

**Algebra Solution Key**  
**Chapter 9**  
**Polynomials and Factoring; More on Probability**

**Lesson 9.1**  
**Addition and Subtraction of Polynomials**

1. A *Polynomial* is an expression made with constants, variables, and positive integer exponents of the variables.
2. A *Monomial* is a one termed polynomial. It can be a constant, a variable, or a combination of constants and variables.
3. The *degree* of a polynomial is the largest exponent of a single term. (The degree of a term is the sum of the powers on each variable in the term.)
4. The coefficient of the first term of a polynomial in standard form is called the *Leading Coefficient*.
5.  $x^2 + 3x^{\frac{1}{2}}$  is NOT a polynomial because the second term has a fractional exponent.
6.  $\frac{1}{3}x^2y - 9y^2$  IS a polynomial because it is only made up of constants and variables with positive integer exponents.
7.  $3x^{-3}$  is NOT a polynomial because the term has a negative exponent.
8.  $\frac{2}{3}t^2 - \frac{1}{t^2}$  is NOT a polynomial because the second term is equal to a variable with a negative exponent.
9.  $3 - 2x \Rightarrow -2x + 3$  The degree of the polynomial is 1.
10.  $8x^4 - x + 5x^2 + 11x^4 - 10 \Rightarrow 19x^4 + 5x^2 - x - 10$   
The degree of the polynomial is 4.
11.  $8 - 4x + 3x^3 \Rightarrow 3x^3 - 4x + 8$  The degree of the polynomial is 3.
12.  $-16 + 5f^8 - 7f^3 \Rightarrow 5f^8 - 7f^3 - 16$  The degree of the polynomial is 8.
13.  $-5 + 2x - 5x^2 + 8x^3 \Rightarrow 8x^3 - 5x^2 + 2x - 5$  The degree of the polynomial is 3.
14.  $x^2 - 9x^4 + 12 \Rightarrow -9x^4 + x^2 + 12$  The degree of the polynomial is 4.

$$15. (x + 8) + (-3x - 5) = (x + -3x) + (8 + -5) = -2x + 3$$

16.

$$(8r^4 - 6r^2 - 3r + 9) + (3r^3 + 5r^2 + 12r - 9)$$

$$8r^4 + 3r^3 + (-6r^2 + 5r^2) + (-3r + 12r) + (9 + -9)$$

$$8r^4 + 3r^3 - r^2 + 9r$$

17.

$$(-2x^2 + 4x - 12) + (7x + x^2)$$

$$(-2x^2 + x^2) + (4x + 7x) - 12$$

$$-x^2 + 11x - 12$$

18.

$$(2a^2b - 2a + 9) + (5a^2b - 4b + 5)$$

$$(2a^2b + 5a^2b) - 2a - 4b + (9 + 5)$$

$$7a^2b - 2a - 4b + 14$$

19.

$$(6.9a^2 - 2.3b^2 + 2ab) + (3.1a - 2.5b^2 + b)$$

$$6.9a^2 + (2.3b^2 - 2.5b^2) + 2ab + 3.1a + b$$

$$6.9a^2 - 0.2b^2 + 2ab + 3.1a + b$$

20.

$$(-t + 15t^2) - (5t^2 + 2t - 9)$$

$$-t + 15t^2 - 5t^2 - 2t + 9$$

$$-t + 10t^2 - 2t + 9$$

$$10t^2 - 3t + 9$$

21.

$$(-y^2 + 4y - 5) - (5y^2 + 2y + 7)$$

$$-y^2 + 4y - 5 - 5y^2 - 2y - 7$$

$$-6y^2 + 2y - 12$$

22.

$$(-h^7 + 2h^5 + 13h^3 + 4h^2 - h - 1) - (-3h^5 + 20h^3 - 3h^2 + 8h - 4)$$

$$-h^7 + 2h^5 + 3h^5 + 13h^3 - 20h^3 + 4h^2 + 3h^2 - h - 8h - 1 + 4$$

$$-h^7 + 5h^5 - 7h^3 + 7h^2 - 9h + 3$$

23.

$$(-5m^2 - m) - (3m^2 + 4m - 5)$$

$$-5m^2 - 3m^2 - m - 4m + 5$$

$$-8m^2 - 5m + 5$$

24.

$$(2a^2b - 3ab^2 + 5a^2b^2) - (2a^2b^2 + 4a^2b - 5b^2)$$

$$5a^2b^2 - 2a^2b^2 + 2a^2b - 4a^2b - 3ab^2 + 5b^2$$

$$3a^2b^2 - 2a^2b - 3ab^2 + 5b^2$$

25.

$$\text{blue} = x \cdot y = xy$$

$$\text{yellow} = x \cdot z = xz$$

$$\text{total} = xy + xz + xz = xy + 2xz$$

26.

$$\text{red} = a \cdot b = ab$$

$$\text{green} = a \cdot a = a^2$$

$$\text{total} = a^2 + ab + ab + ab + ab = a^2 + 4ab$$

27.

$$\text{pink} = y \cdot 2x = 2xy$$

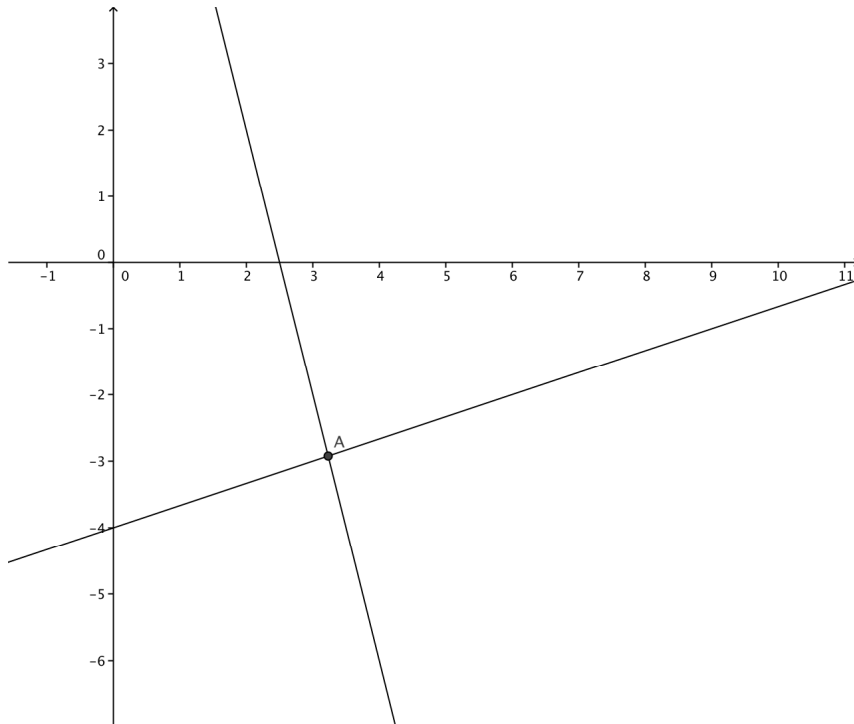
$$\text{white} = x \cdot x = x^2$$

$$\text{total} = 2xy - x^2 - x^2 = -2x^2 + 2xy$$

28.  $2a + 2b - ab$

Mixed Review

$$29. \begin{cases} y = \frac{1}{3}x - 4 \\ y = -4x + 10 \end{cases} \approx (3, -3)$$



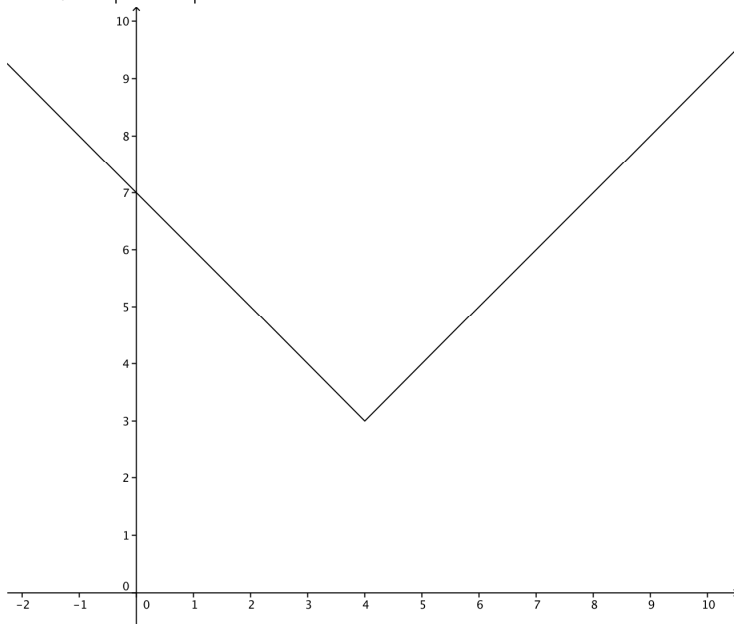
30.

$$12 = -\frac{4}{u}$$

$$12u = -4$$

$$u = -\frac{4}{12} = -\frac{1}{3}$$

31.  $y = |x - 4| + 3$



1. Domain = all real numbers

Range = all real numbers  $\geq$  3

2. The graph has been shifted from the parent function up 3 spaces (+3) and 4 spaces to the right (-4).

32.

1. We have two regular 6-sided dice. We know that each die has the outcomes 1, 2, 3, 4, 5, or 6. We rolled both dice. We need to find the sample space.

The sample space is all possible outcomes of the event. In this example, the sample space is obtained from the sum of the numbers on both dice.

Possible outcomes are:

$$(1+1) = 2$$

$$(1+2) = (2+1) = 3$$

$$(2+3) = (3+2) = (1+4) = (4+1) = 5$$

$$(3+3) = (2+4) = (4+2) = (1+5) = (5+1) = 6$$

$$(3+4) = (4+3) = (2+5) = (5+2) = (1+6) = (6+1) = 7$$

$$(4+4) = (5+3) = (3+5) \dots\dots = 8$$

$$(5+4) = (4+5) \dots\dots\dots = 9$$

$$(6+4) = (4+6) \dots\dots\dots = 10$$

$$(5+6) = (6+5) \dots\dots\dots = 11$$

$$(6+6) = 12$$

We conclude that the sample space is  $\{ 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 \}$

2. We know that all possible outcomes are  $6*6 = 36$  possible outcomes.

We need to determine the possibility of getting a sum of 9.

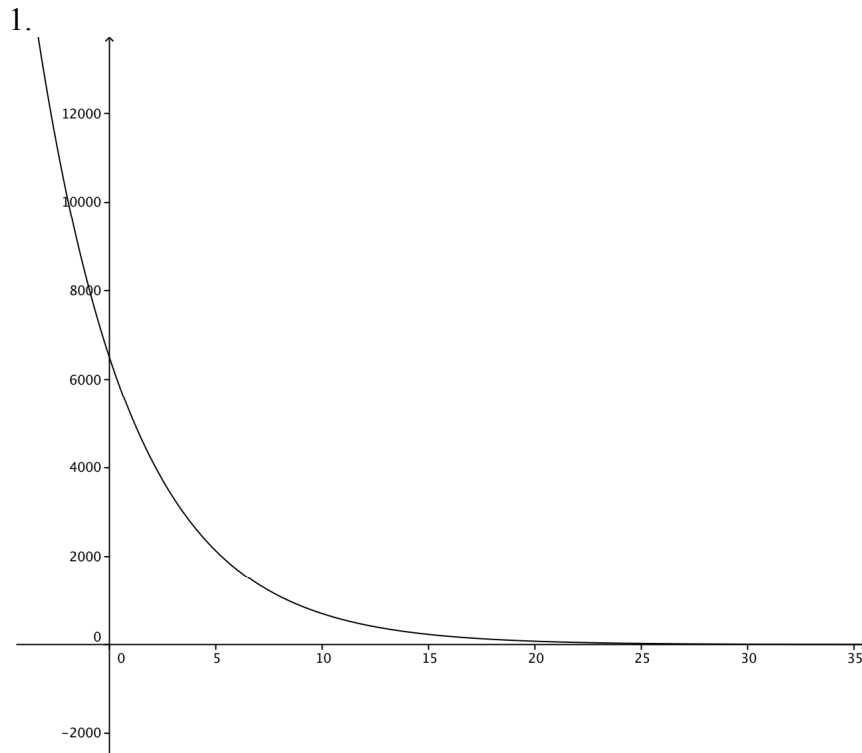
To get a sum of 9 we need to get one of the following outcomes.

$$\implies (4+5), (5+4), (3+6), (6+3)$$

The total is 4 pairs.

