LESSON 6.5

# Graphical Solutions

**You will need:**

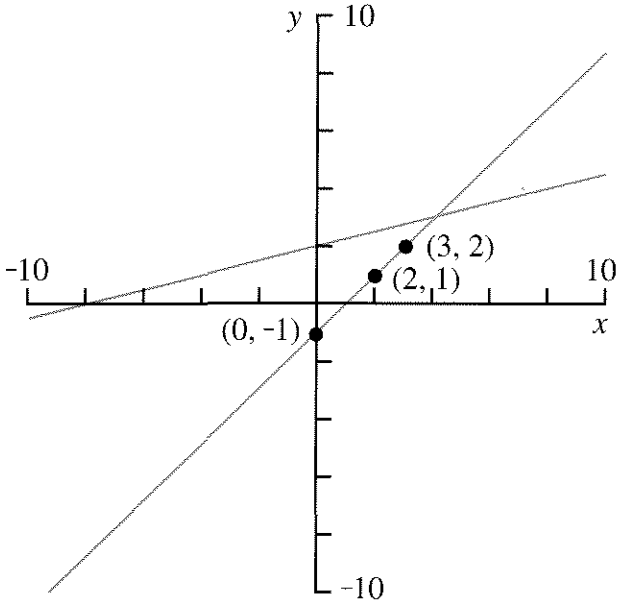
graphing calculator (optional)

graph paper

## A GRAPHICAL ANALYSIS

**1.** On the same axes, graph $y = x - 1$ and $y = 0.25x + 2$.

Your graph should look like the one below. The three points that are marked and labeled with their coordinates are all on the part of the graph of $y = x - 1$ that is *below* the graph of $y = 0.25x + 2$.




**2.** Find the coordinates of three points on the part of the line $y = x - 1$ that is *above* the graph of $y = 0.25x + 2$.

**3.** Find the coordinates of the point where the two lines cross.

**4.** If $x = 100$,

a. which graph is above, $y = x - 1$ or $y = 0.25x + 2$?

b. what is the value of $0.25x + 2$?

c. what is the value of $x - 1$?

**5.** If $x = -100$,

a. which graph is above, $y = x - 1$ or $y = 0.25x + 2$?

b. what is the value of $0.25x + 2$?

c. what is the value of $x - 1$?

**6.** Describe all the values of $x$ for which the graph of $y = x - 1$

a. is above the graph of $y = 0.25x + 2$.

b. is below the graph of $y = 0.25x + 2$.

**7.** Describe all the values of $x$ that satisfy each equation or inequality.

a. $0.25x + 2 = x - 1$

b. $0.25x + 2 > x - 1$

c. $0.25x + 2 < x - 1$

## FINDING SOLUTIONS

**8.** Using trial and error, find three values of $x$ that satisfy each inequality.

a. $2x < 3x + 1$

b. $2x > 3x + 1$

It is often easy to find a few values of $x$ that satisfy an inequality. It is harder to find *all* the values, that is, to *solve* the inequality. You have solved equations and inequalities using trial and error, the cover-up method, tables, and the Lab Gear. Another method is to use graphs.

**9.** Graph $y = 2x$ and $y = 3x + 1$ on the same pair of axes. Use the graphs to solve the two inequalities in problem 8. Remember that even though the graph shows values of both $x$ and $y$, the original inequalities involved only the variable $x$. Your answers should involve only $x$.

**10.** Graph each pair of functions on graph paper. Use a separate grid for each pair.

a. $y = 2x - 10$ and $y = 5x - 1$

b. $y = 2x + 10$ and $y = 5x - 2$

c. $y = 2x - 10$ and $y = 5x - 2$

d. $y = x^2$ and $y = 4x - 4$

**11.** Use your graphs from problem 10 to find the values of $x$ that make these equations true.

a. $2x - 10 = 5x - 1$

b. $2x + 10 = 5x - 2$

c. $2x - 10 = 5x - 2$

d. $x^2 = 4x - 4$

**12.** Summary Write a paragraph explaining how you can use graphs to help solve equations and inequalities. Illustrate by showing how you would use your method to solve these equations and inequalities.

a. $-2x + 1 > 3x - 4$

b. $2x - 1 > -3x + 4$

c. $3x + 4 = -2x - 6$

d. $x^2 = x + 2$

## MORE EQUATIONS AND INEQUALITIES

Use the techniques you have learned to solve these equations and inequalities. You can use trial and error, the cover-up method, tables, graphs, or the Lab Gear. Show your work.

**13.** $6x + 1 \leq -3x + 7$

**14.** $2x + 32 = 6x + 28$

**15.** $4(x + 5) = 4x + 20$

**16.** $-3 + m < -m - 3$

**17.** $\frac{5x + 3}{4} - 6 = 1$

**18.** $x^2 = 6 - x$

**19.** $\frac{x}{x + 1} = 1$

**20.** $\frac{x + 5}{2} + x = 19$

## REVIEW *SUBSTITUTION*

For each problem, write a simple expression that shows the relationship between $\Delta$ and $\Diamond$. (Hint: If you cannot find the relationship by using algebra, make a table of values of $\Delta$ and $\Diamond$ that make the expressions true, and find a pattern in the table.) Show your work.

**21.** $\Delta - \Diamond = \Delta$

**22.** $\Diamond + 2 = \Diamond + \Delta + \Delta$

**23.** $\Diamond + \Delta + \Delta + \Diamond = \Diamond$

**24.** $\Diamond - \Delta + \Diamond - \Delta = \Diamond$

**25.** $\Delta + \Delta = \Diamond + \Diamond$

**26.** $\Diamond + \Delta + \Delta + \Diamond = 4$

## REVIEW/PREVIEW DIVISION AND THE DISTRIBUTIVE LAW

To divide a polynomial by a monomial, you can use the multiplication table format. For example, here is the setup to divide $10x^2 - 5x$ by 5.

| | ? | ? |
|---|---|---|
| 5 | $10x^2$ | $-5x$ |

Ask yourself: *What times 5 = $10x^2$?* and *what times 5 = $-5x$?* Write the answers across the top of the table: $2x^2 - x$.

Divide.

**27.** $\frac{10x^2 - 5x}{x}$ **28.** $\frac{10x^2 - 5x}{5x}$

If the denominator does not divide every term of the numerator, you will still have fractions in the answer. For example:

$$\frac{10x^2 - 5x}{2} = 5x^2 - \frac{5x}{2}$$

Divide.

**29.** $\frac{10x^2 - 5x}{10}$ **30.** $\frac{10x^2 - 5x}{x^2}$

**31.** $\frac{10x^2 - 5x}{3}$

## DISCOVERY WEIGHTED AVERAGES

Mr. Cody counts the quiz average (Q) in his class three times as much as the test average (T). That is, he uses the formula:

$$\frac{3Q + T}{4}$$

(This is called a *weighted* average, because he weights the quizzes three times as much.)

Mr. Fletcher counts the test average twice as much as the quiz average. He uses the formula:

$$\frac{Q + 2T}{3}$$

**Oliver's grades**:
Quizzes: 75 80 85 95 70
Tests: 95 100 80

**Connie's grades:**
Quizzes: 95 98 94 88 90
Tests: 80 80 95

**32.** Which teacher would Oliver prefer to have?

**33.** Which teacher would Connie prefer to have?

**34.** Oliver and Connie are both in Mr. Dodge's class. He gives students an A who have an average of 90 or better. If possible, show how Mr. Dodge can weight the tests and quizzes so that

a. Oliver has an A average;
b. Connie has an A average;
c. both Connie and Oliver have an A average.