

## Assignment #2 – Verifying Properties of Triangles & Quadrilaterals

- (A) **What:** Use analytical geometry skills to verify properties of triangles & quadrilaterals
- (B) **Who:** You may work on your own or you will work with a partner of your choosing, subject to my approval (or I may simply assign you to a partner)
- (C) **How:** I have pre-selected a number of questions from Nelson 10, Chapters 2.5 (Q11,12,13,14,15,16) and 2.7 (8,11,12,15,17). You and your partner are required to present a minimum of 4 solutions to these questions. The solution requirements are:
- Write out the question for which you are presenting a solution.
  - You should be VISUALIZING the problem. The first part of your solution will be to prepare a graph of the shape in question, either by hand, or by technology. I strongly recommend that you do the problem on Geogebra first. Either way, a graph MUST appear as part of your solution.
  - You must now PLAN how to work through the problem. The second item that MUST appear in your solution is your outline of a strategy showing what you need to do & how you plan on doing it.
  - You now need to CARRY OUT your plan. The third part of your solution will be your algebraic working out of your plan/strategy.
  - Now you need to CONCLUDE your work. The fourth part of your solution will be to present a conclusion & a justification of your question
  - These solutions will be presented on a poster, each solution on a separate sheet.
- (D) **Grading:** I will grade ALL solutions you and your partner prepare and if you and your partner complete more than 4 solutions, I will record only the best 4 solutions
- (E) **When:** You have two class periods to complete the solutions to the questions

10. Show that the midsegments of a rhombus with vertices at  $R(-5, 2)$ ,  $S(-1, 3)$ ,  $T(-2, -1)$ , and  $U(-6, -2)$  form a rectangle.
11. Show that the diagonals of the rhombus in question 10 are perpendicular and bisect each other.
14. A trapezoid has vertices at  $A(1, 2)$ ,  $B(-2, 1)$ ,  $C(-4, -2)$ , and  $D(2, 0)$ .
- ▣ a) Show that the line segment joining the midpoints of  $BC$  and  $AD$  is parallel to both  $AB$  and  $DC$ .
- b) Show that the length of this line segment is half the sum of the lengths of the parallel sides.
8.  $\triangle LMN$  has vertices at  $L(3, 4)$ ,  $M(4, -3)$ , and  $N(-4, -1)$ . Use analytic geometry to determine the area of the triangle.
15. A stained glass window is in the shape of a triangle, with vertices at  $A(-1, -2)$ ,  $B(-2, 1)$ , and  $C(5, 0)$ .  $\triangle XYZ$  is formed inside  $\triangle ABC$  by joining the midpoints of the three sides. The glass that is used for  $\triangle XYZ$  is blue, but the remainder of  $\triangle ABC$  is green. Determine the ratio of green to blue glass used.
12. Show that the midsegments of a square with vertices at  $A(2, -12)$ ,  $B(-10, -8)$ ,  $C(-6, 4)$ , and  $D(6, 0)$  form a square.
15.  $\triangle ABC$  has vertices at  $A(3, 4)$ ,  $B(-2, 0)$ , and  $C(5, 0)$ . Prove that the area of the triangle formed by joining the midpoints of  $\triangle ABC$  is one-quarter the area of  $\triangle ABC$ .
11.  $\triangle JKL$  has vertices at  $J(-2, 0)$ ,  $K(2, 8)$ , and  $L(7, 3)$ . Use analytic geometry to determine the coordinates of the circumcentre (the point where the perpendicular bisectors intersect).
17. Determine the type of triangle that is formed by the lines  $x + y = 11$ ,  $x - y = 1$ , and  $x - 3y = 3$ . Justify your decision.
13. a) Show that points  $A(-4, 3)$  and  $B(3, -4)$  lie on  $x^2 + y^2 = 25$ .
- b) Show that the perpendicular bisector of chord  $AB$  passes through the centre of the circle.
16. Naomi claims that the midpoint of the hypotenuse of a right triangle is the same distance from each vertex of the triangle. Create a flow chart that summarizes the steps you would take to verify this property.
12. A university has three student residences, which are located at points  $A(2, 2)$ ,  $B(10, 6)$ , and  $C(4, 8)$  on a grid. The university wants to build a tennis court an equal distance from all three residences. Determine the coordinates of the tennis court.