The probability is  $4/36 = 1/9$

33.



2. exponential decay

3. the initial value is 6500

4. Domain = all real numbers  
Range = all positive real numbers

5.

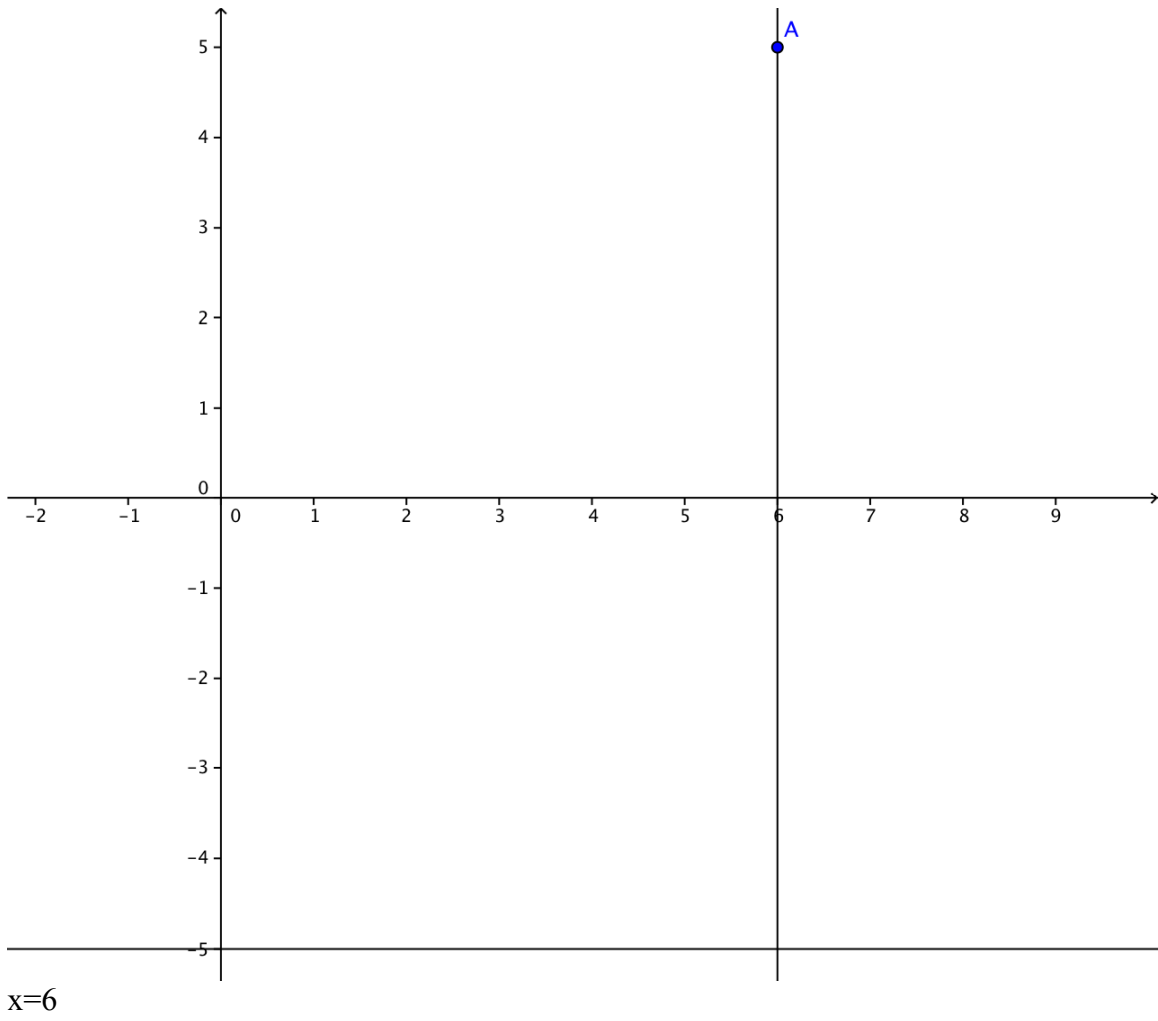
$$y = 6500(0.8)^x$$

$$y = 6500(0.8)^{9.5}$$

$$y = 6500(.120047985437)$$

$$y = 780.311905343$$

34.



## Lesson 9.2

### Multiplication of Polynomials

$$1. (2x)(-7x) = -14x^2$$

$$2. 4(-6a) = -24a$$

$$3. (-5a^2b)(-12a^3b^3) = 60a^{2+3}b^{1+3} = 60a^5b^4$$

$$4. (-5x)(5y) = -25xy$$

$$5. y(xy^4) = x \cdot y^{4+1} = xy^5$$

$$6. (3xy^2z^2)(15x^2yz^3) = 45x^{1+2}y^{2+1}z^{2+3} = 45x^3y^3z^5$$

$$7. x^8(xy^3 + 3x) = x^{8+1}y^3 + 3x^{8+1} = x^9y^3 + 3x^9 = 4x^9y^3$$

$$8. 2x(4x - 5) = 8x^2 - 10x$$

$$9. 6ab(-10a^2b^3 + c^5) = -60a^{1+2}b^{1+3} + 6abc^5 = -60a^3b^4 + 6abc^5$$

$$10. 9x^3(3x^2 - 2x + 7) = 27x^{3+2} - 18x^{3+1} + 63x^3 = 27x^5 - 18x^4 + 63x^3$$

$$11. 3a^2b(9a^2 - 4b^2) = 27a^{2+2}b - 12a^2b^{1+2} = 27a^4b - 12a^2b^3$$

$$12. (x - 2)(x + 3) = x^2 + 3x - 2x - 6 = x^2 + x - 6$$

$$(a + 2)(2a)(a - 3)$$

$$13. (2a^2 + 4a)(a - 3)$$

$$2a^3 - 6a^2 + 4a^2 - 12a$$

$$2a^3 - 2a^2 - 12a$$

$$14. (-4xy)(2x^4yz^3 - y^4z^9) = -8x^5y^2z^3 + 4xy^5z^9$$

$$15. (x-3)(x+2) = x^2 + 2x - 3x - 6 = x^2 - x - 6$$

16.

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

$$3a^4 - 4a^2 + 6a^2 - 8$$

$$3a^4 + 2a^2 - 8$$

17.

$$(7x-2)(9x-5)$$

$$63x^2 - 35x - 18x + 10$$

$$63x^2 - 53x + 10$$

18.

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

$$4x^3 - 2x^2 + 6x - 2x^2 + x - 3$$

$$4x^3 - 4x^2 + 7x - 3$$

19.

$$(3x+2)(9x^2 - 6x + 4)$$

$$27x^3 - 18x^2 + 12x + 18x^2 - 12x + 8$$

$$27x^3 + 8$$

20.

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

$$(a^2 \cdot a^2) + (a^2 \cdot -3a) + (a^2 \cdot 4) + (2a \cdot a^2) + (2a \cdot -3a) + (2a \cdot 4) + (-3 \cdot a^2) + (-3 \cdot -3a) + (-3 \cdot 4)$$

$$a^4 - 3a^3 + 4a^2 + 2a^3 - 6a^2 + 8a - 3a^2 + 9a - 12$$

$$a^4 + (-3a^3 + 2a^3) + (4a^2 - 6a^2 - 3a^2) + (8a + 9a) - 12$$

$$a^4 - a^3 - 5a^2 + 17a - 12$$

21.

$$(3m + 1)(m - 4)(m + 5)$$

$$(3m^2 - 12m + m - 4)(m + 5)$$

$$(3m^2 - 11m - 4)(m + 5)$$

$$(3m^2 \cdot m) + (3m^2 \cdot 5) + (-11m \cdot m) + (-11m \cdot 5) + (-4 \cdot m) + (-4 \cdot 5)$$

$$3m^3 + 15m^2 - 11m^2 - 55m - 4m - 20$$

$$3m^3 + 4m^2 - 59m - 20$$

22.

$$\text{Volume} = (x^2 + 2x)(2x + 1)$$

$$\text{Volume} = (x^2 \cdot 2x) + (x^2 \cdot 1) + (2x \cdot 2x) + (2x \cdot 1)$$

$$\text{Volume} = 2x^3 + x^2 + 4x^2 + 2x$$

$$\text{Volume} = 2x^3 + 5x^2 + 2x$$

23. The base of the whole rectangle is  $2x+4$

The height of the whole rectangle is  $x+5$

$$A = b(h)$$

$$A = (2x + 4)(x + 5)$$

$$A = 2x^2 + 10x + 4x + 20$$

$$A = 2x^2 + 14x + 20$$

24.

First we have to find the area of the entire rectangle, including the missing piece.

The base =  $3x$

The height =  $x+x = 2x$

Now we find the area.

$$A = b(h)$$

$$A = 3x(2x)$$

$$A = 6x^2$$

$6x^2$  is the area of the entire rectangle WITH the missing piece. Now we have to find the area of that missing piece and subtract it from the overall area.

the base =  $3x-8$

the height =  $x$

$$A = b(h)$$

$$A = (3x - 8)x$$

$$A = 3x^2 - 8x$$

This is the area of the missing piece. Let's subtract.

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

$$6x^2 - 3x^2 + 8x$$

$$3x^2 + 8x$$

The area of the figure is  $3x^2 + 8x$ .

25.

$$V = l(w)(h)$$

$$l = 3x + 4$$

$$w = 2x$$

$$h = x + 1$$

$$V = (3x + 4)(2x)(x + 1)$$

$$V = (6x^2 + 8x)(x + 1)$$

$$V = 6x^3 + 6x^2 + 8x^2 + 8x$$

$$V = 6x^3 + 14x^2 + 8x$$

The volume of the figure is  $6x^3 + 14x^2 + 8x$

26.

$$V = l(w)(h)$$

$$l = 2x + 4$$

$$w = 3x - 1$$

$$h = 4x$$

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

$$V = (2x + 4)(12x^2 - 4x)$$

$$V = 24x^3 - 8x^2 + 48x^2 - 16x$$

$$V = 24x^3 + 40x^2 - 16x$$

The volume of the figure is  $24x^3 + 40x^2 - 16x$

27.  $n^4 + n^3 + n^2$

28.

*Find the next four terms of the sequence 1, 3/2, 9/4, 27/8, ...*

To find r we divide any term by the term in front of it : 3/2 divided by 1 = 3/2, r=3/2

Now we multiply to find the next four terms:

$$27/8 * 3/2 = \underline{81/16} * 3/2 = \underline{243/32} * 3/2 = \underline{729/64} * 3/2 = \underline{2187/128}$$

1, 3/2, 9/4, 27/8, 81/16, 243/32, 729/64, 2187/128...

29.

1.

Week (x)	Books read in the week	Total # of books (y)
0	3	3
1	3	6
2	3	9
3	3	12
4	3	15
5	3	18
6	3	21

2. The total # of books (y) is equal to the number of weeks (x) times the number of books read in that week (3) plus the initial 3 books.

$$y = 3x + 3$$

$$y = 3x + 3$$

$$63 = 3x + 3$$

3.

$$60 = 3x$$

$$x = 20$$

Reece will have read 63 books after week 20.

