grid is optional.]



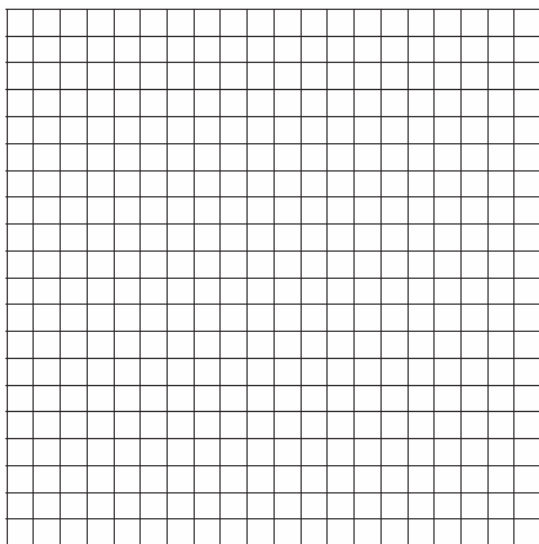
NAME: \_\_\_\_\_

9. 010333b, P.I. G.G.69

Quadrilateral  $KATE$  has vertices  $K(1,5)$ ,  $A(4,7)$ ,  $T(7,3)$ , and  $E(1,-1)$ .

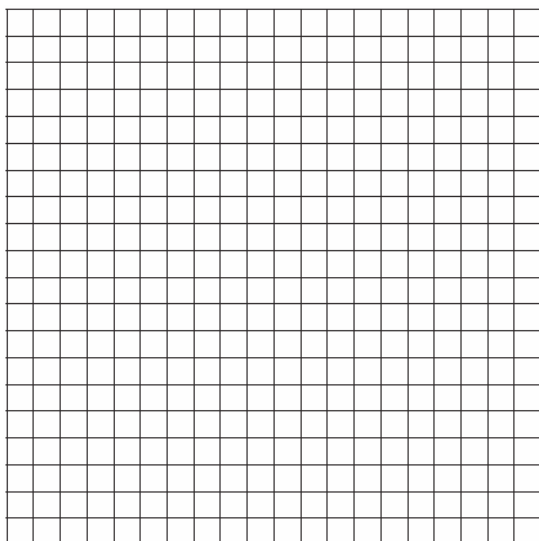
a Prove that  $KATE$  is a trapezoid. [The use of the grid is optional.]

b Prove that  $KATE$  is *not* an isosceles trapezoid.



10. 080434b, P.I. G.G.69

The coordinates of quadrilateral  $JKLM$  are  $J(1,-2)$ ,  $K(13,4)$ ,  $L(6,8)$ , and  $M(-2,4)$ . Prove that quadrilateral  $JKLM$  is a trapezoid but not an isosceles trapezoid. [The use of the grid is optional.]



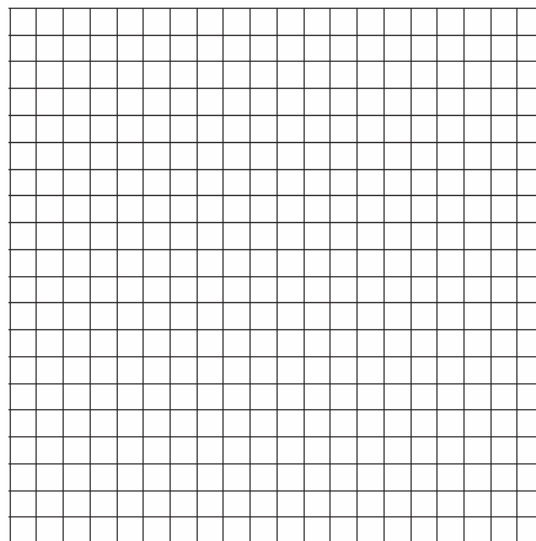
11. 080933b, P.I. G.G.69

Given:  $T(-1,1)$ ,  $R(3,4)$ ,  $A(7,2)$ , and  $P(-1,-4)$

Prove:  $TRAP$  is a trapezoid.

