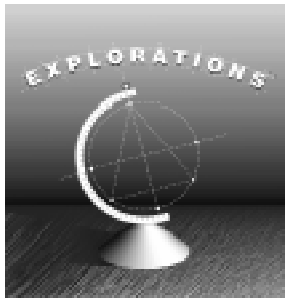

Exploring the Basics of Geometry with Cabri

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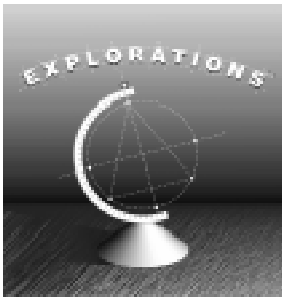

Contents

About the Authors

WENDY WILGUS is currently a high school mathematics teacher at Chattahoochee High School in Alpharetta, Georgia. She has been teaching for six years. Her degree is from the University of Wisconsin at Eau Claire.

LISA PIZZUTO is a mathematics teacher at Chattahoochee High School in Alpharetta, Georgia. She has taught geometry for ten years and has a B.S. in mathematics from the State University of New York College at Buffalo.

Preface

This book is designed to be used by geometry students of any level and to cover the basic topics in geometry. We developed this book to enhance your geometry class without taking time away from the curriculum.

Each activity is designed so that a student can walk into the computer lab and, with a brief introduction to the Cabri software, work through a series of steps to discover geometric concepts.

We have called the first activity in our series a tour. It is designed to allow students to experience the different tools of Cabri and also to reinforce the basic vocabulary they have learned in class. Every student should complete the tour before working on the consecutive activities. Each activity helps students to discover a theorem, postulate, or geometric concept, and allows students to experience the true meaning of these ideas. We encourage you to make copies of the tour available to all of your students so that they can refer to if they have any problems completing the basic constructions.

These activities have not only enhanced our classes but improved our classroom environment. Our students enjoyed using the labs and looked forward to going to the computer throughout the year.

We hope you have a great school year and enjoy using technology as much as we do.

We would like to thank Raymond Klein and Cathy Jahr for their comments on our manuscript, and Jeanie Anirudhan and Nelah McComsey of Texas Instruments for their assistance in the production of this book.

— *Wendy Wilgus*

— *Lisa Pizzuto*

Name _____

Date _____

EXPLORATIONS

Activity 1

Cabri Geometry Tour

In this activity, you will practice some of the basic functions of the Cabri Geometry software, including use of the Pointer, Point, Line, Measure, and Construct toolbars.

1. Create and label points.

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

   b. Move the pencil to any location in the plane and click. Immediately type the name of the point (for example, *A*, *B*, *C*). Repeat this process to make 5 points.

   c. If you forget to label a point, select **Label** from the Display Toolbar. Move the crosshair near a point. When the message ***This point*** appears, click once. A box should appear. Type the label you wish to give this point (for example, *A*, *B*, *C*). Move the crosshair away from the point and click to remove the label box. Repeat this process for each of the points that are still unlabeled.

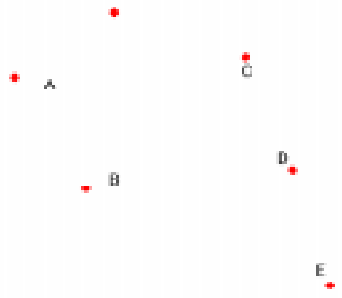

Figure 1.1

2. Correct an error.

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

   b. Move the crosshair to the point or line you wish to remove. When the appropriate message appears (for example, ***This point***), click to select that figure. (The selected item will begin flashing). Press the DELETE key. The selected figure will disappear.

3. Clear the screen.
   - Click on **Edit** and then click on **Select All**. Press the DELETE key.

     – or –
   - Press and hold the CRTL key and type A. Press the DELETE key.
4. Create two intersecting lines.
   a. From the Lines Toolbar, select **Line**.
   b. Move the pencil to the plane and click once. Type a point name (for example, *A*, *B*, *C*).
   c. Move the pencil to a second spot and click once. This will create a line.
   d. Repeat the first three steps to create a second line so that it intersects the first.
   e. From the Points Toolbar, select **Intersection Point**.
   f. Move the pencil to the intersection point until the message ***Point at this intersection*** appears. Click once. Type the point name.
   g. From the Points Toolbar, select **Point On Object**.
   h. Move the pencil until the message ***On this line*** appears. Click once. Type the point name.

