Module 5: Polynomials and Factoring

Section 5.1 Defining and Combining Polynomials

Practice Problems 5.1

For Problem 1-5, tell if the expression given is a polynomial. If it is not, explain why not.

1. $4x^2 + 3x$

2. $-5x^3 - \frac{x}{4}$

3. $\frac{7}{x-2}$

4. $\sqrt{x} + 8$

5. $7x^{-3}$

For Problem 6, fill in the blank boxes in the table given to complete the problem.

6.

Polynomial	**Name by Terms**	**Name by Degree**
$-x$		
$-7x^2 + 2$		
$-5x^5 - 3x^2 - 0.8$		
$3x^5y^3 - 4x^3y^2 + 6xy$		

For Problem 7-9, use the given polynomial to fill in the blank.

$$12x^3 - 3xy + 7x$$

7. It is called a __________________________ because it has __________________________ terms.

8. The degree of the highest term is __________________________.

9. The term with the highest degree is called the lead term; it has a coefficient of ________________________.

For Problem 10 and 11, solve the multiple-choice problem given.

10. Which of the following is a polynomial?

a) $4x^2 - 3x^{\frac{1}{2}}$

b) $2x^3 - 5xy^2 - 3$

c) $\frac{1}{x-5}$

d) $-6x^2y^{-1}$

11. Which of the following is not a polynomial?

a) $11x^4 - 2$

b) $5x^6 + 3x^5y + 3y^4$

c) $-\frac{7}{x-3}$

d) $-\frac{x-3}{7}$

For Problem 12-16, tell whether or not the expression given is a polynomial. If it is, tell if it is a monomial, binomial, or trinomial.

12. $3x - 4yz$

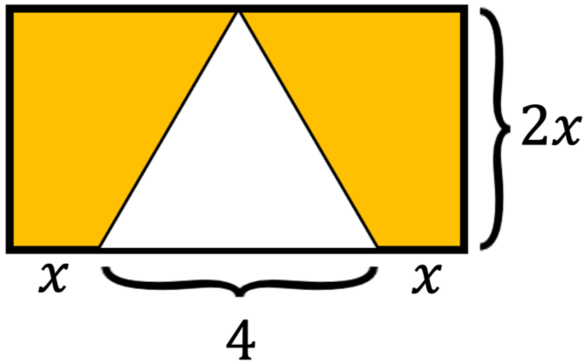
13. -5

14. $-5x$

15. $8n^4 + 2n^{-3}$

16. $4m^2 + 3m - 7$

For Problem 17-20, use the given figure to solve the problem.



17. Write a polynomial expression to represent the area of the rectangle.

18. Write a polynomial expression to represent the area of the triangle.

19. Write a polynomial expression to represent the area of the shaded (yellow) region.

20. Is the polynomial for the area of the shaded (yellow) region a monomial, binomial, or trinomial?

Section 5.2 Using Polynomial Blocks

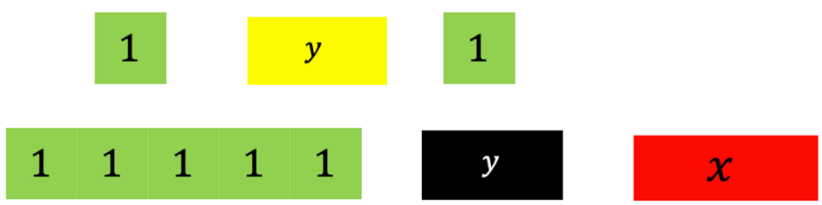
Practice Problems 5.2

For Problem 1-7, write a polynomial expression for the blocks given by combining like terms. Black shapes represent positive values and colorful shapes represent negative values. (Remember, adding by a negative is the same as subtracting.)

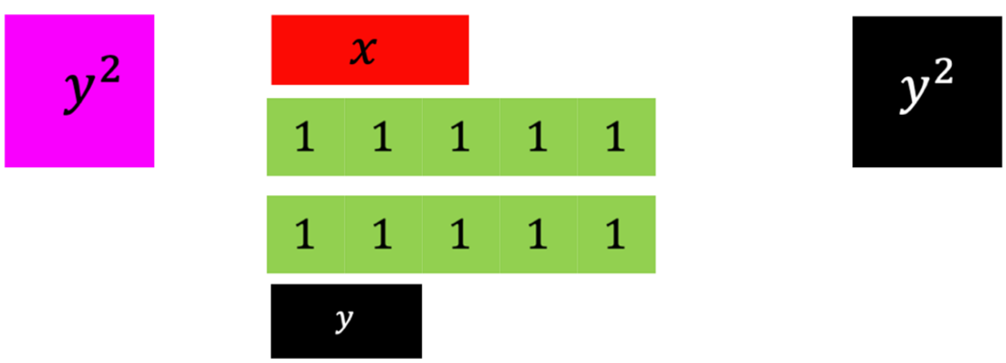
1.

