Unit 8

Creating Equations and Systems of Equations

Guided Notes

KEY

Name

Period

If found, please return to Mrs. Brandley's room, M-8.

Concept 1: Factoring Prep Review

Standard Form of a Quadratic: $Ax^2 + Bx + C = 0$

Put the following quadratics in standard form and list A, B, and C.

1. $3x + 5x^2 = 7$

SF: $5x^2 + 3x - 7$

A: 5

B: 3

C: -7

2. $-4x^2 = 2x - 6$

SF: $4x^2 + 2x - 6$

A: 4

B: 2

C: -6

3. $2x = x^2 - 9$

SF: $x^2 - 2x - 9$

A: 1

B: -2

C: -9

Factor out the greatest common factor in the following expressions:

4. $2x^2 + 10x$

$2x(x+5)$

5. $12x^2 - 3x + 6$

$3(4x^2 - x + 2)$

6. $5x^2 - 15x + 10$

$5(x^2 - 3x + 2)$

7. $x^2 - 2x + 7$

none

$1(x^2 - 2x + 7)$

Given the following quadratics, list what AxC is and what B is, then find two numbers that multiply to AC and add to B.

8. $3x^2 - 7x + 4 = 0$

AxC: 12

B: -7

2 #'s: -3 & -4

9. $x^2 + 8x + 16 = 0$

AxC: 16

B: 8

2 #'s: 4 & 4

10. $2x^2 + 8x + 6 = 0$

AxC: 12

B: 8

2 #'s: 6 & 2

Factor the following by grouping:

11. $(x^2 + 5x) + (-3x - 15) = 0$

$x(x+5) - 3(x+5)$

$(x+5)(x-3)$

12. $(2x^2 - 6x) + (4x - 12) = 0$

$2x(x-3) + 4(x-3)$

$(x-3)(2x+4)$

13. $(6x^2 - 8x) + (3x - 4) = 0$

$2x(3x-4) + 1(3x-4)$

$(3x-4)(2x+1)$

Concept 2: Factoring Review

Greatest Common Factor

1. $3x - 3 = 0$

$3(x-1)$

Factored: $3(x-1)$

Solved: $x = 1$

2. $x^2 - 4x = 0$

$x(x-4)$

Factored: $x(x-4)$

Solved: $x = 0, 4$

3. $9x^2 + 6x = 0$

$3x(3x+2)$

Factored: $3x(3x+2)$

Solved: $x = 0, -2/3$

A=1 Quadratic

4. $x^2 + 5x + 6 = 0$

AC 6 B 5

2 & 3

$(x+2)(x+3)$

Factored: $(x+2)(x+3)$

Solved: $x = -2, -3$

2. $2x^2 - 8x + 8 = 0$

$2(x^2 - 4x + 4)$

AC 4 B -4

-2 & -2

$(x-2)(x-2)$

Factored: $(x-2)(x-2)$

Solved: $x = 2$

3. $x^2 - 5x - 14 = 0$

AC -14 B -5

-7 & 2

$(x-7)(x+2)$

Factored: $(x-7)(x+2)$

Solved: $x = 7, -2$

A not equal to 1 Quadratic

7. $6x^2 - 5x - 4 = 0$

AC: -24 B -5

-8 & 3

$(6x^2 - 8x) + (3x - 4)$

$2x(3x-4) + 1(3x-4)$

$(3x-4)(2x+1)$

Factored: $(3x-4)(2x+1)$

Solved: $x = 4/3, -1/2$

8. $3x^2 + 2x - 8 = 0$

AC -24 B 2

-4 & 6

$(3x^2 - 4x) + (6x - 8)$

$x(3x-4) + 2(3x-4)$

$(3x-4)(x+2)$

Factored: $(3x-4)(x+2)$

Solved: $x = 4/3, -2$

9. $6x^2 + 7x - 3 = 0$

AC -18 B 7

-2 & 9

$6x^2 - 2x + 9x - 3$

$2x(3x-1) + 3(3x-1)$

$(3x-1)(2x+3)$

Factored: $(3x-1)(2x+3)$

Solved: $x = 1/3, -3/2$

Concept 3: Creating Equations

Sum: the solution to an **addition** problem

Difference: the solution to a **subtraction** problem

Product: the solution to a **multiplication** problem

Quotient: the solution to a **division** problem

Write the following phrases as a numerical expression:

The sum of five and seven $5+7$

The difference of twelve and nine $12-9$

The product of four and six 4×6

The quotient of twenty-seven and three $\frac{27}{3}$

Now try the following:

1. The sum of five times a number n and thirteen? $5n+13$

2. The quotient of four and the quantity of two less than one-third of a number x? $\frac{4}{\frac{1}{3}x-2}$

3. The difference of six times a number x and the quotient of the number x and five? $6x-\frac{x}{5}$

This same idea can applied taking numerical expressions and writing them verbally:

4. $5-\frac{x}{76}$ The difference of five and the quotient of x and seventy-six

5. $4+\frac{1}{3}x$ The sum of four and one-third of a number x.

