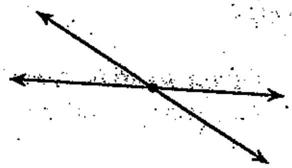
NAME ______________________________ CLASS ______________ DATE ______________

Enrichment

1.1 Exploring Relationships Among Lines in a Plane

When two lines lie in the same plane, they can be related in one of two ways.

The lines intersect. When this occurs, the intersection is one point.



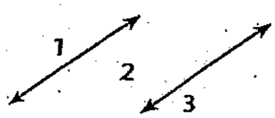
The lines do not intersect. When this occurs, the lines are called *parallel*.

1. Consider three lines that lie in the same plane. Make sketches of all possible ways the 3 lines can be related.

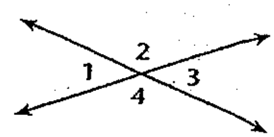
2. Now consider four lines that lie in the same plane. Make sketches of all possible ways the 4 lines can be related.

Lines in a plane divide the plane into *regions*. The number of regions depends on the relationship between the lines. For instance, two lines in a plane can divide the plane into either three or four regions.

If the lines are parallel, three regions are determined.



If the lines intersect, four regions are determined.



3. a. Complete the table at right by finding the *greatest* number of regions determined by the given number of lines in a plane. Refer to your drawings above as needed.

Number of lines	0	1	2	3	4
Number of regions			4		

b. Refer to the table in part **a.** What is the pattern in the *Number of regions* row?

____

c. Use the pattern that you identified in part **b** to predict the greatest number of regions determined by five lines in a plane. ______________

d. On a separate sheet of paper, make a drawing to verify your prediction from part **c.**

4. Using your work in Exercise 3 as a model, answer this question: Given six lines in a plane, what is the greatest possible number of points of intersection?

____

NAME ______________________ CLASS __________ DATE __________

Enrichment

1.3 Degrees, Minutes, and Seconds

For greater accuracy in angle measurement, each degree can be divided into sixty equal parts, called **minutes** ($1° = 60'$). Each minute can be further divided into sixty equal parts, called **seconds** ($1' = 60''$).

Given a decimal angle measure, you can convert it to degrees and minutes.

$$\begin{aligned} 67.2° &= 67° + 0.2° \\ &= 67° + (0.2 \times 60)' \\ &= 67° + 12', \text{ or } 67° 12' \end{aligned}$$

Given an angle measure in degrees and minutes, you can convert it to a decimal measure.

$$\begin{aligned} 119° 51' &= 119° + 51' \\ &= 119° + \left(\frac{51}{60}\right)° \\ &= 119° + 0.85°, \text{ or } 119.85° \end{aligned}$$

Convert to degrees and minutes.

1. 112.9° __________
2. 4.75° __________
3. $34.\overline{6}°$ __________

Convert to a decimal angle measure.

4. 82° 15′ __________
5. 165° 42′ __________
6. 7° 20′ __________
7. Convert 9.375° to degrees, minutes, and seconds. __________
8. Convert 26° 32′ 15″ to a decimal angle measure. __________

You can add or subtract angle measures written in degrees, minutes, and seconds.

$$\begin{array}{r} 37° 16' 29'' \\ + \underline{\ 8° 22' 46''} \\ 45° 38' 75'' \rightarrow 45° 39' 15'' \end{array}$$

$$\begin{array}{r} 128° 20' 25'' \\ - \underline{\ 62° 53' 11''} \end{array} \rightarrow \begin{array}{r} 127° 80' 25'' \\ - \underline{\ 62° 53' 11''} \\ 65° 27' 14'' \end{array}$$

Find each sum or difference.

9. $\begin{array}{r} 6° 41' 55'' \\ + \underline{9° 29' 42''} \end{array}$

10. $\begin{array}{r} 50° 30' 10'' \\ - \underline{31° 40' 15''} \end{array}$

11. $\begin{array}{r} 164° 25' 44'' \\ - \underline{\ 37° 34' 21''} \end{array}$

12. $\begin{array}{r} 72° \\ - \underline{26° 38' 53''} \end{array}$

Find the measure of the complement of an angle having the given measure.