2.

3.

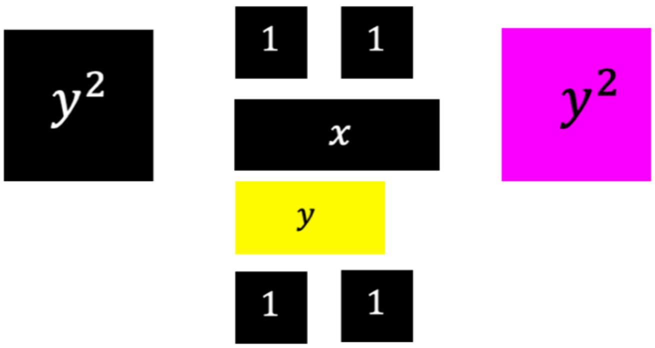


4.

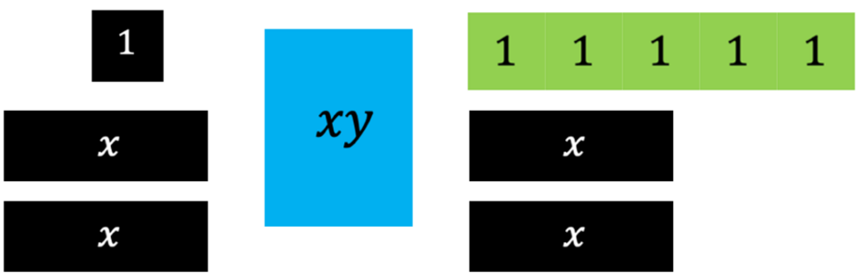


5.

6.



7.



8.

For Problem 9-20, simplify the polynomial expression given using variables rather than blocks.

9. $x + x + xy + y$

10. $-xy + xy + xy + y$

11. $x - x + xy + xy$

12. $x - x + y - y + xy - xy$

13. $xy + y + y - y$

14. $-x + (-x) - y + (-y) + xy$

15. $xy + xy + xy + xy$

16. $xy - xy$

17. $x + x - y^2$

18. $x^2 + y^2$

19. $xy - 2xy + xy + x^2$

20. $x + xy + 1 + xy + 1 + x^2 + y^2$

Section 5.3 Factoring Out a Common Factor

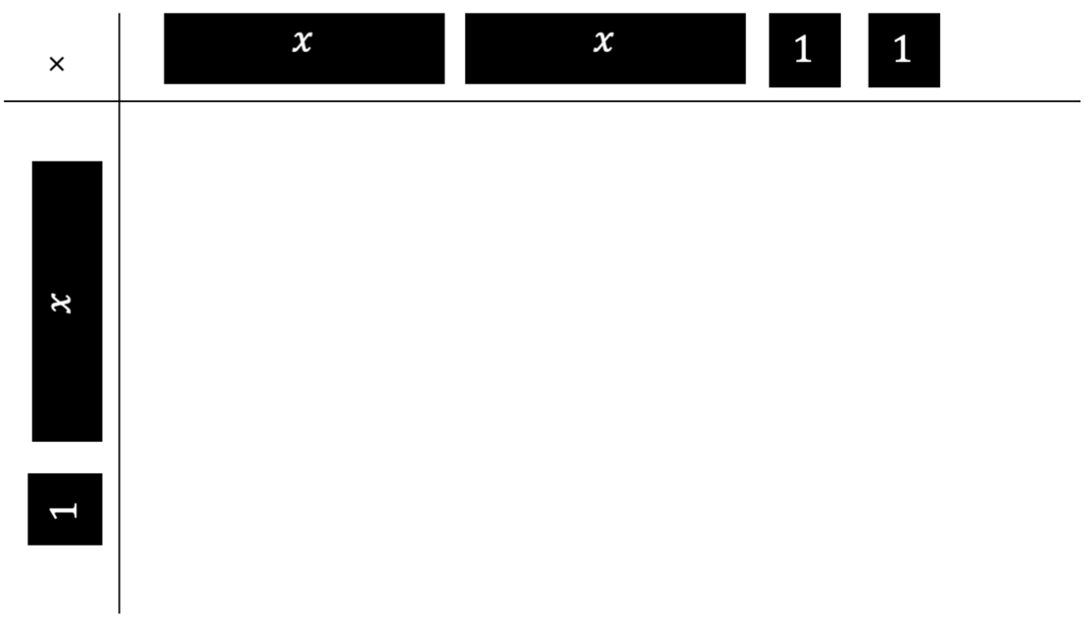
Practice Problems 5.3

For Problem 1-4, use the polynomial blocks and a t-frame to solve the problem.

