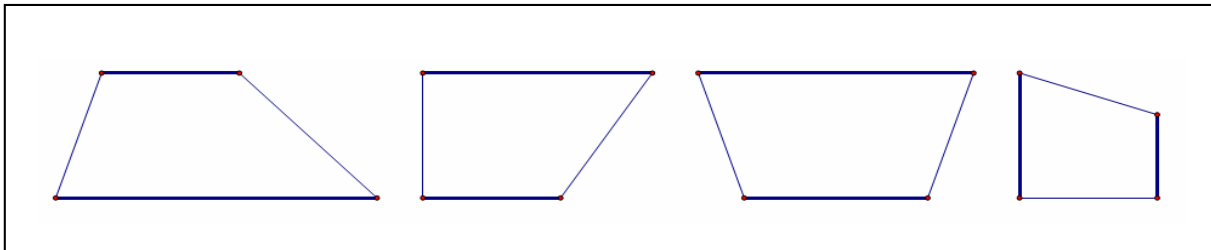


TRAPEZOID SKETCHING, CONSTRUCTION, AND EXPLORATION

based on an activity from the Near North District School Board

Sketching a Trapezoid

1. Launch *The Geometer's Sketchpad*.
2. Use the point tool to draw 4 points.
3. Use the segment tool to connect the four points to form a quadrilateral.
4. Use the arrow tool to move the points and segments around until the figure resembles a trapezoid.



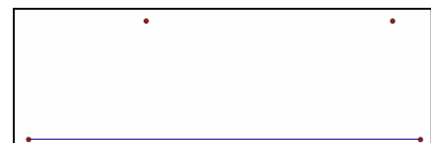
A trapezoid is a quadrilateral with one pair of parallel sides. All of the above images show trapezoids (parallel sides are shown with heavy lines).

5. What happens to your trapezoid as soon as you drag a vertex or side?

Because sketched trapezoids have this annoying habit of morphing to something else, we use *The Geometer's Sketchpad* to construct a trapezoid, so that we can investigate a trapezoid without its becoming something else.

Constructing a Trapezoid

6. From the File menu, select **File > New Sketch** (or, use CTRL + N).
7. Construct two points and the segment between them.
8. Construct a third point not on the segment.
9. Use the selection arrow tool to select the segment and the third point.
10. From the Construct menu, **Construct > Parallel Line**. You will now have a line constructed and automatically selected.
11. From the Construct menu, **Construct > Point on Parallel Line**. This creates a point which is forced to always be on the parallel line.
12. Select only the constructed line and select **Display > Hide Parallel Line**.
13. Use the arrow tool to select the last point (from step 10) and move it around. Notice that you can't drag it off the hidden line.
14. Construct three more segments to create the trapezoid, using the end points of the first segment, and the two points apart from it (see image at right).



15. Use the arrow tool to drag the vertices of the trapezoid to create a trapezoid that looks like:

- a) a parallelogram
- b) a rectangle
- c) a rectangle joined to a right triangle
- d) an isosceles trapezoid

16. Save your trapezoid construction. (**File > Save As...**)

What Do Two Trapezoids make?

17. Select a side of the trapezoid, and from the Display menu, choose **Display > Color**. Color each of the four sides of the trapezoid differently.

16. Select one of the non-parallel sides of the trapezoid. Construct the midpoint of this side (**Construct > Midpoint**).

17. With this midpoint selected, choose **Transform > Mark Center** from the menu (or simply double-click on the point).

18. Use **Edit > Select All** from the menu and then **Transform > Rotate** from the menu. The angle to rotate the trapezoid is 180 degrees.

19. We have now constructed an exact, congruent copy of the trapezoid. By comparing colors, notice where each of the original segments was rotated.

20. What is the shape of the resulting figure?

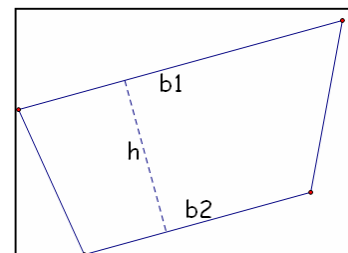
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- Be sure to test this by dragging the various points around.

21. Select each of the vertices of the original trapezoid. Construct the quadrilateral interior and then use the Measure menu to find its area (**Measure > Area**).

22. Repeat step 21 to find the area of the entire figure.

23. What is the relationship between these two areas? Why does this make sense?

24. Label the two parallel sides "b1" and "b2". Write a formula for the area of the whole shape, in terms of h, b1 and b2, where h is the distance between the two parallel sides.



25. Using 23 and 24 above, write a formula for the area of the original trapezoid.