6. $(x+2)+\frac{7}{x}$ The sum of "the sum of x and two" and "the quotient of seven and x".

7. A car salesman earns a $30,000 salary plus a commission of $600 for every car he sells. He wants to earn $80,000, how many cars does he need to sell?

x = # of cars

EQUATION: $30{,}000 + 600x = 80{,}000$

SOLUTION: $x = 83.\overline{3}$ 84 cars

8. A school football game charges $5 for students and $8 for adults. The football team really wants new uniforms that will cost $1200. If 50 adults come. How many children need to be with them?

s : # of students
a : # of adults

EQUATION: $5s + 8a = 1200$

SOLUTION: $5s + 8(50) = 1200$

$s = 160$ students

9. Three more than 6 times the square of a number is 57. Find the number.

EQUATION: $6x^2 + 3 = 57$

SOLUTION: $x = \pm 3$

10. Bobby is having a growth spurt. He is currently 34 inches tall. If he grows 2 inches a month (I told you, growth spurt) how many months will it take for him to reach 4 feet tall?

x = # of months

EQUATION: $34 + 2x = 48$

SOLUTION: $x = 7$ months

11. Savannah makes a square garden but realizes that it's too small to grow everything she wants to grow. She only has room to extend it two feet on one side and three feet on the other. The area of the new garden is 156 square feet. How long was one side of the original square garden?

EQUATION: $(x+2)(x+3) = 156$

$x^2 + 5x + 6 = 156$

$x^2 + 5x - 150 = 0$

-10 & 15

$(x-10)(x+15)$

SOLUTION: 10 feet

$x = 10, -15$

Concept 4: Systems of Equations

When we have a single equation, it is impossible to solve if it has more than one variable. However, if we have two equations and two variables we can solve it using substitution or elimination. We are going to solve them using substitution.

Linear Equations:

1. $y = x + 5$
   $y = 2x - 3$

$x + 5 = 2x - 3$
$+3 \quad +3$
$x + 8 = 2x$
$-x \quad -x$
$8 = x \quad x = 8$

2. $y = 5x + 2$
   $y = 3x - 8$

$5x + 2 = 3x - 8$
$-3x \quad -2 \quad -3x \quad -2$
$\frac{2x}{2} = \frac{-10}{2}$
$x = -5$

A Linear and Quadratic Equation:

3. $y = x^2 - 9x + 18$
$y = 4x - 12$

$x^2 - 9x + 18 = 4x - 12$
$-4x + 12 \quad -4x + 12$
$x^2 - 13x + 30$
$(x - 10)(x - 3)$
$x = 10, 3$

4. $y = x^2 - 20$
$y = x + 10$

$x^2 - 20 = x + 10$
$-x - 10 \quad -x - 10$
$x^2 - x - 30 = 0$
$(x - 6)(x + 5)$
$x = 6, -5$

5. $y = x^2 + 8x + 15$
$y = -6x - 9$

$x^2 + 8x + 15 = -6x - 9$
$+6x + 9 \quad +6x + 9$
$x^2 + 14x + 24$
$(x + 12)(x + 2)$
$x = -12, -2$

6. $y = x^2 - 3x - 6$
$y = -7x + 6$

$x^2 - 3x - 6 = -7x + 6$
$+7x - 6 \quad +7x - 6$
$x^2 + 4x - 12$
$(x - 2)(x + 6)$
$x = 2, -6$

7. $y = x^2 - 4x - 16$
$y = 5x + 6$

$x^2 - 4x - 16 = 5x + 6$
$-5x - 6 \quad -5x - 6$
$x^2 - 9x - 22$
$(x - 11)(x + 2)$
$x = 11, -2$

8. $y = x^2 + 9x + 13$
$y = -x - 11$

$x^2 + 9x + 13 = -x - 11$
$+x + 11 \quad +x + 11$
$x^2 + 10x + 24$
$(x + 6)(x + 4)$
$x = -6, -4$