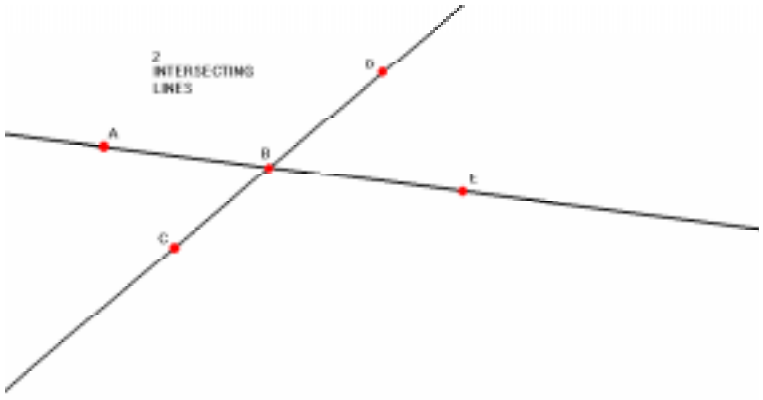

Figure 1.2

5. Clear the screen.
6. Create an angle.
   a. From the Lines Toolbar, select **Ray**.
   b. Click on the screen where you want the vertex of the angle. Type *B*.
   c. Move the pencil and click once to establish one side of the angle.
   d. Move the pencil to the vertex until the message ***This point*** appears. Click once.
   e. Move the pencil to create an acute angle and click to establish second side.
   f. From the Points Toolbar, select **Point On Object**.
   g. Move the pencil to one ray until the message ***On this ray*** appears. Click once. Type *A*.
   h. Move the pencil to the second ray until the message ***On this ray*** appears. Click once. Type *C*.

7. Measure an angle.

a. From the Measure Toolbar, select **Angle**.

b. Move the cursor to point *A*. The message ***This point*** appears. Click once.

c. Move the cursor to point *B*. The message ***This point*** appears. Click once.

d. Move the cursor to point *C*. The message ***This point*** appears. Click once.

e. The measure of the angle appears with a flashing bar. This allows you to type the name of the angle (for example, ABC = 45.5).

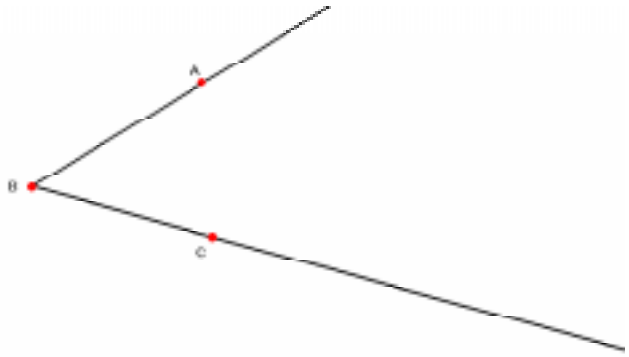

Figure 1.3

8. Change the angle.

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

b. Move the cross-bar until you see the message ***This ray***.

c. Click on one of the rays on the angle and hold until it becomes a hand.

d. You can now drag the angle and watch the angle change.

9. Bisect an angle.
   a. From the Construct Toolbar, select **Angle Bisector**.
   b. Move the cursor to point *A*. The message ***This point*** appears. Click once.
   c. Move the cursor to point *B*. The message ***This point*** appears. Click once.
   d. Move the cursor to point *C*. The message ***This point*** appears. Click once.
   e. Place a point on the bisector in the interior of the angle.
   f. Using the new point, measure one of the angles created by the bisector.
   g. This measure should be half of the original.