## Scoring Rubric – Verifying Geometric Properties

	Exemplary (10)	Proficient (8.5)	Developing (7)	Emerging (6)
<p><b>Knowledge/Understanding</b></p> <p><b>Key Question:</b> <i>Are the mathematics of the solution done in an accurate and complete manner?</i></p>	<ul style="list-style-type: none"> <li>• <b>All</b> aspects of your solution were complete, accurate, and consistent</li> <li>• Your solution was entirely accurate</li> <li>• <b>All</b> of your work, discussion and mathematical representations were <b>consistent</b> with one another and <b>relevant</b> to the task</li> </ul>	<ul style="list-style-type: none"> <li>• <b>All</b> aspects of your solution were complete and consistent</li> <li>• Your solution was essentially accurate</li> <li>• <b>Most</b> of your work, discussion and mathematical representations were <b>consistent</b> with one another and <b>relevant</b> to the task</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Some</b> aspects of your solution were inconsistent, incomplete, or incorrect</li> <li>• The evidence for your solution was inconsistent or unclear</li> <li>• There were <b>some inconsistencies and errors</b> in your work, discussion and mathematical representations</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Many</b> aspects of your solution were inconsistent, incomplete, or incorrect</li> <li>• You gave no evidence of how you arrived at your solution</li> <li>• There were <b>significant inconsistencies and errors</b> in your work, discussion and mathematical representations</li> </ul>
<p><b>Thinking/Problem Solving</b></p> <p><b>Key Question:</b> <i>Did the student use critical thinking and analytical skills?</i></p> <p><b>Key Question:</b> <i>Did the student plan and carry out an effective strategy for solving the problem?</i></p>	<ul style="list-style-type: none"> <li>• Your approach to the task was <b>insightful</b></li> <li>• You confirmed that your solution was correct using alternate analytical algebra strategies</li> <li>• You noted possible sources of error or ambiguity or limitations in the problem</li> </ul>	<ul style="list-style-type: none"> <li>• Your approach to the task was <b>appropriate</b></li> <li>• You confirmed that your solution was correct using technology</li> </ul>	<ul style="list-style-type: none"> <li>• You used an <b>oversimplified approach</b> to the task</li> <li>• You attempted to confirm that your solution was correct</li> </ul>	<ul style="list-style-type: none"> <li>• Your strategies were not appropriate for the task</li> <li>• You did not attempt to confirm that your solution was correct</li> <li>• Your reasoning and your work were inconsistent</li> </ul>
<p><b>Communication</b></p> <p><b>Key Question:</b> <i>Did the student clearly, concisely, and completely convey meaning through various forms?</i></p> <p><b>Key Question:</b> <i>Are the mathematics organized and presented in an accurate and complete manner?</i></p>	<ul style="list-style-type: none"> <li>• <b>All</b> explanations and mathematical representations were clear, concise and complete</li> <li>• <b>The entire solution is</b> organized &amp; presented in a clear, concise and complete manner</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Most</b> explanations and mathematical representations were clear, concise and complete</li> <li>• <b>Most of the solution is</b> organized &amp; presented in a clear, concise and complete manner</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Some</b> explanations and mathematical representations were clear, concise and complete</li> <li>• <b>At times, the solution is</b> organized &amp; presented in a clear, concise and complete manner</li> </ul>	<ul style="list-style-type: none"> <li>• Your explanations and mathematical representations were <b>often unclear, incomplete or redundant</b></li> <li>• <b>Rarely is the solution is</b> organized &amp; presented in a clear, concise and complete manner</li> </ul>

Name: \_\_\_\_\_

Knowledge: /10

Thinking: /10

Communication: /10

Block: \_\_\_\_ Total Score: /30