1. $3x^2 + 3x = 3x(\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_)$

×

2. Draw the area blocks inside the t-frame using the line-up rule. Write the area as a polynomial.



3. Write the factored form using the product of the side lengths from Problem 2.

4. Use the Distributive Property to show that the product in Problem 3 is the area in Problem 2.

For Problem 5 and 6, write the problem algebraically using the product of the side lengths set equal to the area.

5. The sides of a rectangle are given; find the area of the rectangle using a t-frame: $(x+1)(x+4)$.

×	

6. Write the area for Problem 5 algebraically by combining like terms. Use the Distributive Property for Problem 5 to show this is the area found.

For Problem 7-10, given the sides of a rectangle, find the area using a t-frame or the Distributive Property. Simplify by combining like terms.

7. $(x+3)(x+2)$

8. $x(x+4)$

9. $(x+2)(x+2)$

10. $(x+1)(x+5)$

You can use an array and multiply for negative numbers to find the area of terms.

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

	x	-2
x	x^2	$+2x$
-2	$-2x$	-4

For Problem 11-16, fill in the missing boxes (?) for the arrays given in the problem and find the area of the simplified terms.

11. $(x-3)(x+1)$

	x	$+1$
x	x^2	?
-3	?	-3

12. $(x-2)(x-4)$

	x	-4
x	?	$-4x$
-2	$-2x$	?

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

	x	-2
x	?	$-2x$
$+5$	?	?

14. $(x-1)(x-1)$

	x	-1
x	x^2	?
-1	?	?

15. $(x+4)(x-1)$

	☐	☐
☐	x^2	$+4x$
☐	$-x$	-4

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

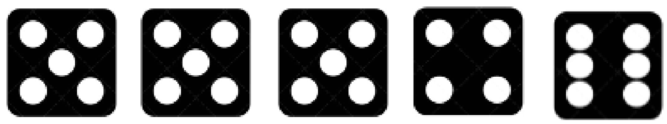
	☐	☐
☐	x^2	$+5x$
☐	$-2x$	-10

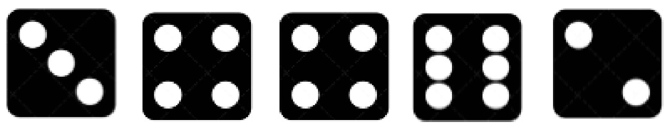
For Problem 17-20, solve the challenge problem given.

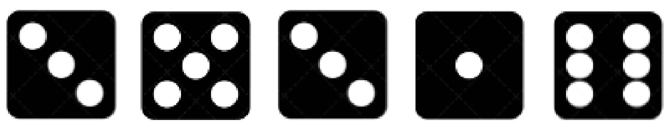
17. On the next page is a challenge problem about polar bears that come in pairs and fish that are where you expect them to be. See if you can solve the riddle by filling in the blanks.

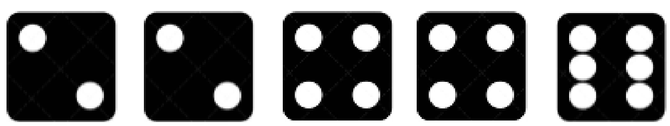
<u>Polar Bears and Fish</u>

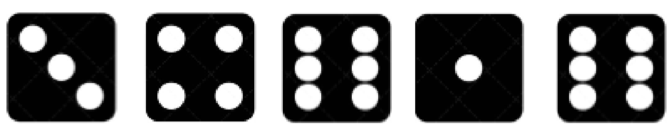
Polar bears come in pairs.
They gather around holes like petals on a flower.
How many bears do you see?
How many fish in the sea?
Fish are where you expect them to be!

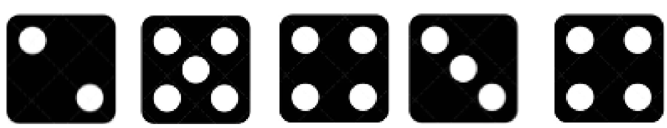

Bears = 12 Fish = 6

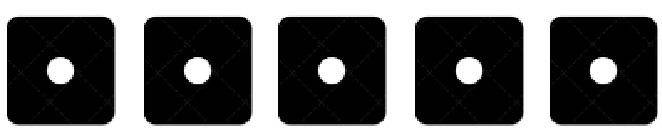

Bears = 2 Fish = 4

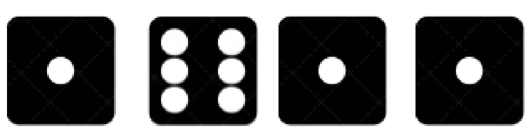

Bears = 8 Fish = 16


Bears = 0 Fish = 0


Bears = 2 Fish = _____


Bears = _____ Fish = 6


Bears = _____ Fish = _____


Bears = 0 Fish = 18

18. Remember Pascal's Triangle from General Mathematics? Use Pascal's Triangle to find how many ways you can spell each word below starting from the top and moving down. Each number of Pascal's Triangle is the sum of the pair diagonally above it.