30.  $0.062\% = .00062$

31.

$$ab\left(a + \frac{b}{4}\right)$$

$$a = 4$$

$$b = -3$$

$$4 \cdot -3\left(4 + \frac{-3}{4}\right) = -12\left(4 \frac{1}{4}\right) = -51$$

32.

$$3s(3 + 6s) + 6(5 + 3s)$$

$$9s + 18s^2 + 30 + 18s$$

$$18s^2 + 18s + 9s + 30$$

$$18s^2 + 27s + 30$$

### Lesson 9.3

#### Special Products of Polynomials

$$1. (x + 9)^2 = x^2 + 2(x)(9) + 9^2 = x^2 + 18x + 81$$

$$2. (x - 1)^2 = x^2 - 2(x)(1) + 1^2 = x^2 - 2x + 1$$

$$3. (2y + 6)^2 = 4y^2 + 2(2y)(6) + 6^2 = 4y^2 + 24y + 36$$

$$4. (3x - 7)^2 = 9x^2 - 2(3x)(7) + 49 = 9x^2 - 42x + 49$$

$$5. (7c + 8)^2 = 49c^2 + 2(7c)(8) + 64 = 49c^2 + 112c + 64$$

$$6. (9a^2 + 6)^2 = 81a^4 + 2(9a^2)(6) + 36 = 81a^4 + 108a^2 + 36$$

$$7. (b^2 - 1)^2 = b^4 - 2(b^2)(1) + 1^2 = b^4 - 2b^2 + 1$$

$$8. (m^3 + 4)^2 = m^6 + 2(m^3)(4) + 4^2 = m^6 + 8m^3 + 16$$

$$9. \left(\frac{1}{4}t + 2\right)^2 = \frac{1}{16}t^2 + 2\left(\frac{1}{4}t\right)(2) + 2^2 = \frac{1}{16}t^2 + t + 4$$

$$10. (6k - 3)^2 = 36k^2 - 2(6k)(3) + 3^2 = 36k^2 - 36k + 9$$

$$11. (a^3 - 7)^2 = a^6 - 2(a^3)(7) + 49 = a^6 - 14a^3 + 49$$

$$12. (4x^2 + y^2)^2 = 16x^4 + 2(4x^2)(y^2) + y^4 = 16x^4 + 8x^2y^2 + y^4$$

$$13. (8x - 3)^2 = 64x^2 - 2(8x)(3) + 3^2 = 64x^2 - 48x + 9$$

$$14. (2x - 1)(2x + 1) = 4x^2 - 1$$

$$15. (2x - 3)(2x + 3) = 4x^2 - 9$$

$$16. (4 + 6x)(4 - 6x) = 16 - 36x^2$$

$$17. (6 + 2r)(6 - 2r) = 36 - 4r^2$$

$$18. (-2t + 7)(2t + 7) = (7 - 2t)(7 + 2t) = 49 - 4t^2$$

$$19. (8z - 8)(8z + 8) = 64z^2 - 64$$

$$20. (3x^2 + 2)(3x^2 - 2) = 9x^4 - 4$$

$$21. (x - 12)(x + 12) = x^2 - 144$$

$$22. (5a - 2b)(5a + 2b) = 25a^2 - 4b^2$$

$$23. (ab - 1)(ab + 1) = a^2b^2 - 1$$

$$24. (a - b)(a - b) = (a - b)^2 = a^2 - 2ab + b^2$$

$$25. 45 \times 55 = (50 - 5)(50 + 5) = 50^2 - 5^2 = 2500 - 25 = 2475$$

$$26. 97 \times 83 = (90 + 7)(90 - 7) = 90^2 - 7^2 = 8100 - 49 = 8051$$

$$27. 19^2 = (20 - 1)(20 - 1) = 20^2 - 2(20)(1) + 1^2 = 400 - 40 + 1 = 361$$

$$28. 56^2 = (50 + 6)(50 + 6) = 50^2 + 2(50)(6) + 6^2 = 2500 + 600 + 36 = 3136$$

$$29. 876 \times 924 = (900 - 24)(900 + 24) = 900^2 - 24^2 = 810000 - 576 = 809424$$

$$30. 1002 \times 998 = (1000 + 2)(1000 - 2) = 1000^2 - 2^2 = 1000000 - 4 = 999996$$

$$31. 36 \times 44 = (40 - 4)(40 + 4) = 40^2 - 4^2 = 1600 - 16 = 1584$$

Mixed Review

32.

$$5x(3x + 5) + 11(-7 - x)$$

$$15x^2 + 25x - 77 - 11x$$

$$15x^2 + 25x - 11x - 77$$

$$15x^2 + 14x - 77$$

33.

We don't know how many students are in the school overall, but we know the fractions for each class must add up to one:  $\frac{1}{4} + \frac{2}{5} + \frac{1}{6} + ? = 1$ . We don't know what fraction of the whole school are seniors so that is what we must find out first.

$$\frac{1}{4} + \frac{2}{5} + \frac{1}{6} + x = 1$$

$$\frac{15}{60} + \frac{24}{60} + \frac{10}{60} + x = 1$$

$$\frac{49}{60} + x = 1$$

$$x = 1 - \frac{49}{60} = \frac{60}{60} - \frac{49}{60} = \frac{11}{60}$$

$$x = \frac{11}{60}$$

We now know that the 130 seniors make up  $\frac{11}{60}$  of the school. Let's use this information to figure out what the total population of the school is.

$$\frac{11}{60} = \frac{130}{x}$$

$$11x = 7800$$

$$x \approx 709$$

There are approximately 709 students in the whole school. Now we just need to calculate what  $\frac{2}{5}$  (the percentage of sophomores) of 709 (the total number of students) is.

$$\frac{2}{5} \times 709 = \frac{1418}{5} \approx 284$$

There are approximately 284 students in the sophomore class.

34.  $12! = 479001600$

35.

$$m(\text{slope}) = \frac{y_1 - y_2}{x_1 - x_2}$$

$$m = \frac{1 - (-16)}{\frac{3}{4} - \frac{3}{4}} = \frac{1 + 16}{0} = \frac{17}{0} = \text{undefined}$$

36.

First we convert the pounds to grams by multiplying.

$$260 * 454 = 118040 \text{ grams}$$

Now we must convert grams to kilograms. 1kg = 1000 grams

$$118040/1000 = 118.04 \text{ kg}$$

The person would weigh 118.04 kilograms.

$$37. |16 - v| = 3$$

$$(16 - v) = 3 \quad -(16 - v) = 3$$

$$-v = 3 - 16 \quad -16 + v = 3$$

$$-v = -13 \quad v = 3 + 16$$

$$v = 13 \quad v = 19$$

$$v = 13, 19$$

38.

Yes this is a function, because for every x value there is only one possible y value.

Functions are defined as expressions where for each input there is only one output.

## Lesson 9.4

### Polynomial Equations in Factored Form

1. The *Zero Product Property* states that the only way for a product to be zero is for one or more of the terms being multiplied to be zero. Complex polynomials can be set equal to zero the factored, with each factor being set equal to zero, in order to solve the polynomial.

$$2. 36a^2 + 9a^3 - 6a^7 = 3a^2(12 + 3a - 2a^5)$$

$$3. 4x^3y^2 + 12x + 16y = 4(x^3y^2 + 3x + 4y)$$

$$4. 3x^3 - 21x = 3x(x^2 - 7)$$

$$5. 5x^6 + 15x^4 = 5x^4(x^2 + 3)$$

$$6. 4x^3 + 10x^2 - 2x = 2x(2x^2 + 5x - 1)$$

$$7. -10x^6 + 12x^5 - 4x^4 = 2x^4(-5x^2 + 6x - 2)$$

$$8. 12xy + 24xy^2 + 36xy^3 = 12xy(1 + 2y + 3y^2)$$

$$9. 5a^3 - 7a = a(5a^2 - 7)$$

$$10. 45y^{12} + 30y^{10} = 15y^{10}(3y^2 + 2)$$

$$11. 16xy^2z + 4x^3y = 4xy(4yz + x^2)$$

$$12. (x - 2)(x) = 2$$

The zero product property cannot be used because the equation is not set equal to zero. It is in the wrong format.

$$13. (x + 6) + (3x - 1) = 0$$

The zero product property does not apply when the two terms are being added, not multiplied.

$$14. (x^{-3})(x + 7) = 0$$

The zero product property cannot be applied because this is not a true polynomial (it has a negative exponent) and when  $x=0$  the solution will be undefined.

$$15. (x + 9) - (6x - 1) = 4$$

The zero product property does not apply when the two terms are being subtracted, not multiplied.

$$16. (x^4)\left(\frac{1}{x^2} - 1\right) = 0$$

The zero product property cannot be applied because this is not a true polynomial (it has a variable in the denominator) and when  $x=0$  the solution will be undefined.

$$17. x(x + 12) = 0$$

$$x = 0$$

$$x + 12 = 0$$

$$x = -12$$

*Check*

$$x(x + 12) = 0$$

$$0(0 + 12) = 0$$

$$0(12) = 0$$

$$0 = 0$$

$$x(x + 12) = 0$$

$$-12(-12 + 12) = 0$$

$$-12(0) = 0$$

$$0 = 0$$

$$18. (2x + 3)(5x - 4) = 0$$

$$2x + 3 = 0$$

$$2x = -3$$

$$x = -\frac{3}{2}$$

$$5x - 4 = 0$$

$$5x = 4$$

$$x = \frac{4}{5}$$

*Check*

$$(2x + 3)(5x - 4) = 0$$

$$\left(2\left(-\frac{3}{2}\right) + 3\right)\left(5\left(-\frac{3}{2}\right) - 4\right) = 0$$

$$(-3 + 3)\left(-\frac{15}{2} - 4\right) = 0$$

$$(0)\left(-\frac{7}{2}\right) = 0$$

$$0 = 0$$

$$(2x + 3)(5x - 4) = 0$$

$$\left(2\left(\frac{4}{5}\right) + 3\right)\left(5\left(\frac{4}{5}\right) - 4\right) = 0$$

$$\left(\frac{8}{5} + 3\right)(4 - 4) = 0$$

$$\left(\frac{23}{5}\right)(0) = 0$$

$$0 = 0$$

$$19. (2x + 1)(2x - 1) = 0$$

$$2x + 1 = 0$$

$$2x = -1$$

$$x = -\frac{1}{2}$$

$$2x - 1 = 0$$

$$2x = 1$$

$$x = \frac{1}{2}$$

*Check*

$$(2x + 1)(2x - 1) = 0$$

$$\left(2\left(-\frac{1}{2}\right) + 1\right)\left(2\left(-\frac{1}{2}\right) - 1\right) = 0$$

$$(-1 + 1)(-1 - 1) = 0$$

$$(0)(-2) = 0$$

$$0 = 0$$

$$(2x + 1)(2x - 1) = 0$$

$$\left(2\left(\frac{1}{2}\right) + 1\right)\left(2\left(\frac{1}{2}\right) - 1\right) = 0$$

$$(1 + 1)(1 - 1) = 0$$

$$(2)(0) = 0$$

$$0 = 0$$

20.

$$24x^2 - 4x = 0$$

$$4x(6x - 1) = 0$$

$$4x = 0$$

$$x = 0$$

$$6x - 1 = 0$$

$$6x = 1$$

$$x = \frac{1}{6}$$

*Check*

$$24x^2 - 4x = 0$$

$$24(0^2) - 4(0) = 0$$

$$24(0) - 0 = 0$$

$$0 - 0 = 0$$

$$0 = 0$$

$$24x^2 - 4x = 0$$

$$24\left(\frac{1}{6}\right)^2 - 4\left(\frac{1}{6}\right) = 0$$

$$24\left(\frac{1}{36}\right) - \frac{2}{3} = 0$$

$$\frac{2}{3} - \frac{2}{3} = 0$$

$$0 = 0$$

21.

