Names _____

Midsegment Exploration

1. Open the document *midsegment.tns* from the *MyDocuments* folder on the Home Screen. Follow the directions in the file and answer the questions on this sheet.

   Rename the file with your initials at the front of the file name. For example, *rbcmidsegment.tns*

2. Move to page 1.2 of the document. Segment $\overline{MP}$ was constructed by connecting the midpoints of $\overline{AB}$ and $\overline{AC}$. Grab a vertex of the triangle and drag it to another location. $\overline{MP}$ is called a midsegment.

   A *midsegment* of a triangle is a segment connecting the midpoints of two sides.

   What do you observe?

3. Move to page 1.3 of the document. Find the slope of each side of the triangle and each midsegment. Follow the directions from the teacher on how to find the slope. Grab a vertex of the triangle and observe the slopes of each side of the triangle and each midsegment.

   What conclusions can you make?

4. Move to page 1.4 of the document. Find the length of each side of the triangle and each midsegment. Follow the directions from the teacher on how to measure the length of the segments. Grab a vertex of the triangle and observe the length of each side of the triangle and each midsegment.

   What conclusion can you make?

5. Move to page 1.5 of the document. Find the area of ΔABC and ΔAMP. Grab a vertex of the triangle and observe the relationship between the areas.

   What conclusion can you make about the area of the two triangles?

6. Move to page 1.6 of the document. Find the area of ΔABC and ΔCNP. Grab a vertex of the triangle and observe the relationship between the areas.

7. Move to page 1.7. Find the area of ΔABC and ΔBMN. Grab a vertex of the triangle and observe the relationship between the areas.

8. Using the information from questions 5-7, what conclusion can you make about the area of the smaller triangle and the larger triangle?

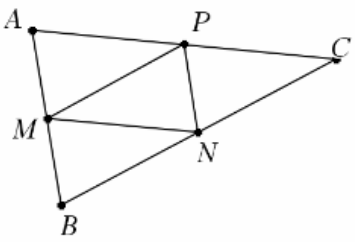
9. If *b* represents the base and *h* represents the height in triangle ABC, show an algebraic justification of your conclusion in question 8.

10. Move to page 1.8 and find the area of each of the four small triangles and the area of the large triangle. Place the area of each triangle on the screen at a convenient location. Grab each vertex and move the triangle.

    What observations can you make?

11. There are four triangles. Are the triangles congruent?

12. If any triangles are congruent, mark all congruent segments and write the congruence relations indicated.



13. Explain your reasoning in question 12.

14. Roger is building a campground at Jordan Lake that is the shape of a triangle, ΔXYZ, where $\overline{YZ}$ is the base of the triangle. He wants to subdivide the camping ground into 3 smaller pieces, a quadrilateral for tent camping and two triangles for RV camping. He wants the area of the tent camping to be equal to the total area of the RV camping.

    Roger first finds the midpoint M of side $\overline{XZ}$ and the midpoint N of side $\overline{XY}$. He placed a point P on side $\overline{YZ}$ but **not** at the midpoint. He forms the quadrilateral by connecting N and P and connecting M and P.

    Move to page 1.9. Use the tools in the N-spire to investigate Roger's plan. Where should he locate point P?

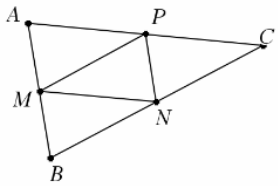
    Does the area of the tent camping equal the area of the RV camping? Justify your answer.

15. Write an algebraic justification of your conclusion in problem 14.

Follow up questions to Midsegment Investigation.

1. If M, P, and N are the midpoints of the three sides of ΔABC, how does the area of ΔMNP compare to the area of ΔABC?

2. If the midpoints of the segments $\overline{MN}$, $\overline{PM}$, and $\overline{PN}$ are connected to form another triangle, how is the area of this second "midsegment triangle" related to the original triangle?



3. If the process is repeated, how is the area of the third triangle related to the original triangle?

4. Let G represent the area of the original triangle. Write an expression to relate the area of the *nth* "midsegment triangle" to the area of the original triangle.

5. How does the perimeter of ΔMNP compare to the perimeter of ΔABC?

6. If the midpoints of the segments, $\overline{MN}$, $\overline{PM}$, and $\overline{PN}$ are connected to form another triangle, how is the perimeter of this second "midsegment triangle" related to the original triangle?

7. If the process is repeated, how is the perimeter of the third triangle related to the original triangle?

8. Let Q represent the perimeter of the original triangle. Write an expression to relate the perimeter of the *nth* "midsegment triangle" to the perimeter of the original triangle.