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1

a)

O
N N

b)

W
O O
W W W

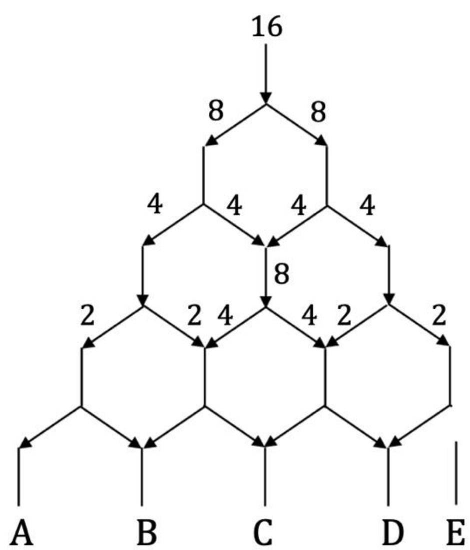
c)

N
I I
C C C
E E E E

d)

P
A A
S S S
C C C C
A A A A A
L L L L L L

19. Sixteen mice enter a hexagonal maze as shown below. At each fork, half go one way and half go the other way. How many mice leave the maze at A, B, C, D, and E?



20. This final game is called "The Rainbow Puzzle." Below are the rules:

For a 3 × 3 gameboard, use 3 different colored chips with 3 chips of each color (red; yellow; blue). Chips of the same color must be contiguous, which means they must be joined on one side. Complete the square below using this rule.

For a 4 × 4 gameboard, use 4 different colored chips with 4 chips of each color (red; yellow; blue; green). (I have given you some hints about how many and what color chips are in some of the squares below.)

For example, the second row has 1 red, 1 green, and 2 blue chips. The fourth column has 1 yellow and 3 green chips. Fill the square grid below with the chips.

		2B; 1Y; 1R		3Y; 1B
1R; 1G; 2B				
1R; 3Y				

			1G; 1Y; 2R	
1B; 3Y				
2R; 2B				

	1G; 3R			3Y; 1B
2Y; 1G; 1R				
1B; 2R; 1Y				

Section 5.4 Multiplying Binomials

Practice Problems 5.4

For Problem 1-8, follow the instructions/answer the question given to solve the problem.

1. Complete the array to multiply $(x - 2)$ by $(x + 3)$.

	x	-2
x		
$+3$		

2. Multiply $(x - 2)$ by $(x + 3)$ using the Distributive Property.

3. Multiply $(x + 2)$ by $(x + 2)$ using a t-frame.

4. Multiply $(x + 2)$ by $(x + 2)$ using the Distributive Property.

5. Multiply $(x + 2)$ by $(x - 2)$ using any method.

6. Do you always get a trinomial when you multiply two binomials? Why or why not?

7. Give an example of another binomial when two binomials are multiplied.

8. Multiply y by $(y + 3)$ by $(y - 1)$ using the Distributive Property.

For Problem 9-16, use the Distributive Property to multiply the polynomial given.

9. $x(x+4)$

10. $x(x-2)$

11. $(x+2)(x-8)$

12. $(x-3)(x-6)$

13. $m(m+4)(m-2)$

14. $(m+n)(m+2n)$

15. $(m-5)(m+1)$

16. $(m+3)(m^2-1)$

For Problem 17-20, use the Distributive Property to eliminate the parenthesis, then combine like terms.

17. $3(m+2)+6(m-1)$

18. $3x(x-1)-(x^2+3)$

19. $-2(m+4)-3(m+3)$

20. $2(x-4)+3(x-1)-4(2x-6)$

Section 5.5 Binomial Squares

Practice Problems 5.5

For Problem 1 and 2, follow the instructions and/or answer the question(s) given to solve the problem.

1. Which polynomials below represent a binomial square?

   a) $(n - 0.3)^2$
   b) $t^2 + s^2$
   c) $(m + 8)(m - 8)$
   d) $(4 - p)^2$
   e) $(t + 3)(t + 3)$

2. Is $(x + 4)^2$ equal to $x^2 + 16$? Show why or why not.

For Problem 3-5, multiply the binomial square given and check your solution using the steps in the Lesson Notes.

3. $(x + 5)^2$

4. $(y - 2)^2$

5. $(x + 4)^2$

For Problem 6-9, follow the instructions and/or answer the question(s) given to solve the problem.