$$60m = 45m^2$$

$$45m^2 = 60m$$

$$45m^2 - 60m = 0$$

$$15m(3m - 4) = 0$$

$$15m = 0$$

$$m = 0$$

$$3m - 4 = 0$$

$$3m = 4$$

$$m = \frac{4}{3}$$

*Check*

$$60m = 45m^2$$

$$60(0) = 45(0^2)$$

$$0 = 45(0)$$

$$0 = 0$$

$$60m = 45m^2$$

$$60\left(\frac{4}{3}\right) = 45\left(\frac{4}{3}\right)^2$$

$$80 = 45\left(\frac{16}{9}\right)$$

$$80 = 80$$

$$22. (x - 5)(2x + 7)(3x - 4) = 0$$

$$x - 5 = 0$$

$$x = 5$$

$$2x + 7 = 0$$

$$2x = -7$$

$$x = -\frac{7}{2}$$

$$3x - 4 = 0$$

$$3x = 4$$

$$x = \frac{4}{3}$$

*Check*

$$(x - 5)(2x + 7)(3x - 4) = 0$$

$$(5 - 5)(2 \cdot 5 + 7)(3 \cdot 5 - 4) = 0$$

$$(0)(3)(11) = 0$$

$$0 = 0$$

$$(x - 5)(2x + 7)(3x - 4) = 0$$

$$\left(\left(-\frac{7}{2}\right) - 5\right)\left(2 \cdot \left(-\frac{7}{2}\right) + 7\right)\left(3\left(-\frac{7}{2}\right) - 4\right) = 0$$

$$\left(-\frac{17}{2}\right)(0)\left(-\frac{29}{2}\right) = 0$$

$$0 = 0$$

$$(x - 5)(2x + 7)(3x - 4) = 0$$

$$\left(\frac{4}{3} - 5\right)\left(2\left(\frac{4}{3}\right) + 7\right)\left(3\left(\frac{4}{3}\right) - 4\right) = 0$$

$$\left(-\frac{11}{3}\right)\left(\frac{29}{3}\right)(0) = 0$$

$$0 = 0$$

$$23. 2x(x + 9)(7x - 20) = 0$$

$$2x = 0$$

$$x = 0$$

$$x + 9 = 0$$

$$x = -9$$

$$7x - 20 = 0$$

$$7x = 20$$

$$x = \frac{20}{7}$$

*Check*

$$2x(x + 9)(7x - 20) = 0$$

$$2 \cdot 0(0 + 9)(7 \cdot 0 - 20) = 0$$

$$0(9)(-20) = 0$$

$$0 = 0$$

$$2x(x + 9)(7x - 20) = 0$$

$$2 \cdot -9(-9 + 9)(7(-9) - 20) = 0$$

$$-18(0)(-83) = 0$$

$$0 = 0$$

$$2x(x + 9)(7x - 20) = 0$$

$$2 \cdot \frac{20}{7} \left( \frac{20}{7} + 9 \right) \left( 7 \cdot \frac{20}{7} - 20 \right) = 0$$

$$\frac{40}{7} \left( \frac{83}{7} \right) (0) = 0$$

$$0 = 0$$

24.

$$18y - 3y^2 = 0$$

$$3y(6 - y) = 0$$

$$3y = 0$$

$$y = 0$$

$$6 - y = 0$$

$$-y = -6$$

$$y = 6$$

*Check*

$$18y - 3y^2 = 0$$

$$18(0) - 3(0)^2 = 0$$

$$0 - 0 = 0$$

$$0 = 0$$

$$18y - 3y^2 = 0$$

$$18(6) - 3(6)^2 = 0$$

$$108 - 3(36) = 0$$

$$108 - 108 = 0$$

$$0 = 0$$

25.

$$9x^2 = 27x$$

$$9x^2 - 27x = 0$$

$$9x(x - 3) = 0$$

$$9x = 0$$

$$x = 0$$

$$x - 3 = 0$$

$$x = 3$$

*Check*

$$9x^2 = 27x$$

$$9(0)^2 = 27(0)$$

$$0 = 0$$

$$9x^2 = 27x$$

$$9(3)^2 = 27(3)$$

$$9(9) = 81$$

$$81 = 81$$

26.

$$4a^2 + a = 0$$

$$a(4a + 1) = 0$$

$$a = 0$$

$$4a + 1 = 0$$

$$4a = -1$$

$$a = -\frac{1}{4}$$

*Check*

$$4a^2 + a = 0$$

$$4(0)^2 + 0 = 0$$

$$0 + 0 = 0$$

$$0 = 0$$

$$4a^2 + a = 0$$

$$4\left(-\frac{1}{4}\right)^2 + \left(-\frac{1}{4}\right) = 0$$

$$4\left(\frac{1}{16}\right) - \frac{1}{4} = 0$$

$$\frac{1}{4} - \frac{1}{4} = 0$$

$$0 = 0$$

27.

$$b^2 - 3b = 0$$

$$b(b - 3) = 0$$

$$b = 0$$

$$b - 3 = 0$$

$$b = 3$$

*Check*

$$b^2 - 3b = 0$$

$$(0)^2 - 3(0) = 0$$

$$0 - 0 = 0$$

$$0 = 0$$

$$b^2 - 3b = 0$$

$$(3)^2 - 3(3) = 0$$

$$9 - 9 = 0$$

$$0 = 0$$

Mixed Review

28.

$$-4x + 11x^4 - 6x^7 + 1 - 3x^2$$

$$-6x^7 + 11x^4 - 3x^2 - 4x + 1$$

degree = 7

leadcoefficient = -6

29.

$$(9a^2 - 8a + 11a^3) - (3a^2 + 14a^5 - 12a) + (9 - 3a^5 - 13a)$$

$$9a^2 - 8a + 11a^3 - 3a^2 + 14a^5 + 12a + 9 - 3a^5 - 13a$$

$$-14a^5 - 3a^5 + 11a^3 + 9a^2 - 3a^2 - 8a + 12a - 13a + 9$$

$$-17a^5 + 11a^3 + 6a^2 - 17a + 9$$

$$\frac{1}{3}a^3 \times (36a^4 + 6)$$

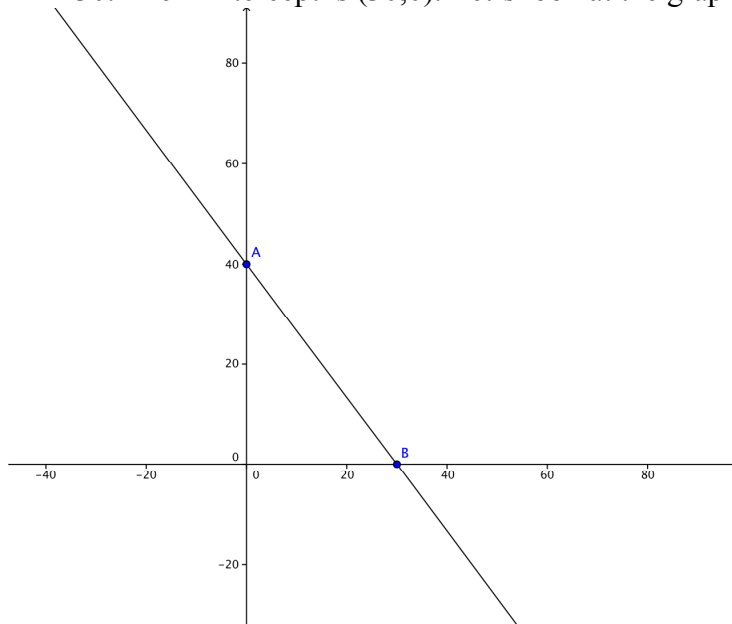
30.  $\left(\frac{1}{3} \cdot 36\right)(a^{3+4}) + \left(\frac{1}{3} \cdot 6\right)(a^{3+0})$

$$12a^7 + 2a^3$$

31.

1.  $0.4x + 0.3y = 12$

2. To find the intercepts we first make  $x=0$ :  $0.4(0)+0.3y=12$  which results in  $y=40$ . The y-intercept is  $(0,40)$ . Now we make  $y=0$ :  $0.4x+0.3(0)=12$  which results in  $x=30$ . The x-intercept is  $(30,0)$ . Let's look at the graph.



3. Three possible combinations to make this true: *Answers will vary, any point that falls along the line of the function or checks in the function is correct.*

32.

12.99 is almost 13.

13 is the same as  $10 + 3$

8 times 10 is 80

8 times 3 is 24

Add these together and get 104.

Multiply .01 times 8 by moving the decimal two places to the left = 0.08

104 minus 0.08 is the same as  $103 + 1 - 0.08 = 103 + 0.92 = 103.92$

**Lesson 9.5**  
**Factoring Quadratic Expressions**

1.  $x^2 + 10x + 9 = (x + 9)(x + 1)$

2.  $x^2 + 15x + 50 = (x + 5)(x + 10)$

3.  $x^2 + 10x + 21 = (x + 7)(x + 3)$

4.  $x^2 + 16x + 48 = (x + 4)(x + 12)$

5.  $x^2 - 11x + 24 = (x - 8)(x - 3)$

6.  $x^2 - 13x + 42 = (x - 6)(x - 7)$

7.  $x^2 - 14x + 33 = (x - 11)(x - 3)$

8.  $x^2 - 9x + 20 = (x - 4)(x - 5)$

9.  $x^2 + 5x - 14 = (x + 7)(x - 2)$

10.  $x^2 + 6x - 27 = (x + 9)(x - 3)$

11.  $x^2 + 7x - 78 = (x + 13)(x - 6)$

12.  $x^2 + 4x - 32 = (x + 8)(x - 4)$

13.  $x^2 - 12x - 45 = (x - 15)(x + 3)$

14.  $x^2 - 5x - 50 = (x - 10)(x + 5)$

15.  $x^2 - 3x - 40 = (x - 8)(x + 5)$

16.  $x^2 - x - 56 = (x - 8)(x + 7)$

17.  $-x^2 - 2x - 1 = -(x^2 + 2x + 1) = -(x + 1)(x + 1)$

18.  $-x^2 - 5x + 24 = -(x^2 + 5x - 24) = -(x + 8)(x - 3)$

$$19. -x^2 + 18x - 72 = -(x^2 - 18x + 72) = -(x - 12)(x - 6)$$

$$20. -x^2 + 25x - 150 = -(x^2 - 25x + 150) = -(x + 30)(x - 5)$$

$$21. x^2 + 21x + 108 = (x + 9)(x + 12)$$

$$22. -x^2 + 11x - 30 = -(x^2 - 11x + 30) = -(x - 6)(x - 5)$$

$$23. x^2 + 12x - 64 = (x + 16)(x - 4)$$

$$24. x^2 - 17x - 60 = (x - 20)(x + 3)$$

Mixed Review

25.

$$f(x) = \frac{1}{2}x^2 - 6x + 4$$

$$f(2) = \frac{1}{2}(2)^2 - 6(2) + 4$$

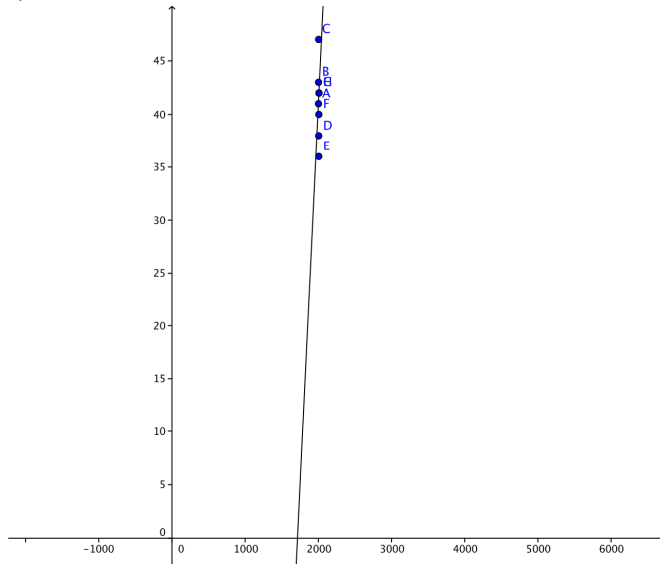
$$f(2) = \frac{1}{2}(4) - 12 + 4$$

$$f(2) = 2 - 12 + 4$$

$$f(2) = -6$$

26.

1.



2.  $x - 7y = 1715$

$$x - 7y = 1715$$

$$(2012) - 7y = 1715$$

$$-7y = 1715 - 2012$$

3.  $-7y = -297$

$$y = -297 \div -7$$

$$y = 42.4285714286$$

$$y \approx 42$$

27.  $\sqrt{405} = \sqrt{400 \cdot 5} = 20\sqrt{5}$

28.