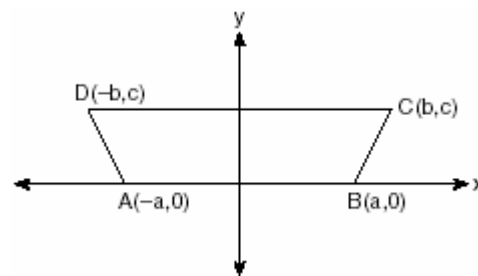
$TRAP$  is *not* an isosceles trapezoid.

[The use of the grid is optional.]



12. 080534b, P.I. G.G.69

In the accompanying diagram of  $ABCD$ , where  $a \neq b$ , prove  $ABCD$  is an isosceles trapezoid.



*G.G.69: Investigate, justify, and apply the properties of triangle and quadrilaterals in the coordinate plane, using the distance, midpoint, and slope formulas*

- [4]  $15 + 5\sqrt{5}$ , and appropriate work is shown.  
[3] Appropriate work is shown, but one computational error is made.  
or [3] Appropriate work is shown, but the perimeter is not expressed in simplest radical form.  
or [3] Appropriate work is shown to find the length of all three sides, but the perimeter is not found.  
[2] Appropriate work is shown, but two or more computational errors are made.  
or [2] Appropriate work is shown, but one conceptual error is made.  
or [2] Appropriate work is shown to find the lengths of two sides, but no further correct work is shown.  
[1] Appropriate work is shown, but one conceptual error and one computational error are made.  
or [1] Appropriate work is shown to find the length of one side, but no further correct work is shown.  
or [1]  $15 + 5\sqrt{5}$ , but no work is shown.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.  
[1] 

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- [2] The slopes of  $\overline{RA}$  and  $\overline{PT}$  are calculated correctly, and appropriate work is shown, and the statement is made that since their slopes are equal, the lines are parallel.  
[1] Appropriate work is shown, but one computational error is made.  
or [1] Appropriate work is shown, but one conceptual error is made.  
or [1] Appropriate work is shown, and the slopes are shown to be equal, but no concluding statement is written.  
[0] A statement is written that lines with equal slopes are parallel, but no work is shown.  
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.  
[2] 

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- [4] The student draws parallelogram  $ABCD$  correctly, identifies  $D(1,3)$ , and justifies the coordinates of  $D$  by using any appropriate method to show  $ABCD$  is a parallelogram.  
[3] The student draws parallelogram  $ABCD$  incorrectly but justifies  $D$  appropriately.  
or [3] The student draws parallelogram  $ABCD$  correctly and identifies  $D(1,3)$ , but the justification is incomplete.  
[2] The student draws parallelogram  $ABCD$  correctly and identifies  $D(1,3)$ , but no justification is shown.  
[1] The student either draws parallelogram  $ABCD$  correctly or identifies  $D(1,3)$  correctly.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.  
[3] 