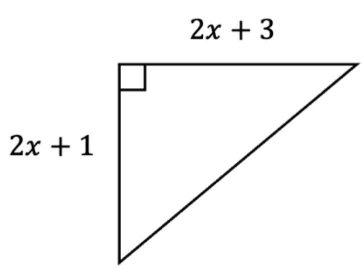
6. Will a binomial square always result in a trinomial? Why or why not?

7. The function $f(t) = -4.6(t - 0.3)^2 + 2.1$ is the height of a ball thrown in which t represents time in seconds and $f(t)$ represents height in meters.

a) Expand the binomial square and multiply through to find another form of this equation.

b) When t is equal to 0, the ball is released. How high is the ball from the ground when it is released?

8. Two sides of a triangle are given. If the perimeter of the triangle is $7x + 11$, find the length of the third side of the triangle.



9. What is the polynomial expression for the area of the triangle in Problem 8?

For Problem 10-14, use the given information to solve the problem.
The total population for females in City A is modeled by the equation $F = 123y + 10{,}062$ and the total number of males in City A is modeled by the equation $M = 156y + 11{,}144$ in which y is the number of years since 2010.

10. How many females were in City A in 2015?

11. How many males were in City A in 2015?

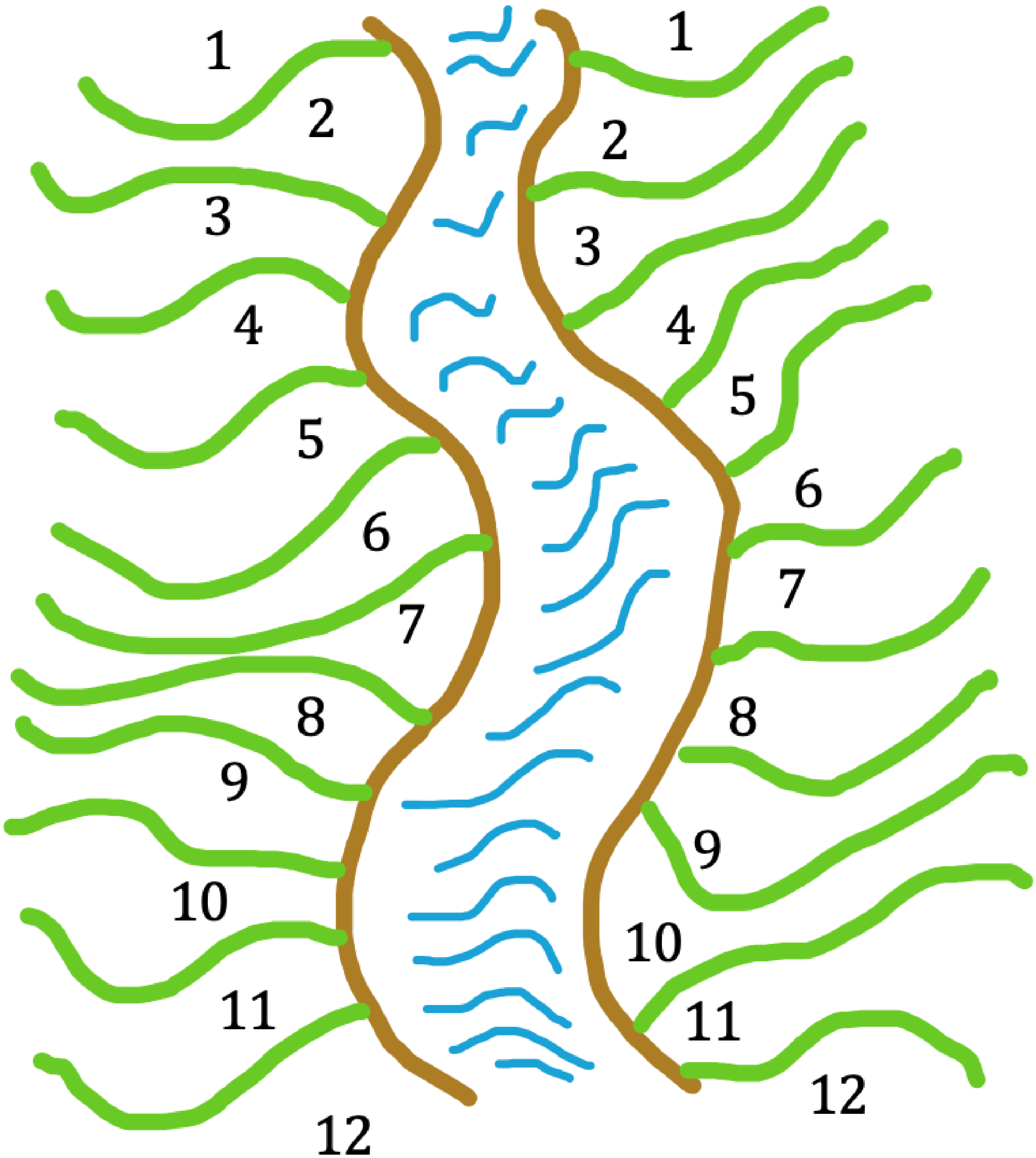
12. Write a polynomial equation for the total number of people in City A. Let $T =$ total population and y be the years Since 2010.