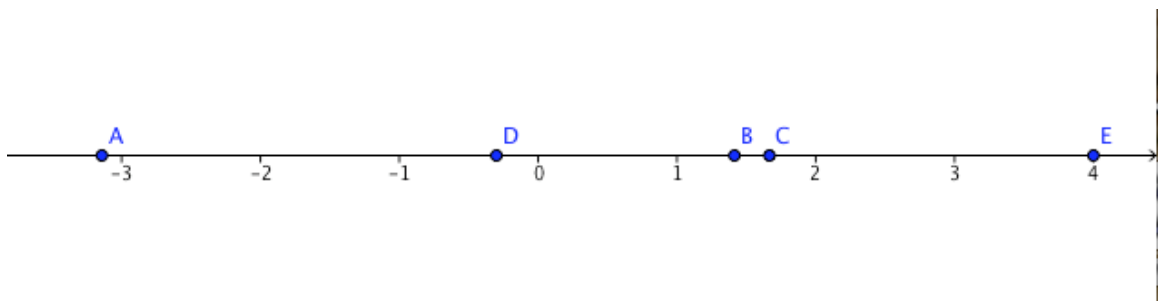
$$A = -\pi$$

$$B = \sqrt{2}$$

$$C = \frac{5}{3}$$

$$D = -\frac{3}{10}$$

$$E = \sqrt{16}$$



29. The multiplicative inverse of  $9/4$  is  $4/9$ .

Quick Quiz

1.

$$6x^2y^4z + 6x^6 - 2y^5 + 11xyz^4$$

$$6x^2y^4z + 11xyz^4 + 6x^6 - 2y^5$$

$$\text{degree} = 7$$

$$\text{leading coefficient} = 6$$

2.

$$(a^2b^2c + 11abc^5) + (4abc^5 - 3a^2b^2c + 9abc)$$

$$a^2b^2c + 11abc^5 + 4abc^5 - 3a^2b^2c + 9abc$$

$$(11abc^5 + 4abc^5) + (a^2b^2c - 3a^2b^2c) + 9abc$$

$$15abc^5 - 2a^2b^2c + 9abc$$

3.

$$\text{Volume} = lwh$$

$$l = (a + 2)$$

$$w = (a + 4)$$

$$h = (3a)$$

$$V = (a + 2)(a + 4)(3a)$$

$$V = (a^2 + 4a + 2a + 8)(3a)$$

$$V = (a^2 + 6a + 8)(3a)$$

$$V = 3a^3 + 18a^2 + 24a$$

4.  $-3hjk^3(h^2j^4k + 6hk^2) = -3h^3j^5k^4 - 18h^2jk^5$

5.

$$(x - 3)(x + 4)(2x - 1) = 0$$

$$x - 3 = 0$$

$$x = 3$$

$$x + 4 = 0$$

$$x = -4$$

$$2x - 1 = 0$$

$$2x = 1$$

$$x = \frac{1}{2}$$

*Check*

$$(x - 3)(x + 4)(2x - 1) = 0$$

$$(3 - 3)(3 + 4)(2(3) - 1) = 0$$

$$(0)(7)(5) = 0$$

$$0 = 0$$

$$(x - 3)(x + 4)(2x - 1) = 0$$

$$(-4 - 3)(-4 + 4)(2(-4) - 1) = 0$$

$$(-7)(0)(-9) = 0$$

$$0 = 0$$

$$(x - 3)(x + 4)(2x - 1) = 0$$

$$\left(\frac{1}{2} - 3\right)\left(\frac{1}{2} + 4\right)\left(2\left(\frac{1}{2}\right) - 1\right) = 0$$

$$\left(-2\frac{1}{2}\right)\left(4\frac{1}{2}\right)(0) = 0$$

$$0 = 0$$

$$6. (a - 9b)(a + 9b) = a^2 - 81b^2$$

**Lesson 9.6****Factoring Special Products**

1.  $x^2 + 8x + 16 = (x + 4)^2$

2.  $x^2 - 18x + 81 = (x - 9)^2$

3.  $-x^2 + 24x - 144 = -(x^2 - 24x + 144) = -(x - 12)^2$

4.  $x^2 + 14x + 49 = (x + 7)^2$

5.  $4x^2 - 4x + 1 = (2x - 1)^2$

6.  $25x^2 + 60x + 36 = (5x + 6)^2$

7.  $4x^2 - 12xy + 9y^2 = (2x - 3y)^2$

8.  $x^4 + 22x^2 + 121 = (x^2 + 11)^2$

9.  $x^2 - 4 = (x + 2)(x - 2)$

10.  $x^2 - 36 = (x + 6)(x - 6)$

11.  $-x^2 + 100 = 100 - x^2 = (10 + x)(10 - x)$

12.  $x^2 - 400 = (x + 20)(x - 20)$

13.  $9x^2 - 4 = (3x + 2)(3x - 2)$

14.  $25x^2 - 49 = (5x + 7)(5x - 7)$

15.  $-36x^2 + 25 = 25 - 36x^2 = (5 + 6x)(5 - 6x)$

16.  $16x^2 - 81y^2 = (4x + 9y)(4x - 9y)$

17.

$$x^2 - 11x + 30 = 0$$

$$(x - 6)(x - 5) = 0$$

$$x - 6 = 0$$

$$x = 6$$

$$x - 5 = 0$$

$$x = 5$$

*Check*

$$x^2 - 11x + 30 = 0$$

$$(6)^2 - 11(6) + 30 = 0$$

$$36 - 66 + 30 = 0$$

$$-30 + 30 = 0$$

$$0 = 0$$

$$x^2 - 11x + 30 = 0$$

$$(5)^2 - 11(5) + 30 =$$

$$25 - 55 + 30 = 0$$

$$-30 + 30 = 0$$

$$0 = 0$$

18.

$$x^2 + 4x = 21$$

$$x^2 + 4x - 21 = 0$$

$$(x + 7)(x - 3) = 0$$

$$x + 7 = 0$$

$$x = -7$$

$$x - 3 = 0$$

$$x = 3$$

*Check*

$$x^2 + 4x = 21$$

$$(-7)^2 + 4(-7) = 21$$

$$49 - 28 = 21$$

$$21 = 21$$

$$x^2 + 4x = 21$$

$$(3)^2 + 4(3) = 21$$

$$9 + 12 = 21$$

$$21 = 21$$

19.

$$x^2 + 49 = 14x$$

$$x^2 - 14x + 49 = 0$$

$$(x - 7)^2 = 0$$

$$x - 7 = 0$$

$$x = 7$$

*Check*

$$x^2 + 49 = 14x$$

$$(7)^2 + 49 = 14(7)$$

$$49 + 49 = 98$$

$$98 = 98$$

20.

$$x^2 - 64 = 0$$

$$(x + 8)(x - 8) = 0$$

$$x + 8 = 0$$

$$x = -8$$

$$x - 8 = 0$$

$$x = 8$$

*Check*

$$x^2 - 64 = 0$$

$$(-8)^2 - 64 = 0$$

$$64 - 64 = 0$$

$$0 = 0$$

$$x^2 - 64 = 0$$

$$(-8)^2 - 64 = 0$$

$$64 - 64 = 0$$

$$0 = 0$$

21.

$$x^2 - 24x + 144 = 0$$

$$(x - 12)^2 = 0$$

$$x - 12 = 0$$

$$x = 12$$

*Check*

$$x^2 - 24x + 144 = 0$$

$$(12)^2 - 24(12) + 144 = 0$$

$$144 - 288 + 144 = 0$$

$$-144 + 144 = 0$$

$$0 = 0$$

22.

$$4x^2 - 25 = 0$$

$$(2x + 5)(2x - 5) = 0$$

$$2x + 5 = 0$$

$$2x = -5$$

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

$$2x - 5 = 0$$

$$2x = 5$$

$$x = \frac{5}{2}$$

*Check*

$$4x^2 - 25 = 0$$

$$4\left(-\frac{5}{2}\right)^2 - 25 = 0$$

$$25 - 25 = 0$$

$$0 = 0$$

$$4x^2 - 25 = 0$$

$$4\left(\frac{5}{2}\right)^2 - 25 = 0$$

$$25 - 25 = 0$$

$$0 = 0$$

23.

$$x^2 + 26x = -169$$

$$x^2 + 26x + 169 = 0$$

$$(x + 13)^2 = 0$$

$$x + 13 = 0$$

$$x = -13$$

*Check*

$$x^2 + 26x = -169$$

$$(-13)^2 + 26(-13) = -169$$

$$169 - 338 = -169$$

$$-169 = -169$$

24.

$$-x^2 - 16x - 60 = 0$$

$$-(x^2 + 16x + 60) = 0$$

$$-(x + 6)(x + 10) = 0$$

$$-x - 6 = 0$$

$$-x = 6$$

$$x = -6$$

$$-x - 10 = 0$$

$$-x = 10$$

$$x = -10$$

*Check*

$$-x^2 - 16x - 60 = 0$$

$$-(-6)^2 - 16(-6) - 60 = 0$$

$$-36 + 96 - 60 = 0$$

$$-96 + 96 = 0$$

$$0 = 0$$

$$-x^2 - 16x - 60 = 0$$

$$-(-10)^2 - 16(-10) - 60 = 0$$

$$-100 + 160 - 60 = 0$$

$$60 - 60 = 0$$

$$0 = 0$$

Mixed Review

$$25. \begin{cases} 3x + 7y = 1 \\ kx - 14y = -2 \end{cases}$$

To make this system have an infinite number of solutions they must have the same slope and y-intercept. Let's change both equations to slope-intercept form ( $y=mx+b$ ).

$$\begin{array}{l} 3x + 7y = 1 \\ 7y = 3x + 1 \\ y = \frac{3}{7}x + \frac{1}{7} \end{array} \qquad \begin{array}{l} kx - 14y = -2 \\ -14y = kx - 2 \\ y = \left(\frac{k}{-14}\right)x + \frac{2}{14} \\ y = \left(\frac{k}{-14}\right)x + \frac{1}{7} \end{array}$$

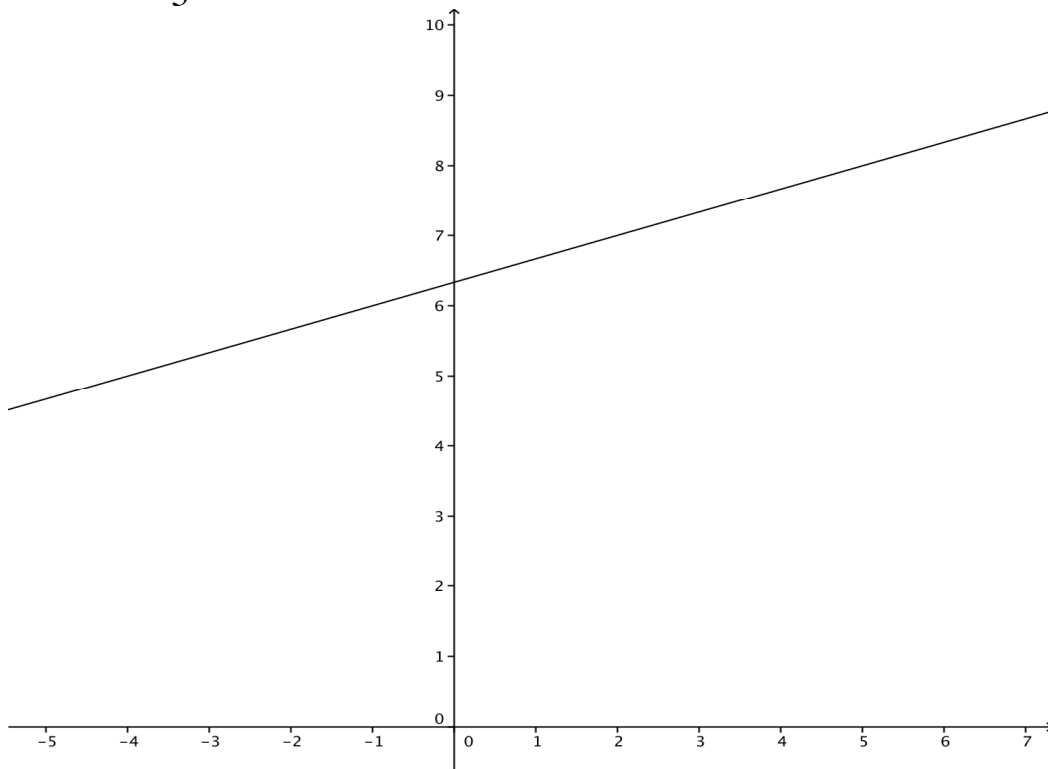
Now that they are both in slope-intercept form, we can see that they already have the same y-intercept. We need to make the slopes equal.

$$\begin{aligned} \frac{k}{-14} &= \frac{3}{7} \\ 7k &= -42 \\ k &= -6 \end{aligned}$$

When  $k = -6$ , then the system will have an infinite number of solutions.

$$26. \\ 2 * 3 * 4 = 24 \text{ possible combinations}$$

$$27. y - 5 = \frac{1}{3}(x + 4)$$



$$y - 5 = \frac{1}{3}(x + 4)$$

$$y - 5 = \frac{1}{3}x + \frac{4}{3}$$

$$y = \frac{1}{3}x + \frac{4}{3} + 5$$

$$y = \frac{1}{3}x + 6\frac{1}{3}$$

The slope is  $\frac{1}{3}$ .