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- [4] Appropriate work is shown, and an appropriate concluding statement is made to prove quadrilateral  $ABCD$  is a rhombus.
- [3] The proof is completed appropriately, but one computational error is made, but an appropriate concluding statement is made.
- or [3] Appropriate work is shown to prove quadrilateral  $ABCD$  is a rhombus, but the concluding statement is missing, incomplete, or incorrect.
- [2] The proof is completed appropriately, but more than one computational error is made, but an appropriate concluding statement is made.
- or [2] Appropriate work is shown, but one of the formulas used is incorrect.
- or [2] Appropriate work is shown to prove quadrilateral  $ABCD$  is a parallelogram, and an appropriate concluding statement is made, but the sides are not proved to be equal.
- or [2] Quadrilateral  $ABCD$  is proved to be a rhombus by assuming quadrilateral  $ABCD$  is a parallelogram.
- [1] Appropriate work is shown to prove quadrilateral  $ABCD$  is a parallelogram, and the concluding statement is missing, incomplete, or incorrect.
- or [1] The definition of a rhombus is stated, but no proof is given.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [6] A complete and correct proof is shown.
- [5] Appropriate work is shown, but one computational error is made.
- or [5] Appropriate work is shown, but the final conclusion is not justified or is justified incorrectly.
- [4] Appropriate work is shown, but two or more computational errors are made.
- or [4] Appropriate work is shown to prove TEAM is a parallelogram and not a square, but no work is shown to prove it is a rhombus.
- or [4] Appropriate work is shown to prove TEAM is a rhombus, and partial work is shown to prove TEAM is not a square, but the conclusion is not adequately justified.
- [3] Appropriate work is shown to prove TEAM is a rhombus, but no further correct work is shown.
- or [3] Appropriate work is shown to prove TEAM is not a square, but an incorrect method is used to prove TEAM is a rhombus.
- or [3] An accurate explanation of the process required to complete the proof is stated, and needed formulas are given, but no further correct work is shown.
- [2] Appropriate work is shown to prove TEAM is a parallelogram, but no further correct work is shown.
- [1] A complete explanation of the method of the proof is written, but no further correct work is shown.
- or [1] A statement that TEAM is not a square and a correct reason are written, but no further correct work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [6] Appropriate work is shown, such as using slopes to prove  $ABCD$  is a parallelogram but not a rectangle, and an appropriate concluding statement is made.
- [5] Appropriate work is shown, but one computational or graphing error is made.
- [4] Appropriate work is shown, but two or more computational or graphing errors are made.
- or [4] Appropriate work is shown, but one conceptual error is made, such as using an incorrect formula.
- or [4] A proof is written that correctly shows either  $ABCD$  is a parallelogram or it is not a rectangle, but not both.
- [3] Appropriate work is shown, but two or more computational or graphing errors are made, and the concluding statement is incomplete.
- [2] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.
- or [2] All four slopes are found correctly or the lengths of all four sides are found correctly, and appropriate work is shown, but no further correct work is shown.
- [1] The slopes of all four sides are identified or the lengths of all four lines are identified, but no work is shown and no proof is written.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [6] The vertices  $A'(-1,1)$ ,  $B'(4,-2)$ ,  $C'(3,-5)$ , and  $D'(-2,-2)$  are stated and a complete and correct proof that includes a conclusion is written.
- [5] The vertices are stated, and a proof is written that demonstrates a thorough understanding of the method of proof and contains no conceptual errors, but one reason is missing or is incorrect.
- or [5] A complete proof is written that demonstrates a thorough understanding of the method of proof and contains no conceptual errors, but the vertices of  $A'B'C'D'$  are not stated.
- [4] The vertices are stated, and a proof is written that demonstrates a good understanding of the method of proof, but one conceptual error is made.
- [3] The vertices are stated, and a proof is written that demonstrates a good understanding of the method of proof and contains no conceptual errors, but two reasons are missing or are incorrect.
- [2] The vertices are stated, and some correct relevant statements about the proof are made, but three or four statements or reasons are missing or are incorrect.
- [1] The vertices  $A'(-1,1)$ ,  $B'(4,-2)$ ,  $C'(3,-5)$ , and  $D'(-2,-2)$  are stated, but no proof is written.
- [0] The “given” and/or the “prove” statements are rewritten in the style of a formal proof, but no further correct relevant statements are written.
- or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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[6] The correct slopes of  $\overline{AB} = \frac{1}{2}$  and

$\overline{CD} = \frac{1}{2}$  are found,  $\overline{AB} \parallel \overline{CD}$  is stated, and an explanation of why they are parallel is given.

The correct slopes of  $\overline{AD} = -\frac{5}{2}$  and

$\overline{BC} = -\frac{1}{2}$  are found,  $\overline{AD}$  is not parallel to

$\overline{BC}$  is stated, and an explanation of why they are not parallel is given. An explanation that  $ABCD$  is a trapezoid is given.