13. Use the equation in Problem 12 to find the number of total men and number of total women in City A in 2015.

14. Add the solutions to Problem 10 and Problem 11. Did you get the same population as you did in Problem 13?

For Problem 15, play the game!

To end this section, we are going to play a game called "Cross the River." You will need a partner to play. Begin with 12 chips (or pennies). These will represent boats that will be placed along the "river bank" in front of each player. You will decide where to put the "boats." (You may need to stack them to save space.) The board will be labeled 1-12. You will put your 12 "boats" on your side of the "river" and your partner will put theirs on their side of the river. You may choose to put all 12 on number 12, or one boat on each number. Each player will take turns rolling two fair dice. If you have any boats on the number you roll you get to move your boat(s) to the other side and off the board. The first player to move all their boats across the river wins.



Section 5.6 Difference of Squares

Practice Problems 5.6

For Problem 1-4, find the product that is a difference of squares.

1. $(h+6)(h-6)$

2. $(t+0.4)(t-0.4)$

3. $(k+2)(k-2)$

4. $(s-3)(s+3)$

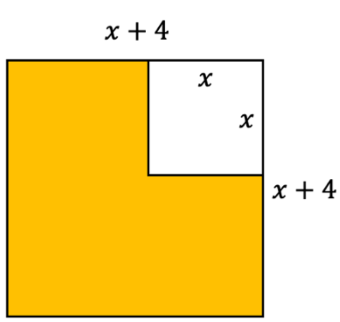
For Problem 5 and 6, expand and find the square of the polynomial given.

5. $(b+3)^2$

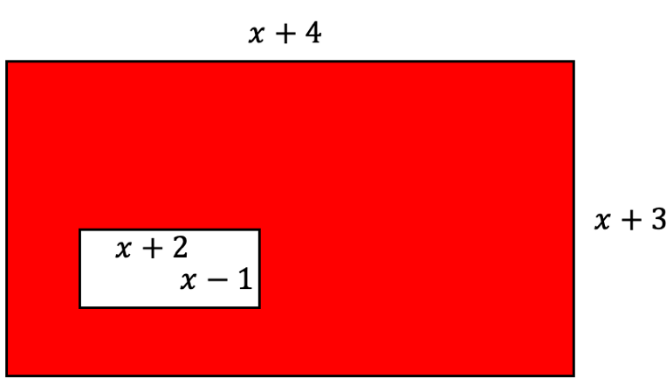
6. $(a-2b)^2$

For Problem 7 and 8, find the area of the shaded region in terms of x.

7.



8.



For Problem 9-14, solve the word problem given.

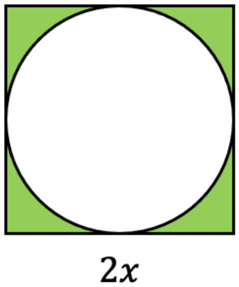
9. Tristan spent half of his money on clothes, then another $\$12.00$ on lunch. When he got home, he had $\$45.00$. How much did Tristan start with? Let m be money.

10. Thorleif's mother gave him $\$22.10$ to buy a poster, but the amount he had only covered $\frac{2}{3}$ of the price of the poster. How much did the poster cost? Let p be the price.

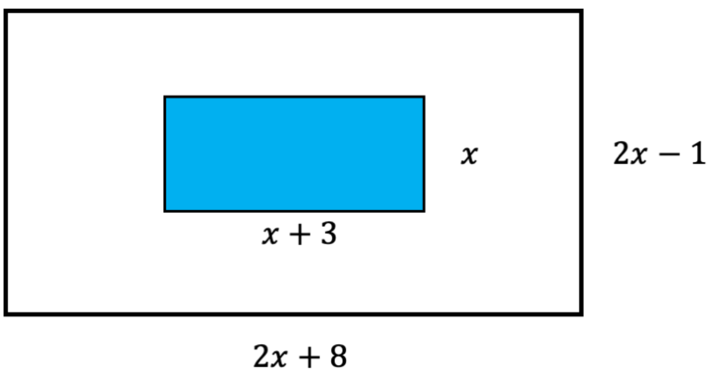
11. Morgan can read 12 pages of her novel each day. How many days will it take her to get to 168 pages? Let d be the number of days.