28.

1.

$$y = a(b)^x$$

$$a = 600$$

$$b = 100\% + 8\% = 1.08$$

$$y = 600(1.08)^x$$

2.

$$y = 600(1.08)^x$$

$$y = 600(1.08)^6$$

$$y = 600(1.58687432294)$$

$$y = 952.124593766$$

$$y \approx \$952.13$$

29.

$$4\frac{8}{9} \div -3\frac{1}{5}$$

$$\frac{44}{9} \div -\frac{16}{5}$$

$$\frac{44}{9} \times -\frac{5}{16} = -\frac{55}{36} = -1\frac{19}{36}$$

30. Any number that is negative and divisible by 2 would be a correct answer.

## Lesson 9.7

### Factoring Polynomials Completely

1.

$$2x^2 + 16x + 30$$

$$2(x^2 + 8x + 15)$$

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

2.

$$12c^2 - 75$$

$$3(4c^2 - 25)$$

$$3(2cx - 5)(2c + 5)$$

3.

$$-x^3 + 17x^2 - 70x$$

$$-x(x^2 - 17x + 70)$$

$$-x(x - 10)(x - 7)$$

4.

$$6x^2 - 600$$

$$6(x^2 - 100)$$

$$6(x + 10)(x - 10)$$

5.

$$-5t^2 - 20t - 20$$

$$-5(t^2 + 4t + 4)$$

$$-5(t+2)(t+2)$$

6.

$$6x^2 + 18x - 24$$

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

$$6(x+4)(x-1)$$

7.

$$-n^2 + 10n - 21$$

$$-(n^2 - 10n + 21)$$

$$-(n-7)(n-3)$$

8.

$$2a^2 - 14a - 16$$

$$2(a^2 - 7a - 8)$$

$$2(a-8)(a+1)$$

9.

$$2x^2 - 512$$

$$2(x^2 - 256)$$

$$2(x + 16)(x - 16)$$

10.

$$12x^3 + 12x^2 + 3x$$

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

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

11.

$$6x^2 - 9x + 10x - 15$$

$$(6x^2 - 9x) + (10x - 15)$$

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

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

12.

$$5x^2 - 35x + x - 7$$

$$(5x^2 - 35x) + (x - 7)$$

$$5x(x - 7) + (x - 7)$$

$$(5x + 1)(x - 7)$$

13.

$$9x^2 - 9x - x + 1$$

$$(9x^2 - 9x) + (-x + 1)$$

$$9x(x - 1) - (x - 1)$$

$$(9x - 1)(x - 1)$$

14.

$$4x^2 + 32x - 5x - 40$$

$$(4x^2 + 32x) + (-5x - 40)$$

$$4x(x + 8) - 5(x + 8)$$

$$(4x - 5)(x + 8)$$

15.

$$12x^3 - 14x^2 + 42x - 49$$

$$(12x^3 - 14x^2) + (42x - 49)$$

$$2x^2(6x - 7) + 7(6x - 7)$$

$$(2x^2 + 7)(6x - 7)$$

16.

$$4x^2 + 25x - 21$$

$$4x^2 + 28x - 3x - 21$$

$$(4x^2 + 28x) + (-3x - 21)$$

$$4x(x + 7) - 3(x + 7)$$

$$(4x - 3)(x + 7)$$

17.

$$24b^3 + 32b^2 - 3b - 4$$

$$(24b^3 + 32b^2) + (-3b - 4)$$

$$8b^2(3b + 4) - (3b + 4)$$

$$(8b^2 - 1)(3b + 4)$$

18.

$$2m^3 + 3m^2 + 4m + 6$$

$$(2m^3 + 3m^2) + (4m + 6)$$

$$m^2(2m + 3) + 2(2m + 3)$$

$$(m^2 + 2)(2m + 3)$$

19.

$$6x^2 + 7x + 1$$

$$6x^2 + 6x + x + 1$$

$$(6x^2 + 6x) + (x + 1)$$

$$6x(x + 1) + (x + 1)$$

$$(6x + 1)(x + 1)$$

20.

$$4x^2 + 8x - 5$$

$$4x^2 + 10x - 2x - 5$$

$$(4x^2 + 10x) + (-2x - 5)$$

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

$$(2x - 1)(2x + 5)$$

21.

$$5a^3 - 5a^2 + 7a - 7$$

$$(5a^3 - 5a^2) + (7a - 7)$$

$$5a^2(a - 1) + 7(a - 1)$$

$$(5a^2 + 7)(a - 1)$$

22.

$$3x^2 + 16x + 21$$

$$3x^2 + 9x + 7x + 21$$

$$(3x^2 + 9x) + (7x + 21)$$

$$3x(x + 3) + 7(x + 3)$$

$$(3x + 7)(x + 3)$$

23.

$$4xy + 32x + 20y + 160$$

$$(4xy + 32x) + (20y + 160)$$

$$4x(y + 8) + 20(y + 8)$$

$$(4x + 20)(y + 8)$$

$$(4(x + 5))(y + 8)$$

24.

$$10ab + 40a + 6b + 24$$

$$2(5ab + 20a + 3b + 12)$$

$$2(5ab + 20a) + (3b + 12)$$

$$2 \cdot 5a(b + 4) + 3(b + 4)$$

$$2(5a + 3)(b + 4)$$

25.

$$9mn + 12m + 3n + 4$$

$$(9mn + 12m) + (3n + 4)$$

$$3m(3n + 4) + (3n + 4)$$

$$(3m + 1)(3n + 4)$$

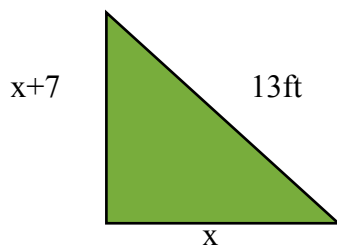
26.

$$\begin{aligned} &4jk - 8j^2 + 5k - 10j \\ &(4jk - 8j^2) + (5k - 10j) \\ &4j(k - 2j) + 5(k - 2j) \\ &(4j + 5)(k - 2j) \end{aligned}$$

27.

$$\begin{aligned} &24ab + 64a - 21b - 56 \\ &(24ab + 64a) + (-21b - 56) \\ &8a(3b + 8) - 7(3b + 8) \\ &(8a - 7)(3b + 8) \end{aligned}$$

28.



We can use the Pythagorean theorem ( $a^2 + b^2 = c^2$  where  $c$  is the hypotenuse) to figure out the value of  $x$  and the length of the sides.

$$a^2 + b^2 = c^2$$

$$x^2 + (x + 7)^2 = 13^2$$

$$x^2 + x^2 + 14x + 49 = 169$$

$$2x^2 + 14x + 49 = 169$$

$$2x^2 + 14x + 49 - 169 = 0$$

$$2x^2 + 14x - 120 = 0$$

$$2(x^2 + 7x - 60) = 0$$

$$2 \cdot (x + 12)(x - 5) = 0$$

$$2(x + 12) = 0$$

$$2x + 24 = 0$$

$$2x = -24$$

$$~~x = -12~~$$

$$2(x - 5) = 0$$

$$2x - 10 = 0$$

$$2x = 10$$

$$x = 5$$

$$x = 5$$

$$x + 7 = 12$$

$$a^2 + b^2 = c^2$$

Check:  $5^2 + 12^2 = 13^2$   
 $25 + 144 = 169$   
 $169 = 169$

The length of the three sides are 5ft, 12ft, and 13 ft.

29.

$$A = l(w)$$

$$l = x + 2$$

$$w = x - 1$$

$$A = 108$$

$$(x + 2)(x - 1) = 108$$

$$x^2 - x + 2x - 2 - 108 = 0$$

$$x^2 + x - 110 = 0$$

$$(x + 11)(x - 10) = 0$$

$$x + 11 = 0$$

$$~~x = -11~~$$

$$x - 10 = 0$$

$$x = 10$$

Check:

$$(x + 2)(x - 1) = 108$$

$$(10 + 2)(10 - 1) = 108$$

$$(12)(9) = 108$$

$$108 = 108$$

When  $x=5$  then the Area of the triangle is 108.

30.

$$x(x + 7) = 120$$

$$x^2 + 7x - 120 = 0$$

$$(x + 15)(x - 8) = 0$$

$$x + 15 = 0$$

$$~~x = -15~~$$

$$x - 8 = 0$$

$$x = 8$$

The two numbers are 8 and 15.

31. We need to find the maximum size picture to frame for \$20.

Let the side of the picture be  $x$  ft.

We know that the total cost will be:

Total cost = cost of glass + cost of frame

Cost of glass = \$1 per sq ft.

Cost of frame = \$2 per ft.

$$\text{glass} = 1 \cdot \text{area} = 1 \cdot x \cdot x = x^2$$

$$\text{frame} = 2 \cdot \text{perimeter} = 2 \cdot 4x = 8x$$

$$\text{Cost} = x^2 + 8x$$

Now we will find the length of the side  $x$  if the cost is 20 dollars.

$$x^2 + 8x = \$20$$

$$x^2 + 8x - 20 = 0$$

$$(x + 10)(x - 2) = 0$$

$$x + 10 = 0$$

$$~~x = -10~~$$

$$x - 2 = 0$$

$$x = 2$$

A picture with the dimensions 2 ft x 2 ft will cost 20 dollars to frame.

32.

1) The area of a square is equal to length times width. Since the length and width of a square are equal then Area of a square is equal to the side squared. If  $s$  equals the side then  $A(s) = s^2$ .

2) Given  $s = 1.5$

$$A(s) = s^2$$

$$A(1.5) = (1.5)^2$$

$$A(1.5) = 2.25$$

The area is 2.25 sq ft.

33.

$$SA = 2\pi r^2 + 2\pi rh$$

$$r = 2$$

$$h = 5.5$$

$$SA = 2(3.14)(2^2) + 2(3.14)(2)(5.5)$$

$$SA = (6.28)(4) + (6.28)(2)(5.5)$$

$$SA = (25.12) + (12.56)(5.5)$$

$$SA = 25.12 + 69.08$$

$$SA = 94.2$$

The surface area of the soup can is 94.2 inches.

34.

$$25g^2 - 36$$

$$(5g + 6)(5g - 6)$$

$$(5g + 6)(5g - 6) = 0$$

$$5g + 6 = 0$$

$$5g = -6$$

$$g = -\frac{6}{5} = -1\frac{1}{5}$$

$$5g - 6 = 0$$

$$5g = 6$$

$$g = \frac{6}{5} = 1\frac{1}{5}$$

35.