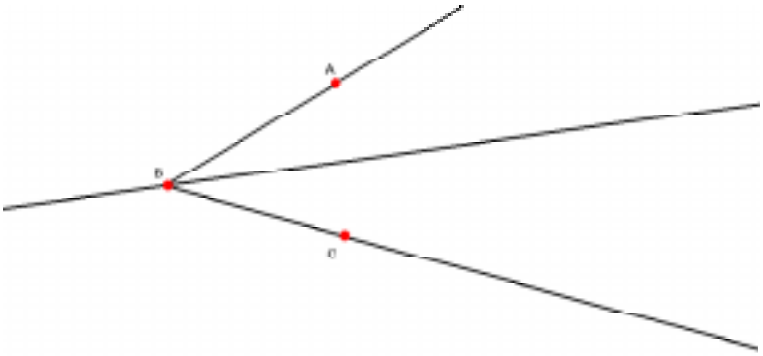

Figure 1.4

10. Clear the screen.
11. Create parallel lines.
    a. From the Lines Toolbar, select **Line**.
    b. Move the pencil to the plane and click once.
    c. Move the pencil to a second spot and click once. This will create a line.
    d. From the Construct Toolbar, select **Parallel Lines**.
    e. Move the pencil to the line until the message ***Parallel to this line***, appears. Click once.
    f. Move the pencil off the line and click once. This creates the parallel line.

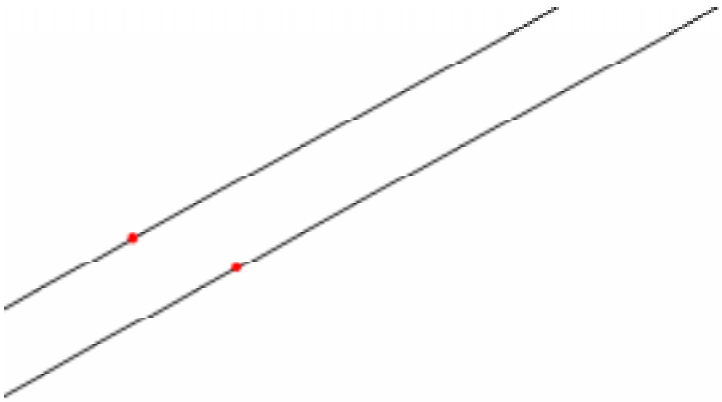

Figure 1.5

12. Clear the screen.

13. Create perpendicular lines.

a. From the Lines Toolbar, select **Line**.

b. Move the pencil to the plane and click once.

c. Move the pencil to a second spot and click once. This creates a line.

d. From the Construct Toolbar, select **Perpendicular Lines**.

e. Move the pencil to the line until the message ***Perpendicular to this line*** appears. Click once.

f. Move the pencil off the line and click once. This creates the perpendicular line.

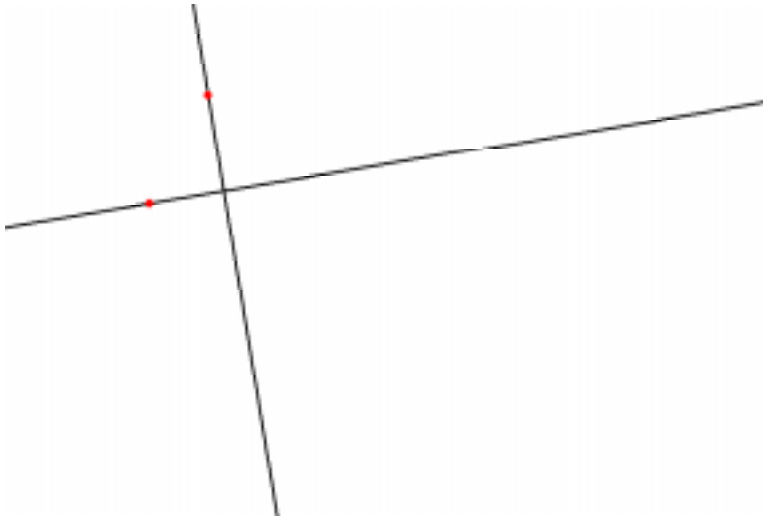

Figure 1.6

14. Clear the screen.

15. Create and label a triangle.

a. From the Lines Toolbar, select **Triangle**.

b. Click once, type *A*, and drag on the screen.

c. Click again to end the segment and create one side of the triangle. Type *B*, drag, and click again to finish the triangle. Type *C*.

