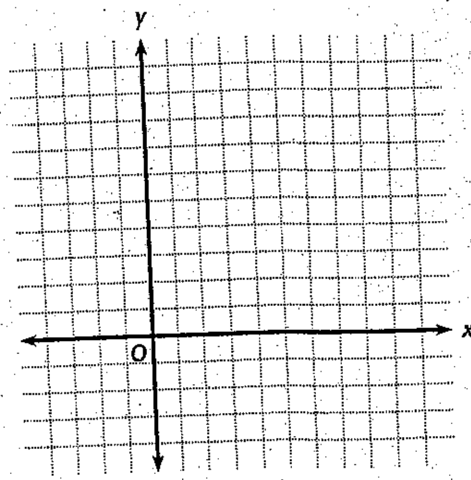
NAME ______________________ CLASS ____________ DATE ____________

Enrichment
5.8 Probability on a Coordinate Plane

Suppose that two real numbers, x and y, are chosen at random so that $0 \le x \le 6$ and $0 \le y \le 6$. What is the probability that their sum is 8 or greater? Since there are infinitely many numbers involved, it may seem impossible to answer this question. However, you can solve the problem by graphing lines on a coordinate plane and calculating areas of figures that are formed by these lines.



1. **a.** Graph this system of inequalities on the coordinate plane at right. $\begin{cases} 0 \le x \le 6 \\ 0 \le y \le 6 \end{cases}$

b. Find the area covered by the solution of the system. ____________

2. **a.** Graph the line with equation $x + y \ge 8$ on the coordinate plane.

b. Find the area of the region where this graph overlaps the solution of the system in Exercise 1. ____________

3. **a.** What is the ratio of the area that you found in Exercise 2 to the area that you found in Exercise 1? ____________

b. What is the probability that two randomly chosen numbers, x and y, with $0 \le x \le 6$ and $0 \le y \le 6$, have a sum that is 8 or greater? ____________

Two numbers, x and y, are chosen so that $0 \le x \le 6$ and $0 \le y \le 6$.

4. Find the probability that the sum of the numbers is

a. 10 or greater. ____________

b. 9 or less. ____________

c. 0 or greater. ____________

d. less than 0. ____________

5. Find the probability that

a. the difference $x - y$ is 3 or greater. ____________

b. the difference $y - x$ is 3 or greater. ____________

c. the difference of the numbers is 3 or greater. ____________

6. The length of a segment is 10 inches. Two points on the segment are chosen at random, creating three nonoverlapping segments. What is the probability that the lengths of these three segments could be the lengths of the sides of a triangle? (Hint: Let x and y be the lengths of two of the segments, and apply the Triangle Inequality Theorem.) ____________

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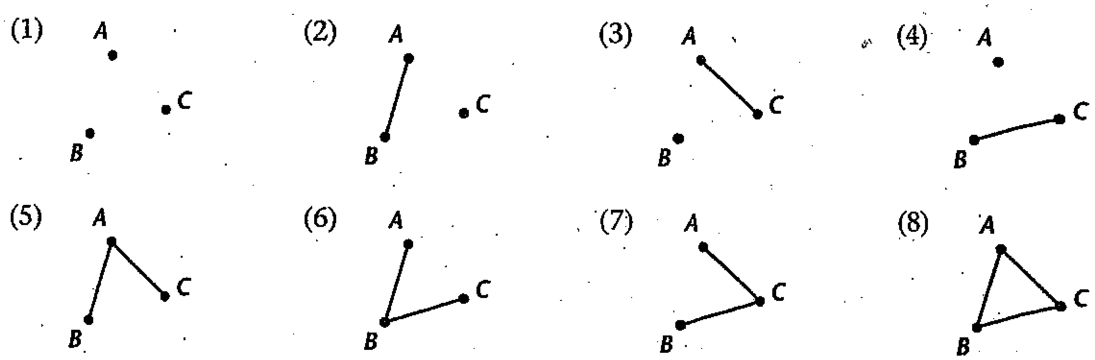
Enrichment
11.3 *Investigating Special Graphs*

In general, there may be any number of edges connecting two vertices of a graph. When that number is restricted, however, some interesting patterns arise. For example, suppose that a graph is restricted so that there is either one edge between two vertices or there is none. Then given any three vertices *A*, *B*, and *C*, there are exactly eight possible graphs, as shown below.



1. If each vertex of a graph has the same degree, then the graph is called a **regular graph**. Which of the restricted graphs above is (are) regular?

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2. When all possible edges have been drawn among *n* vertices, then the restricted graph is called the **complete graph** on *n* vertices. Which of the restricted graphs above are complete?

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3. One restricted graph is the **complement** of another if their combined edges would constitute a complete graph, with no edges being repeated. Which pairs of graphs above are complements?

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4. On a separate sheet of paper, draw all possible graphs using four vertices, *P*, *Q*, *R*, and *S*, that are restricted as described above. Number your graphs.

5. Refer to the graphs that you drew in Exercise 4. List all of the following:

a. regular graphs ______________________

b. complete graphs ______________________

c. pairs of complements ______________________

6. Suppose that a graph has five vertices. How many restricted graphs are possible among these vertices? (Hint: Look for a pattern that relates the number of edges to the number of graphs. How many edges and possible graphs are there when the number of vertices is 1? 2? 3? 4?) ______________