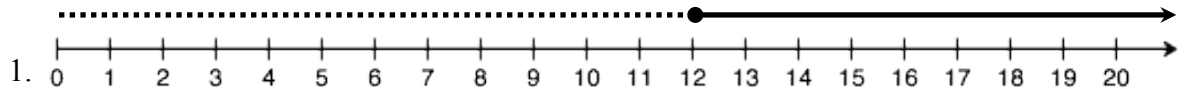
$$343r^3t = 7t(49r^3)$$

$$21t^4 = 7t(3t^3)$$

$$63rt^5 = 7t(9rt^4)$$

The greatest common factor is  $7t$ .

36. Since discounts start with groups more than 12 people, a discount will be given to groups that have 13 or more people in them.



2. The domain of the problem is the set of natural numbers. Since there cannot be negative amount of people in a group and there has to be at least one person, the domain is  $\{1,2,3,4,5,\dots\}$ . When people are a part of the solution, fractions or decimals are not considered. You wouldn't consider a group with 15.5 people in it.

3. The church group with exactly 12 members will not get a discount. The problem specifically states groups with more than 12 people.

## Lesson 9.8

### Probability of Compound Events

1. *Independent events* are occurrences where the outcome of the second event is not affected by the outcome of the first event.

2. Independent

3. Dependent

4. Independent

5. Independent

6.

$$P(A \cap B) = P(A) \times P(B)$$

$$P(A) = \frac{1}{6}$$

$$P(B) = \frac{1}{6}$$

$$P(A \cap B) = \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$$

(events are Independent)

7. *Mutually exclusive* is when two events cannot happen at the same time.

8. mutually exclusive

9. mutually inclusive

10. mutually inclusive

11. mutually exclusive

12. mutually inclusive

13. mutually exclusive

14.

(a) P(heart or club)

In terms of the formula  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$P(\text{heart or club}) = P(\text{heart}) + P(\text{club}) - P(\text{heart and club})$

$$13 \cdot \frac{12}{52} \cdot \frac{1}{51} + 13 \cdot \frac{12}{52} \cdot \frac{1}{51} - 0 = \frac{2}{17}$$

(b) P(heart and club)

In terms of the formula  $P(A \text{ and } B) = P(A) \cdot P(B)$

$P(\text{heart and club}) = P(\text{heart}) \cdot P(\text{club})$

$$(13 \cdot \frac{12}{52} \cdot \frac{1}{51}) \cdot (13 \cdot \frac{12}{52} \cdot \frac{1}{51}) = \frac{1}{289}$$

(c) P(red or heart)

In terms of the formula  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$P(\text{red or heart}) = P(\text{red}) + P(\text{heart}) - P(\text{red and heart})$

$$26 \cdot \frac{25}{52} \cdot \frac{1}{51} + 13 \cdot \frac{12}{52} \cdot \frac{1}{51} - 13 \cdot \frac{12}{52} \cdot \frac{1}{51} = \frac{26 \cdot 25}{52 \cdot 51} = \frac{25}{102}$$

(d) P(jack or heart)

In terms of the formula  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$P(\text{jack or heart}) = P(\text{jack}) + P(\text{heart}) - P(\text{jack and heart})$

$$4 \cdot \frac{3}{52} \cdot \frac{1}{51} + 13 \cdot \frac{12}{52} \cdot \frac{1}{51} - 1 \cdot \frac{0}{52} \cdot \frac{1}{51} = \frac{14}{221}$$

(e) P(red or ten)

In terms of the formula  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$P(\text{red or ten}) = P(\text{red}) + P(\text{ten}) - P(\text{red and ten})$

$$26 \cdot \frac{25}{52} \cdot \frac{1}{51} + 4 \cdot \frac{3}{52} \cdot \frac{1}{51} - 2 \cdot \frac{1}{52} \cdot \frac{1}{51} = \frac{55}{221}$$

(f) P(red queen or black jack)

In terms of the formula  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$P(\text{red queen or black jack}) = P(\text{red queen}) + P(\text{black jack}) - P(\text{red queen and black jack})$

$$2 \cdot \frac{1}{52} \cdot \frac{1}{51} + 2 \cdot \frac{1}{52} \cdot \frac{1}{51} - 0 = \frac{1}{663}$$

15.

$$P(A) = \frac{5}{13}$$

$$P(B) = \frac{8}{12} = \frac{2}{3}$$

$$P(A \cap B) = \frac{5}{13} \cdot \frac{2}{3} = \frac{10}{39}$$

$$16. P = \frac{5}{15} \cdot \frac{4}{14} \cdot \frac{6}{13} \cdot \frac{4}{12} \cdot \frac{3}{11} = \frac{1440}{360360} = \frac{4}{1001}$$

17. Common sense tells us that there are 2 cards in the deck that are both black and 7, therefore the probability is  $2/52$  or  $1/26$ . We can also find the answer using the formula.

$$P(A \cap B) = P(A) \cdot P(B)$$

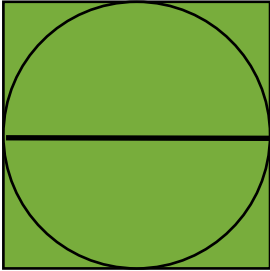
$$P(A) = P(\text{black}) = \frac{26}{52}$$

$$P(B) = P(7) = \frac{4}{52}$$

$$P(A \cap B) = \frac{26}{52} \cdot \frac{4}{52} = \frac{2}{52} = \frac{1}{26}$$

Mixed Review

18.



Area of a square =  $s^2$

Area of a circle =  $\pi r^2$

$$A(\text{square}) = 16^2 = 256$$

$$A(\text{circle}) = \pi \cdot 8^2 = (3.14)(64) = 200.96$$

$$\text{Difference} = 256 - 200.96 = 55.04$$

$$\frac{55.04}{256} = \frac{x}{100}$$

$$5504 = 256x$$

$$x = 21.5$$

The probability of hitting the area inside the square but outside the circle is 55.04 out of 256, or 21.5 %.

19.  $7 - 14x^4 + 7xy^5 - 1x^{-1} = 8x^2y^3$  is not a polynomial because it has a negative exponent and is not set equal to zero.

$$72b^5m^3w^9 - 6(bm)^2w^6$$

20.  $72b^5m^3w^9 - 6b^2m^2w^6$

$$6b^2m^2w^6(12b^3mw^3 - 1)$$

$$2^5 - 7^3a^3b^7 + 3^5a^3b^7 - 2^3$$

21.  $32 - 343a^3b^7 + 243a^3b^7 - 8$

$$24 - 100a^3b^7$$

22.

$$y = a(b)^x$$

1.  $y = 100(1 - 0.125)^w$

$$y = 100(0.875)^w$$

$$y = 100(0.875)^{11}$$

2.  $y = 100(.23019)$  There will be 23% left after 11 washes

$$y = 23$$

3. In order to figure out when the shirt has 75% left, we must make a table of values.

<b>w</b>	<b><math>100(0.875)^w</math></b>	<b>y</b>
2	$100(0.875)^2 = 100 * 0.765625$ $= 76.5625$	$76.5625 = 77$
3	$100(0.875)^3 = 100 * 0.669921$ $875 = 66.9921875$	$66.99 = 67$

We can already see that the answer will be between 2 and 3. Let's make another table.

<b>w</b>	<b><math>100(0.875)^w</math></b>	<b>y</b>
2.1	$100(0.875)^{2.1} = 100 * 0.75554$ $69457836 = 75.5546945$	$75.554 = 76$
2.2	$100(0.875)^{2.2} = 100 * 0.74544$ $8622658 = 74.5448622658$	$74.544 = 75$

This gives us the answer as approximately equal to 2.2. The exact answer is between 2.1 and 2.2.

23.

$$\frac{(100 \div 4 \times 2 - 49)^2}{9 - 2 \times 3 + 2^2}$$

$$\frac{(25 \times 2 - 49)^2}{9 - 2 \times 3 + 2^2}$$

$$\frac{(50 - 49)^2}{9 - 2 \times 3 + 2^2}$$

$$\frac{1^2}{9 - 2 \times 3 + 2^2}$$

$$\frac{1}{9 - 2 \times 3 + 2^2}$$

$$\frac{1}{9 - 2 \times 3 + 4}$$

$$\frac{1}{9 - 6 + 4}$$

$$\frac{1}{3 + 4}$$

$$\frac{1}{7}$$

## Lesson 9.9

### Chapter 9 Review

1. A *Polynomial* is an expression made with constants, variables and positive integer exponents of the variables.
2. A *Monomial* is a polynomial with only one term.
3. A *Trinomial* is a polynomial with three terms.
4. A *Binomial* is a polynomial with two terms.
5. A *Coefficient* is the number that appears before the variable(s) in each term of a polynomial.
6. *Independent Events* are occurrences in which the outcome of the first event does not effect the outcome of the events that follow.
7. *Factors* are terms that are multiplied to create a product.
8. *Factoring* is the process by which one breaks down an expression into its factors or multipliers.

9. The *Greatest Common Factor* is the largest number or term by which a group of terms can all be evenly divided.

10. A *Constant* is a number in a polynomial that is not followed by a variable.

12. *Dependent events* are occurrences where the outcome of the first event effects the outcome of the events that follow.

13.

$$x^5 - 3x^3 + 4x^2 - 5x + 7$$

*coefficients* : 1, -3, 4, -5

*constant* : 7

*degrees* : 5(3,2,1)

14.

$$x^4 - 3x^3y^2 + 8x - 12$$

*coefficients* : 1, -3, 8

*constant* : -12

*degrees* : 5(4,1)

15.  $-4b + 4 + b^2 = b^2 - 4b + 4$

16.  $3x^2 + 5x^4 - 2x + 9 = 5x^4 + 3x^2 - 2x + 9$

17.

$$(x^2 - 2xy + y^2) + (2y^2 - 4x^2) + (10xy + y^3)$$

$$x^2 - 2xy + y^2 + 2y^2 - 4x^2 + 10xy + y^3$$

$$(x^2 - 4x^2) + (-2xy + 10xy) + (y^2 + 2y^2) + y^3$$

$$-3x^2 + 8xy + 3y^2 + y^3$$

$$y^3 + 3y^2 - 3x^2 + 8xy$$

18.

$$\begin{aligned} & (4x^2 + 5x - 9) - (x^3 - 3x^2 + 8x + 12) \\ & 4x^2 + 5x - 9 - x^3 + 3x^2 - 8x - 12 \\ & (4x^2 + 3x^2) + (5x - 8x) + (-9 - 12) - x^3 \\ & 7x^2 - 3x - 21 - x^3 \\ & -x^3 + 7x^2 - 3x - 21 \end{aligned}$$

19.

$$\begin{aligned} & (2x^3 + 3x^2y + 2y) + (x^3 - 2x^2y + 3y) \\ & 2x^3 + 3x^2y + 2y + x^3 - 2x^2y + 3y \\ & (2x^3 + x^3) + (3x^2y - 2x^2y) + (2y + 3y) \\ & 3x^3 + x^2y + 5y \end{aligned}$$

$$20. (-3y^4)(2y^2) = -6y^{4+2} = -6y^6$$

21.

$$\begin{aligned} & -7a^2bc^3(5a^2 - 3b^2 - 9c^2) \\ & -35a^{2+2}bc^3 + 21a^2b^{2+1}c^3 + 63a^2bc^{3+2} \\ & -35a^4bc^3 + 21a^2b^3c^3 + 63a^2bc^5 \end{aligned}$$

22.

$$\begin{aligned} & -7y(4y^2 - 2y + 1) \\ & -28y^{1+2} + 14y^{1+1} - 7y \\ & -28y^3 + 14y^2 - 7y \end{aligned}$$

23.

$$\begin{aligned} & (3x^2 + 2x - 5)(2x - 3) \\ & (3x^2 \cdot 2x) + (3x^2 \cdot -3) + (2x \cdot 2x) + (2x \cdot -3) + (-5 \cdot 2x) + (-5 \cdot -3) \\ & 6x^3 - 9x^2 + 4x^2 - 6x - 10x + 15 \\ & 6x^3 - 5x^2 - 16x + 15 \end{aligned}$$

24.

$$\begin{aligned} & (x^2 - 9)(4x^4 + 5x^2 - 2) \\ & (x^2 \cdot 4x^4) + (x^2 \cdot 5x^2) + (x^2 \cdot -2) + (-9 \cdot 4x^4) + (-9 \cdot 5x^2) + (-9 \cdot -2) \\ & 4x^6 + 5x^4 - 2x^2 - 36x^4 - 45x^2 + 18 \\ & 4x^6 - 31x^4 - 47x^2 + 18 \end{aligned}$$

$$\begin{aligned} 25. & (2x^3 + 7)(2x^3 - 7) \\ & 4x^6 - 49 \end{aligned}$$

(The factors tell us that the answer will be the difference of two squares, so we can eliminate the middle terms.)

