Name _____

Date _____

EXPLORATIONS

Activity 15

Triangle Proportionality

Construct the geometric object by following the instructions below, and then answer the questions about the object.

1. Create a triangle and label it $\triangle XYZ$.
2. Create a line parallel to $\overline{XZ}$ through side $\overline{XY}$.
   a. From the Construct Toolbar, select **Parallel Line**.
   b. Move the pencil toward side $\overline{XZ}$ until the message ***Parallel to this side of the triangle*** appears. Click once.
   c. Move the pencil toward side $\overline{XY}$ until the message ***On this triangle*** appears. Click once.
   d. Label the point of intersection of $\overline{XY}$ and the parallel line point A.
   e. From the Points Toolbar, select **Point Of Intersection**.
   f. Create the point of intersection of the parallel line and side $\overline{YZ}$. Label this point B.

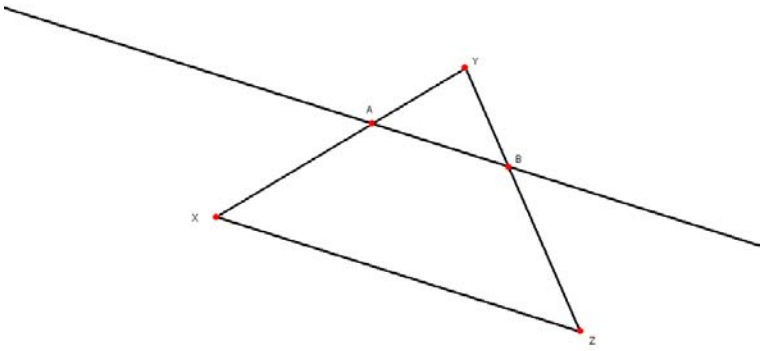

Figure 15.1

3. Measure and label the following distances: $\overline{XA}$, $\overline{YA}$, $\overline{ZB}$ and $\overline{BY}$.

4. Calculate $\overline{XA}/\overline{AY}$.

- **a.** From the Measure Toolbar, select **Calculate**.
- **b.** Click on length of $\overline{XA}$.
- **c.** Click on ÷.
- **d.** Click on length of $\overline{AY}$.
- **e.** Double-click on =.
- **f.** Drag the cursor onto the screen. (A dotted box follows.)
- **g.** Click where you want the result to appear.
- **h.** From the Label Toolbar, select **Comments**.
- **i.** Change the word **result** to **XA/AY** =.

5. Repeat the steps in **#4** to calculate ZB/BY.

6. Record the results below.

XA/AY = _____ ZB/BY = _____

7. Alter the triangle by dragging one of the vertices. Record the results below.

XA/AY = _____ ZB/BY = _____

8. Do the ratios stay the same?

_____

9. Alter the location of the line by dragging point A. Record the results below.

XA/AY = _____ ZB/BY = _____

10. Click and drag point Y. Record the results below.

XA/AY = _____ ZB/BY = _____

11. Why did the ratios from **#8** to **#10** change?

_____

_____

_____

12. Did the ratios from **#9** to **#10** change? Why or why not?

_____

_____

_____

13. What can you conclude about a line that is parallel to one side of a triangle and intersects the other two sides of the triangle?

_____

_____

_____

14. Clear the screen.

15. Create a triangle and label it $\triangle ABC$.

16. Bisect $\angle ABC$.

- **a.** From the Construct Toolbar, select **Angle Bisector**.
- **b.** Move the pencil to vertex A until the message ***This point*** appears. Click once.
- **c.** Move the pencil to vertex B until the message ***This point*** appears. Click once.
- **d.** Move the pencil to vertex C until the message ***This point*** appears. Click once.

17. From the Points Toolbar, select **Point Of Intersection**.

18. Find the point of intersection of the angle bisector and side AC. Label this point Z.

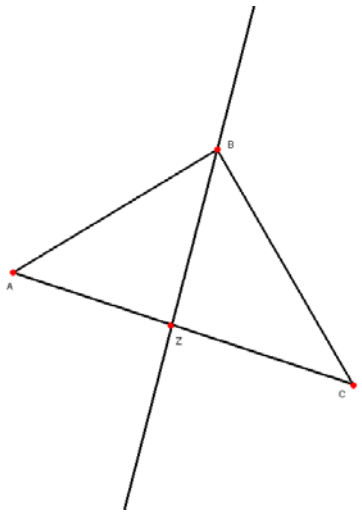

Figure 15.2

19. Measure and label segments $\overline{AZ}$, $\overline{ZC}$, $\overline{AB}$ and $\overline{BC}$.

20. From the Measure Toolbar, select **Calculate**.

21. Calculate and record the following ratios.

$AZ/ZC =$ _____ $AB/BC =$ _____

22. Drag one vertex of the triangle and record the new ratios.

$AZ/ZC =$ _____ $AB/BC =$ _____

23. Drag a different vertex of the triangle and record the new ratios.

$AZ/ZC =$ _____ $AB/BC =$ _____

24. How does the ratio of AZ/ZC compare to the ratio of ZB/BC? _____

25. What can you conclude about a line that bisects an angle of a triangle?

_____

_____

_____

26. Using the angle bisector tool, bisect $\angle ACB$.

27. Create the point of intersection of the angle bisector and side $\overline{AB}$ and label this point W.

28. Measure and label segments $\overline{AW}$, $\overline{WB}$, $\overline{AC}$ and $\overline{BC}$.

29. Calculate and record the following ratios:

$AW/WB =$ _____ $AC/BC =$ _____

30. Alter the triangle by dragging one of the vertices.

31. How do the two ratios compare?

_____

32. Does the conclusion in **#25** hold true using a bisector of $\angle ACB$?

_____

33. Do you believe the conclusion would hold true if you bisected $\angle CAB$?

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