12. Monica and four friends went out to lunch and split the bill. They each paid $\$13.32$ for lunch. How much was the bill? Let b be the bill.

13. Find the area of the shaded region as a polynomial expression. (Hint: The diameter of a circle is the length of the side of a square. The area of a circle is $A = \pi r^2$. The radius of a circle is one-half of the diameter.)



14. Find the area of the non-shaded (blank) region as a polynomial expression.



For Problem 15-18, use the clues to answer each of the questions to find out *who* did the random act of kindness, *with what tool* it was done, and *where* it was done.

15. *Who* drew the smiley-face card for the math teacher?

Find the expansion of $(x - 5)^2$.

Dr. Zero $x^2 - 10x - 25$	Mrs. Asymptote $x^2 - 5$
Mr. Undefined $x^2 + 25$	Penny Nickel $x^2 - 10x + 25$

16. *With what tool* was the smiley-face drawn?

Multiply $(x - 4)(x + 1)$.

Protractor $x^2 - 3$	Ruler $x^2 + 5x + 5$
Compass $x^2 - 3x - 4$	Yardstick $x^2 + 3x - 4$

17. *Where* was the smiley-face drawn?

What is $x^2 - 4$ called?

Quadrant I A sum of squares	Quadrant II A binomial square
Quadrant III A difference of squares	Quadrant IV Square difference

18. Fill in the blanks:

The smiley-face artist is ____.

The tool used was the ____.

The smiley-face was drawn in ____.

Section 5.7 Factoring Special Cases of Polynomials

Practice Problems 5.7

For Problem 1 and 2, solve the problem given.

1. Which of the binomials cannot be factored?

a) $5^2 - t^2$ b) $9x^2 - 9$

c) $3x^2 + 5$ d) $x^2 - 3$

2. There are two choices in Problem 1 that can be factored; demonstrate this below.

For Problem 3-5, find the binomial square for the trinomial given.

3. $x^2 - 8x + 16$

4. $x^2 + 6x + 9$

5. $x^2 - 10x + 25$

For Problem 6 and 7, solve the multiple-choice question given.

6. Which of the trinomials below are not a binomial square?

a) $x^2 - 5x + 6$ b) $x^2 + 4x + 4$

c) $x^2 - 8x - 1$ d) $x^2 - 2x + 1$

7. Which is the factored form of $x^2 - 64$?

a) $(x - 8)^2$ b) $(x + 8)^2$

c) $(x - 2)(x - 32)$ d) $(x - 8)(x + 8)$

For Problem 8-15, factor the binomial given called a difference of squares. The first term is a perfect square and the last term is a perfect square.

8. $x^2 - 9$

9. $x^2 - 16$

10. $x^2 - 100$

11. $x^2 - 144$

12. $x^2 - 25$

13. $x^2 - 49$

14. $x^2 - 36$

15. $x^2 - 81$

For Problem 16-21, factor the perfect square trinomial. Both the first and last terms are perfect squares. Write your solution as a binomial square or the square of a binomial.

16. $x^2 + 8x + 16$

17. $x^2 - 6x + 9$

18. $x^2 - 4x + 4$

19. $x^2 + 4x + 4$

20. $x^2 - 12x + 36$

21. $x^2 + 10x + 25$

Section 5.8 Factoring Using Rectangular Arrays

Practice Problems 5.8

For Problem 1-6, use the array given to fill in the open spaces to find the polynomial.

1.

		2
	x^2	
-6		

2.

	x	
	x^2	$-12x$
2		

3.

		-6
	y^2	
		18

4.

x		$-4x$
	$-3x$	12

5.

x^2	$2x$
$-4x$	

6.

x^2	$1x$
	-5

For Problem 7-14, factor the trinomial given using any method. Change the order first so the monomial term of the highest degree is first and they are in descending order.

7. $9-10m+m^2$

8. $5+6x+x^2$

9. $-9+8x+x^2$

10. $8-7t+t^2$

11. $13+14r+r^2$

12. $20+9x+x^2$

13. $-3-2n+n^2$

14. $x^2-4xy+4y^2$

The difference of squares can have a perfect square for the first term whose coefficient is a perfect square other than 1. For example, $36m^2 - 100n^2$ can be factored to $(6m + 10n)(6m - 10n)$. To check it, use the Distributive Property and multiply:

$$\mathbf{(6m + 10n)(6m - 10n)}$$
$$\mathbf{6m(6m) + 6m(-10n) + 10n(6m) + 10n(-10n)}$$
$$\mathbf{36m^2 \cancel{- 60mn} \cancel{+ 60mn} - 100n^2}$$
$$\mathbf{36m^2 - 100n^2}$$

For Problem 15-20, factor the difference of squares given.