26.

$$\begin{aligned} & (x^2 + 4)^2 = (x^2 + 4)(x^2 + 4) \\ & x^4 + 4x^2 + 4x^2 + 16 \\ & x^4 + 8x^2 + 16 \end{aligned}$$

27.

$$\begin{aligned} & (5x - 2y)^2 = (5x - 2y)(5x - 2y) \\ & 25x^2 - 10xy - 10xy - 4y^2 \\ & 25x^2 - 20xy - 4y^2 \end{aligned}$$

28.

$$(13x^2 + 2y)^2 = (13x^2 + 2y)(13x^2 + 2y)$$

$$169x^4 + 26x^2y + 26x^2y + 4y^2$$

$$169x^4 + 52x^2y + 4y^2$$

29.

$$4x(x + 6)(4x - 9) = 0$$

$$4x = 0$$

$$x = 0$$

$$x + 6 = 0$$

$$x = -6$$

$$4x - 9 = 0$$

$$4x = 9$$

$$x = \frac{9}{4} = 2\frac{1}{4}$$

$$x = 0, -6, 2\frac{1}{4}$$

30.

$$x(5x - 4) = 0$$

$$x = 0$$

$$5x - 4 = 0$$

$$5x = 4$$

$$x = \frac{4}{5}$$

$$x = 0, \frac{4}{5}$$

$$31. -12n + 28n + 4 = 4(-3n + 7n + 1)$$

$$32. 45x^{10} + 45x^7 + 18x^4 = 9x^4(5x^6 + 5x^3 + 2)$$

$$33. -16y^5 - 8y^5x^2 + 40y^6x^3 = -8y^5(2 + x^2 - 5yx^3)$$

$$34. 15u^4 - 10u^6 - 10u^3v = 5u^3(3u - 2u^3 - 2v)$$

$$35. -6a^9 + 20a^4b + 10a^3 = -2a^3(3a^6 - 10ab - 5)$$

$$36. 12x + 27y^2 - 27x^6 = 3(4x + 9y^2 - 9x^6)$$

$$37. (x^2 - 100) = (x + 10)(x - 10)$$

$$38. (x^2 - 1) = (x + 1)(x - 1)$$

$$39. (16x^2 - 25) = (4x + 5)(4x - 5)$$

$$40. (4x^2 - 81) = (2x + 9)(2x - 9)$$

$$41. (5n^2 + 25n) = 5n(n + 5)$$

42.

$$7r^2 + 37r + 36$$

$$7r^2 + 28r + 9r + 36$$

$$(7r^2 + 28r) + (9r + 36)$$

$$7r(r + 4) + 9(r + 4)$$

$$(7r + 9)(r + 4)$$

$$43. \begin{array}{l} 4v^2 + 36v \\ 4v(v + 9) \end{array}$$

44.

$$336xy - 288x^2 + 294y - 252x$$

$$6(56xy - 48x^2 + 49y - 42x)$$

$$6 \cdot (56xy - 48x^2) + (49y - 42x)$$

$$6 \cdot 8x(7y - 6x) + 7(7y - 6x)$$

$$6(8x + 7)(7y - 6x)$$

45.

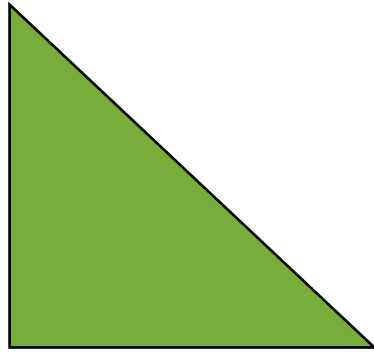
$$10xy - 25x + 8y - 20$$

$$(10xy - 25x) + (8y - 20)$$

$$5x(2y - 5) + 4(2y - 5)$$

$$(5x + 4)(2y - 5)$$

46.



$$a^2 + b^2 = c^2$$

$$x^2 + (x + 3)^2 = 15^2$$

$$x^2 + x^2 + 3x + 3x + 9 - 225 = 0$$

$$2x^2 + 6x - 216 = 0$$

$$2(x^2 + 3x - 108) = 0$$

$$2(x + 12)(x - 9) = 0$$

$$2 \neq 0$$

$$x + 12 = 0$$

$$\cancel{x = -12}$$

$$x - 9 = 0$$

$$x = 9$$

$$x + 3 = 12$$

The three sides of the triangle are 9, 12, and 15 feet.

47.



$$A = l \cdot w$$

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

$$48 = (x + 5)(x - 3)$$

$$48 = x^2 - 3x + 5x - 15$$

$$x^2 + 2x - 15 - 48 = 0$$

$$x^2 + 2x - 63 = 0$$

$$(x + 9)(x - 7) = 0$$

$$x + 9 = 0$$

$$~~x = -9~~$$

$$x - 7 = 0$$

$$x = 7$$

48. The two events are mutually inclusive because the first event (choosing the sports section) and the second event (choosing the movie times list) can occur at the same time, and neither one affects the outcome of the other.

49.

$$P(A \cap B) = P(A) + P(B)$$

$$P(A) = P(\text{spin } 5) = \frac{1}{7}$$

$$P(B) = P(\text{roll } 5) = \frac{1}{6}$$

$$P(A \cap B) = \frac{1}{7} \cdot \frac{1}{6} = \frac{1}{42}$$

50. No, spinning a spinner and rolling a six-sided cube are mutually inclusive events, not mutually exclusive. Both can happen at the same time and neither one affects the outcome of the other.

51. Yes, spinning a spinner and rolling a six-sided cube are independent events. Neither one affects the outcome of the other.

52.

$$P(A \text{ or } B) = P(A) + P(B) - P(A \cap B)$$

$$P(A) = P(\text{spin } 3, 4, \text{ or } 5) = \frac{3}{7}$$

$$P(B) = P(\text{roll } 2) = \frac{1}{6}$$

$$P(A \cap B) = \frac{3}{7} \cdot \frac{1}{6} = \frac{1}{14}$$

$$P(A \text{ or } B) = \frac{3}{7} + \frac{1}{6} - \frac{1}{14} = \frac{18}{42} + \frac{7}{42} - \frac{3}{42} = \frac{25}{42} - \frac{7}{42} = \frac{18}{42} = \frac{3}{7}$$

## Lesson 9.10

### Chapter 9 Test

1.

$$\begin{aligned} & (4x^2 + 5x + 1) - (2x^2 - x - 3) \\ & 4x^2 + 5x + 1 - 2x^2 + x + 3 \\ & (4x^2 - 2x^2) + (5x + x) + (1 + 3) \\ & 2x^2 + 6x + 4 \end{aligned}$$

2.

$$\begin{aligned} & (2x + 5) - (x^2 + 3x - 4) \\ & 2x + 5 - x^2 - 3x + 4 \\ & -x^2 + (2x - 3x) + (5 + 4) \\ & -x^2 - x + 9 \end{aligned}$$

3.

$$\begin{aligned} & (b + 4c) + (6b + 2c + 3d) \\ & b + 4c + 6b + 2c + 3d \\ & 7b + 6c + 3d \end{aligned}$$

4.

$$\begin{aligned} & (5x^2 + 3x + 3) + (3x^2 - 6x + 4) \\ & 5x^2 + 3x + 3 + 3x^2 - 6x + 4 \\ & 8x^2 - 3x + 7 \end{aligned}$$

5.

$$(3x + 4)(x - 5)$$

$$3x^2 - 15x + 4x - 20$$

$$3x^2 - 11x - 20$$

6.

$$(9x^2 + 2)(x + 3)$$

$$9x^3 + 27x^2 + 2x + 6$$

7.

$$(4x + 3)(8x^2 + 2x + 7)$$

$$36x^3 + 8x^2 + 28x + 24x^2 + 6x + 21$$

$$36x^3 + 32x^2 + 34x + 21$$

8.

$$27x^2 - 18x + 3$$

$$3(9x^2 - 6x + 1)$$

$$3(9x^2 - 3x - 3x + 1)$$

$$3(9x^2 - 3x)(-3x + 1)$$

$$3 \cdot 3x(3x - 1) - (3x - 1)$$

$$3(3x - 1)(3x - 1)$$

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

9.

$$9n^2 - 100$$

$$(3n - 10)(3n + 10)$$

10.

$$\begin{aligned} &648x^2 - 32 \\ &8(81x^2 - 4) \\ &8(9x - 2)(9x + 2) \end{aligned}$$

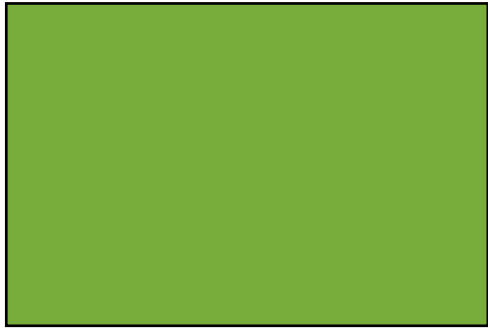
11.

$$\begin{aligned} &81p^2 - 90p + 25 \\ &81p^2 - 45p - 45p + 25 \\ &(81p^2 - 45p) + (-45p + 25) \\ &9p(9p - 5) - 5(9p - 5) \\ &(9p - 5)(9p - 5) \\ &(9p - 5)^2 \end{aligned}$$

12.

$$\begin{aligned} &6x^2 - 35x + 49 \\ &6x^2 - 14x - 21x + 49 \\ &(6x^2 - 14x) + (-21x + 49) \\ &2x(3x - 7) - 7(3x - 7) \\ &(2x - 7)(3x - 7) \end{aligned}$$

13.



$$A = l \cdot w$$

$$45 = (x + 7)(x - 5)$$

$$45 = x^2 - 5x + 7x - 35$$

$$x^2 + 2x - 35 - 45 = 0$$

$$x^2 + 2x - 80 = 0$$

$$(x + 10)(x - 8) = 0$$

$$x + 10 = 0$$

$$\cancel{x} = \cancel{-10}$$

$$x - 8 = 0$$

$$x = 8$$

When  $x=8$  then the area of the rectangle is 45.

14.

$$x(x + 6) = 40$$

$$x^2 + 6x - 40 = 0$$

$$(x + 10)(x - 4) = 0$$

$$x + 10 = 0$$

$$~~x = -10~~$$

$$x - 4 = 0$$

$$x = 4$$

15. Answers for this question will vary. The answer is correct as long as the two events do not affect each others outcome. (picking a card, and rolling a die, spinning a spinner and choosing a marble, etc.) The probability of each event will be the number of times you can achieve the desired outcome over the number of possible outcomes. (ie: die = 1/6)

(a) The answer will vary based on the events and probabilities chosen but should use the formula:  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

(b) The answer will vary based on the events and probabilities chosen but should use the formula:  $P(A \cap B) = P(A) \cdot P(B)$

16.

(a)

$$P(\text{rain}) = \frac{45}{100} = \frac{9}{20}$$

$$P(3\text{days}) = \frac{9}{20} \cdot \frac{9}{20} \cdot \frac{9}{20} = \frac{729}{8000}$$

(b)

$$P(\text{rain}) = \frac{45}{100} = \frac{9}{20}$$

$$P(\text{dry}) = \frac{55}{100} = \frac{11}{20}$$

$$P(\text{rain,dry,rain}) = \frac{9}{20} \cdot \frac{11}{20} \cdot \frac{9}{20} = \frac{891}{8000}$$