13. 5° 14′ __________
14. 36° 22′ 58″ __________
15. 2° 45″ __________

Find the measure of the supplement of an angle having the given measure.

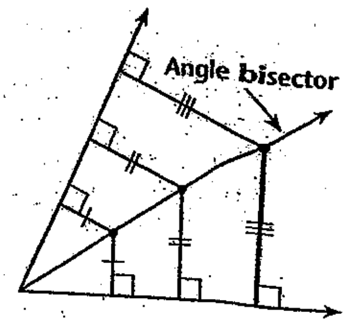
16. 72° 39′ __________
17. 146° 57′ 3″ __________
18. 90° 12″ __________

NAME ______________________ CLASS __________ DATE __________

Enrichment
1.4 Loci

A **locus** is the set of all points that satisfy one or more given conditions. *Locus* is a Latin word that means "location". The plural of locus is *loci*.

An angle bisector is an example of a locus. That is, the bisector of an angle can be described as the locus of all points in the interior of the angle that are equally distant, or **equidistant**, from the sides of the angle.



Draw a figure to illustrate each locus.

1. all points in a plane that are equidistant from the endpoints of a segment, $\overline{XY}$, in that plane

2. all points in a plane that are a given distance from a line, ℓ, in that plane

3. all points in a plane that are equidistant from two parallel lines, m and n, in that plane

4. all points in a plane that are a given distance from a point, P, in that plane

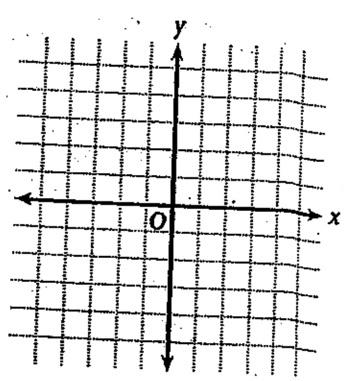
5–8. Repeat Exercises 1–4, this time without the condition that the locus is in the same plane as the given figure. For Exercise 5, for instance, illustrate all points *in space* that are equidistant from the endpoints of a segment $\overline{XY}$. Make your drawings on a separate sheet of paper.

9. Use the coordinate plane at right.

a. Draw the locus of all points that are equidistant from the x-axis and the y-axis.

b. Write an algebraic description of the locus you drew in part **a**.

____



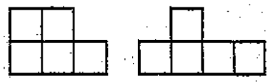
10. Draw a treasure map on a separate sheet of paper. Include important features of the landscape, such as trees, large rocks, and so on. Determine a place to bury the treasure so that a person searching for it must use a locus to find it. Then write a set of instructions for finding the treasure.

NAME ______________________ CLASS ____________ DATE ____________

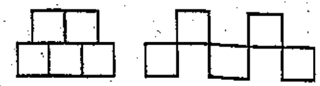
Enrichment
5.1 Pentominoes

A **pentomino** is a figure formed by five congruent squares arranged so that each square shares a common side with at least one other square.

These are pentominoes.



These are *not* pentominoes.



1. In all, there are twelve distinct types of pentomino. Sketch them in the space below.

If you consider the area of each square to be *one square unit*, the area of each pentomino is 5 square units. You can then combine pentominoes to form figures with areas that are multiples of 5 square units. In the figure at right, for instance, three pentominoes are joined together to form a rectangle with an area of 15 square units.

Find a combination of pentominoes that forms a rectangle with the given area. In each rectangle, no type of pentomino may be used more than once. Sketch the combination in the space provided, or use a separate sheet of paper if you need more space.

2. 20 square units

3. 25 square units

4. 30 square units

5. 35 square units

6. 40 square units

7. 45 square units

8. 50 square units

9. 55 square units

10. 60 square units

11. The diagram at right shows a standard checkerboard. Suppose that the squares of the checkerboard are congruent to the squares of a set of pentominoes. On a separate sheet of paper, show a way to cover the checkerboard with the twelve pentominoes so that only the corner squares remain uncovered.