[5] The correct slopes of  $\overline{AB}$ ,  $\overline{CD}$ ,  $\overline{AD}$ , and  $\overline{BC}$  are found, and  $\overline{AB} \parallel \overline{CD}$  and

$\overline{AD}$  not  $\parallel \overline{BC}$  are stated, but an explanation that  $ABCD$  is a trapezoid is not given.

or [5] One computational error is made in finding the slopes, but all further work is appropriate, based on the calculated slopes.

[4] The correct slope of  $\overline{AB}$  and  $\overline{CD}$  are found, and  $\overline{AB} \parallel \overline{CD}$  is stated, but incorrect

slopes of  $\overline{AD}$  and  $\overline{BC}$  are found, but an explanation of why they are not parallel is given, but an explanation that  $ABCD$  is a trapezoid is not given.

or [4] More than one computational error is made in finding the slopes, but  $\overline{AB}$  and  $\overline{CD}$  are found to have equal slopes and  $\overline{AD}$  and  $\overline{BC}$  to have different slopes, but an explanation that  $ABCD$  is a trapezoid is given.

[3] Incorrect slopes of  $\overline{AB}$ ,  $\overline{CD}$ ,  $\overline{AD}$ , and  $\overline{BC}$  are found, such as by using an incorrect formula,  $\overline{AB}$  and  $\overline{CD}$  are found to have equal slopes and  $\overline{AD}$  and  $\overline{BC}$  to have different slopes, but an explanation that  $ABCD$  is a trapezoid is given.

[2] Only the correct slopes of  $\overline{AB}$ ,  $\overline{CD}$ ,  $\overline{AD}$ , and  $\overline{BC}$  are found, and appropriate work is shown.

[1] Only two correct slopes are found, and

[8] appropriate work is shown.

or [1]  $\overline{AB} = \frac{1}{2}$ ,  $\overline{CD} = \frac{1}{2}$ ,  $\overline{AD} = -\frac{5}{2}$ , and

$\overline{BC} = -\frac{1}{2}$ , but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

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[6]  $\overline{KA} \parallel \overline{ET}$ ,  $\overline{AT}$  not  $\parallel \overline{KE}$ , and  $\overline{KE} \neq \overline{AT}$ , and appropriate work is shown.

[5] Appropriate work is shown, but one computational error leads to incorrect conclusions that are appropriate, based on that error.

[4] Appropriate work is shown to find  $\overline{KA} \parallel \overline{ET}$  or  $\overline{AT}$  not  $\parallel \overline{KE}$  and  $\overline{KE} \neq \overline{AT}$ , but no further correct work is shown.

[3] Appropriate work is shown to find  $\overline{KE} \neq \overline{AT}$ , and at least three of the four slopes are found correctly, but no statement regarding parallelism is made.

or [3] Appropriate work is shown to find the four slopes, and correct statements of parallelism are made, but no further correct work is shown.

[2] Appropriate work is shown to find unequal sides, but no further correct work is shown.

or [2] Appropriate work is shown to find the four slopes, but no conclusion is drawn.

or [2] The four slopes are correct, but no work is shown, but appropriate opposite sides are stated to be parallel and nonparallel.

or [2] The slope and distance formulas are used, but more than one computational error is made, but one accurate conclusion is drawn.

[1] Only two correct slopes or distances are found.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[9] incorrect procedure.

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[6]  $\overline{JK} \parallel \overline{ML}, \overline{MJ} \not\parallel \overline{KL}, \overline{MJ} \neq \overline{KL}$ , and

appropriate work is shown or a complete and correct proof is written, and a concluding statement is written.

[5] Appropriate work is shown and a correct concluding statement is written, but one computational error is made in determining the slopes or the lengths of the legs.

or [5] Appropriate work is shown, but the concluding statement is missing or is incomplete.