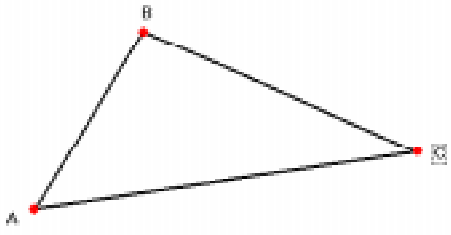

Figure 1.7

Name _____

Date _____

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 $\overline{BC}$?

_____

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

_____

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?

_____

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

_____

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

_____

9. Find and label the measure of each angle.
10. What is the relationship between the opposite angles $\angle A$ and $\angle C$?

_____

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

_____

12. Alter parallelogram $\square ABCD$.
13. Is the relationship between the opposite angles the same?

_____

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

_____

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

_____

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

_____

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

_____

18. Alter parallelogram $\square ABCD$.
19. Is the relationship between the consecutive angles the same?

_____

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

_____

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

_____

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.

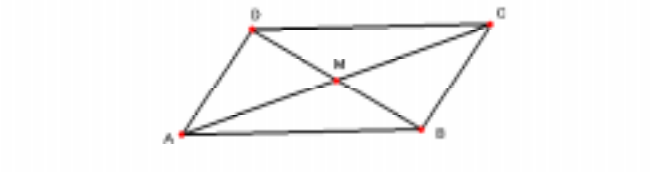

Figure 9.2

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 $\square ABCD$?

_____

27. Alter parallelogram $\square ABCD$.

28. Is the relationship between the diagonals the same?

_____

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

_____

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

_____

EXPLORATIONS

Appendix A

Teacher Information

This section provides notes for teachers and answers to the questions in the student activity.

Activity 1 — Cabri Geometry Tour

Objectives

This activity is designed to help students to become accustomed to the CABRI software. They will complete the following activities:

- ✔ *Create and label points.*
- ✔ *Clear the screen.*
- ✔ *Select and remove errors.*
- ✔ *Create two intersecting lines.*
- ✔ *Create an angle.*
- ✔ *Measure an angle.*
- ✔ *Alter an angle.*
- ✔ *Bisect an angle.*
- ✔ *Create parallel lines.*
- ✔ *Create perpendicular lines.*
- ✔ *Create a triangle.*

Vocabulary

point
plane
angle
vertex
parallel line
triangle
line
intersection
ray
bisect
perpendicular line

Activity 9 — Properties of Parallelograms

Objectives

This activity is designed to help students discover the following theorems:

- ✔ *If a quadrilateral is a parallelogram, then its opposite sides are congruent.*
- ✔ *If a quadrilateral is a parallelogram, then its opposite angles are congruent.*
- ✔ *If a quadrilateral is a parallelogram, then its consecutive angles are supplementary.*
- ✔ *If a quadrilateral is a parallelogram, then its diagonals bisect each other.*

Vocabulary

parallelogram
parallel
opposite angles
congruent
bisect
supplementary
segment
angle
consecutive angles
diagonal
intersection

Prerequisites

Students must understand how to:

- ✔ *Construct and label a segment.*
- ✔ *Construct parallel lines.*
- ✔ *Measure and label sides.*
- ✔ *Measure and label angles.*

Answers

3. Sides AD and BC are congruent.
4. Sides AB and CD are congruent.
6. The relationship does not change.
7. The result does not change.
8. If a quadrilateral is a parallelogram, then its opposite sides are congruent.
10. $\angle A$ and $\angle C$ are congruent.
11. $\angle B$ and $\angle D$ are congruent.
13. The relationship does not change.
14. The result does not change.
15. If a quadrilateral is a parallelogram, then its opposite angles are congruent.
16. $\angle A$ and $\angle B$ are supplementary.
17. $\angle B$ and $\angle C$ are supplementary.
19. Yes, the relationship is the same.
20. The result does not change.
21. If a quadrilateral is a parallelogram, then its consecutive angles are supplementary.
26. The diagonals bisect each other.
28. Yes, the relationship is the same.
29. The result does not change.
30. If a quadrilateral is a parallelogram, then its diagonals bisect each other.