Essential Ideas

RECTANGULAR WINDOWS

The window panes referred to below are those pictured in Lesson 2 of this chapter.

1. Sketch a window having length equal to twice its width that is made up of panes from the A.B. Glare Co. How many panes of each type (corner, edge, and inside) are there?

Use sketches or tables of values to help solve the following problem.

2. How many of each type of pane would you need for windows that are twice as long as they are wide? Your answer will depend on the width of the window. Let the width be W, and find expressions in terms of W for:

a. the length of the window;

b. the number of inside panes;

c. the number of edge panes;

d. the number of corner panes.

3. Draw a pair of axes and label the x-axis *Width* and the y-axis *Number of Panes.* Then make a graph showing each of these as a function of W, the width of the window.

a. the number of inside panes

b. the number of edge panes

c. the number of corner panes

4. As you increase the width of the window, which grows fastest, the number of inside panes, edge panes, or corner panes? Explain, referring to graphs or sketches.

5. The panes described in Lesson 2 cannot be used for windows of width 1.

a. Explain why.

b. Sketch the two types of panes that are needed in this case.

c. Find the number of each type of pane for a window having width 1 and length L.

MULTIPLY

6. Multiply these polynomials.

a. $(3x - 5)(4x - 6)$

b. $(5 - 3x)(6 - 4x)$

c. $(3y + 3x - 1)(-2x + 2y)$

d. $(x + y + z)(-x + y)$

7. Multiply and compare the results. What do you notice? Explain.

a. $(ax - by)(ax - by)$

b. $(by - ax)(by - ax)$

c. $(ax - by)(by - ax)$

REMARKABLE IDENTITIES

8. Find the missing terms.

a. $(ax - \_\_\_\_\_)^2 = \_\_\_\_ - 2ax + 1$

b. $b^2 - x^2 = (b - x)(\_\_\_\_\_)$

c. $y^2 - 10y + \_\_\_\_\_ = (\_\_\_\_)^2$

d. $(ax + \_\_\_)^2 = a^2x^2 + \_\_\_\_\_ + b^2y^2$

FACTOR

Factor. Look for a common factor and use an identity.

9. a. $5x^2 + 20x + 20$
b. $6y^2 + 12xy + 6x^2$
c. $2x^2 + 60x + 450$

10. Find the middle term that will make each of these a perfect square trinomial. Then write it as the square of a binomial.
a. $100a^2 +$ ____ $+ 49b^2$
b. $(1/9)x^2 +$ ____ $+ (1/4)y^2$

11. Factor these polynomials.
a. $4x^2 - 20x + 25$
b. $4x^2 - 25$
c. $25 - 4x^2$

12. Factor these polynomials. (Hint: First look for common factors.)
a. $5y^2 + 90xy + 45x^2$
b. $48x - 27xy^2$
c. $xy^2 - 6x^2y + 9x^3$

SOLVING EQUATIONS WITH SQUARES

Solve for x. There may be no solution, one solution, or more than one solution.

13. $x^2 = 25$

14. $36x^2 = 49$

15. $x^2 - 6x + 9 = 0$

16. $x^2 - 6x + 9 = 1$

GRAPHING INEQUALITIES

17. Use graphs to help you find the solution to each of these compound inequalities. In each case, you will need to graph two horizontal lines and one other line.
a. $-3 < 4x - 3 < 5$
b. $-3 < -4x + 3 < 5$
c. $-5 < 4x - 3 < 3$
d. $-5 < -4x + 3 < 3$

18. Use graphs and tables of values to solve these compound inequalities.
a. $x - 2 < 3x - 4 < x + 5$
b. $x - 2 < 3x - 4 < -x + 5$

BILLIONS AND BILLIONS

The following was written on an ice cream package: \$3 billion is 1% of the U.S. yearly defense budget. If you ate one ice cream cone per hour per day it would take you 342,466 years to consume 3 billion ice cream cones.

19. Check that the calculation is accurate.

20. Assuming that the information is accurate, what is the U.S. *hourly* defense budget?

LIGHT-YEARS

21. A *light-year* is the distance light travels in one year. Figure out how far that is in kilometers, given that light travels approximately 299,793 kilometers per second. Use scientific notation.

WHAT A BARGAIN

22. Say that a particularly expensive necklace costs one googol dollars.
a. Fortunately, it's on sale at 99% off. How much does it cost now?
b. What percent-off sale would be needed so that the necklace would cost ten billion dollars?