[4] Appropriate work is shown and a correct concluding statement is written, but two or more computational errors are made.

or [4] The quadrilateral is proved to be a trapezoid, but the two nonparallel sides are not proved to be unequal.

or [4] A proof is written that shows that  $\overline{JK} \parallel \overline{ML}$  and  $\overline{MJ} \neq \overline{KL}$ , but the difference

between a quadrilateral and a trapezoid is not addressed.

[3] Appropriate work is shown, but one conceptual error is made.

[2] The quadrilateral is proved to be a trapezoid, but one conceptual error is made, and the two nonparallel sides are not proved to be unequal.

or [2] The lengths of all four sides are found correctly, but no further correct work is shown.

or [2] The two nonparallel sides are proved to be unequal, but no further correct work is shown.

[1] The proof shows that the first set of sides is parallel, but no further correct work is shown.

or [1] JKLM is graphed correctly and the definition of an isosceles trapezoid is written, but no proof is written.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[10] incorrect procedure.

[6] A complete and correct proof with an appropriate concluding statement is written.

[5] Appropriate work is shown, but one computational or graphing error is made.

or [5] Appropriate work is shown to prove *TRAP* is a trapezoid and the lengths of the sides are found, but no concluding statement is made regarding it not being isosceles.

or [5] All calculations necessary to prove *TRAP* is a trapezoid but not isosceles are made, but one statement or reason is missing or is incorrect.

[4] Appropriate work is shown, but two or more computational or graphing errors are made.

or [4] Appropriate work is shown, but one conceptual error is made.

or [4] Appropriate work is shown to prove *TRAP* is a trapezoid with an appropriate concluding statement, but no further correct work is shown.

[3] Appropriate work is shown to find *TP*, *RA*, and the slopes of all four sides, but no conclusions are written.

[2] Appropriate work is shown, but one conceptual error and one computational, graphing, or justification error are made.

or [2] Appropriate work is shown to prove  $\overline{TR} \parallel \overline{PA}$  with appropriate justification, but no further correct work is shown.

or [2] Appropriate work is shown to find the slopes of all four sides and either *TP* or *RA*, but no conclusions are written.

[1] Appropriate work is shown to find the slopes of all four sides, but no further correct work is shown.

or [1] Appropriate work is shown to find *TP* and *RA*, but no further correct work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[11] incorrect procedure.



- [6] A complete and correct proof that includes a concluding statement is written, such as showing that  $\overline{AB}$  is parallel to  $\overline{CD}$  and that  $\overline{BC}$  is not parallel to  $\overline{AD}$  by finding their slopes and using the distance formula to show that the two nonparallel sides are equal.
- [5] Appropriate work is shown, but one computational error is made.
- [4] Appropriate work is shown, but two or more computational errors are made.
- or [4] Appropriate work is shown, but one conceptual error is made, such as using an incorrect formula.
- or [4] The slopes of all four sides are found correctly and the lengths of  $\overline{AD}$  and  $\overline{BC}$  are found correctly, and appropriate work is shown, but no conclusion is stated.
- or [4] A proof is written that correctly shows  $ABCD$  is a trapezoid, but it is not proved to be isosceles.
- [3] The slopes of only one pair of sides are found correctly, but the lengths of  $\overline{AD}$  and  $\overline{BC}$  are found correctly, and appropriate work is shown, and an appropriate conclusion is stated.
- or [3] A correct numerical illustration is given in lieu of a proof of the general case.
- [2] The slopes of only one pair of sides are found correctly, but the lengths of  $\overline{AD}$  and  $\overline{BC}$  are found correctly, and appropriate work is shown, but no conclusion is stated.
- [1] Either the slopes or the lengths of  $\overline{AD}$  and  $\overline{BC}$  are found correctly, but no conclusion is stated.
- or [1] The correct definition of an isosceles trapezoid is written, but no further correct work is shown.
- [0] The slopes of  $\overline{AB}$  and  $\overline{DC}$  are found correctly, but no further correct work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [12]
-