EXPLORATIONS

Activity 9

Properties of Parallelograms

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

1. Create a parallelogram.

    a. Construct segment $\overline{AB}$.

    b. Construct a line above $\overline{AB}$ parallel to it.

    c. Label a point at the left end of the new line D.

    d. Construct segment $\overline{AD}$.

    e. Construct a line parallel to $\overline{AD}$ through point B.

    f. Find the intersection point and label it C.

    g. From the Draw Toolbar, select **Hide/Show**.

    h. Move to line $\overline{BC}$ until the message *This line* appears. Click once. A dotted line appears.

    i. Move to line $\overline{CD}$ until the message *This line* appears. Click once. A dotted line appears.

    j. Construct segment $\overline{CD}$ and $\overline{BC}$.

Figure 9.1

2. Find and label the lengths of all the sides.

3. What is the relationship between opposite sides $\overline{AD}$ and $\overline{BC}$?

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4. What is the relationship between opposite sides $\overline{AB}$ and $\overline{CD}$?

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5. Alter parallelogram $\square ABCD$.

    a. From the Points Toolbar, select **Pointer**.

    b. Move to point A until the message *This point* appears. Click once and drag.

6. Is the relationship between the opposites sides the same?

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7. Alter the parallelogram several times by using the pointer to see if the results change. If they do, under what conditions?

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8. What can you conclude about the opposite sides of a parallelogram?

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9. Find and label the measure of each angle.

10. What is the relationship between the opposite angles $\angle A$ and $\angle C$?

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11. What is the relationship between the opposite angles $\angle B$ and $\angle D$?

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12. Alter parallelogram $\square ABCD$.

13. Is the relationship between the opposite angles the same?

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14. Alter the parallelogram several times by using the pointer to see if the results change. If they do, under what conditions?

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15. What can you conclude about the opposite angles of a parallelogram?

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16. What is the relationship between the consecutive angles $\angle A$ and $\angle B$?

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17. What is the relationship between the consecutive angles $\angle B$ and $\angle C$?

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18. Alter parallelogram $\square ABCD$.

19. Is the relationship between the consecutive angles the same?

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20. Alter the parallelogram several times by using the pointer to see if the results change. If they do, under what conditions?

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21. What can you conclude about the consecutive angles of a parallelogram?

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22. Clear the measurements.

23. Construct segments $\overline{AC}$ and $\overline{BD}$, which represent the diagonals.
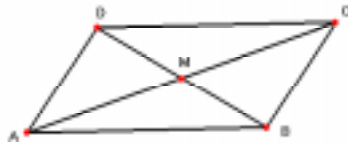
24. Find the intersection point and label it M.

Figure 9.2

25. Find and label the lengths of segments $\overline{AM}$, $\overline{BM}$, $\overline{CM}$, and $\overline{DM}$.

26. What is the relationship between the diagonals of parallelogram $\square ABCD$?

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27. Alter parallelogram $\square ABCD$.

28. Is the relationship between the diagonals the same?

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29. Alter the parallelogram several times by using the pointer to see if the results change. If they do, under what conditions?

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30. What can you conclude about the diagonals of a parallelogram?

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