15. $4y^2 - 25$

16. $16x^2 - 9y^2$

17. $121a^2 - 144b^2$

18. $9t^2 - 49$

19. $49a^2 - 36$

20. $16m^2 - 25n^2$

Section 5.9 Factoring Trinomials with a Lead Coefficient of One

Practice Problems 5.9

For Problem 1-10, factor the trinomial given if it can be factored. If it cannot be factored, write "Not Possible."

1. $x^2 + x - 2$

2. $x^2 - 3x + 2$

3. $x^2 - x - 2$

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

5. $x^2 - 4x - 45$

6. $x^2 - 3x - 18$

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

8. $x^2 + 11x + 18$

9. $x^2 + 6x + 9$

10. $x^2 - 11x + 18$

For Problem 11-20, tell which two numbers in the trinomial can be multiplied to result in the last term and added to result in the coefficient of the middle term. If it is not possible to factor the trinomial, write "Not Possible." Write those that can be factored in factored form.
(Each trinomial has a first term with a factor of 1.)

11. $x^2 - 3x + 2$

12. $m^2 - m - 6$

13. $t^2 - 22t + 121$

14. $r^2 - 4r - 12$

15. $y^2 - 16y + 64$

16. $t^2 + 6t + 5$

17. $x^2 + 11x + 28$

18. $a^2 - 14a + 24$

19. $x^2 + 7x + 2$

20. $x^2 + 7x + 2$

Section 5.10 Factoring Trinomials with a Lead Coefficient Not Equal to One

Practice Problems 5.10

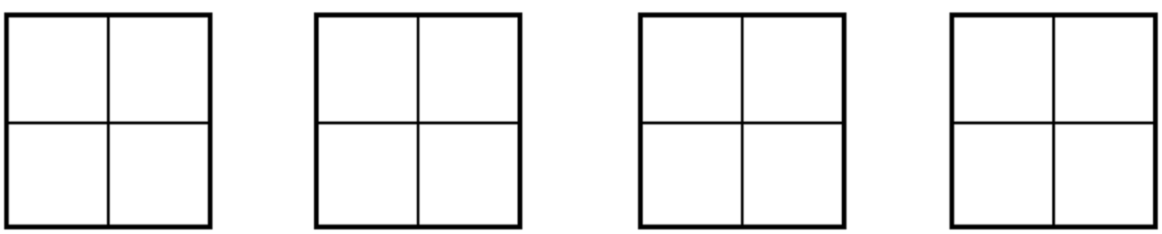
For Problem 1-5, use the trinomial $3x^2 + 5x - 2$ to solve the problem.

1. What factors multiply together to result in the coefficient of the first term?

2. What factors multiply together to result in the constant (last term)?

3. What are the signs that go inside the parenthesis for the factored form of the trinomial?

4. List four possible arrangements of the trinomial using the arrays below.



5. Tell which factored form of the arrays in Problem 4 results in the trinomial.

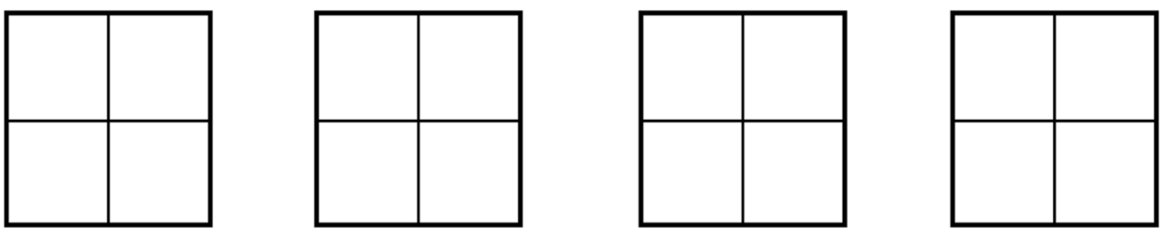
For Problem 6-10, use the trinomial $4x^2 + 8x + 3$ to solve the problem.

6. What factors multiply together to result in the coefficient of the first term?

7. What factors multiply together to result in the constant (last term)?

8. What are the signs that go inside the parenthesis for the factored form of the trinomial?

9. List four possible arrangements of the trinomial using the arrays below.



10. Tell which factored form of the arrays in Problem 9 results in the trinomial.

For Problem 11-18, expand the middle term to factor the trinomial.

11. $3m^2 - 19m + 20$

12. $3r^2 + 8r + 4$

13. $2b^2 + 5b + 3$

14. $3n^2 - 8n - 3$

15. $6m^2 + 5m - 6$

16. $3t^2 - 2t - 1$

17. $16x^2 - 8x + 1$

18. $3z^2 + 2z - 8$

19. How is the solution to $(3m - 3)(m + 1)$ different from the solution to $(3m + 1)(m - 3)$?

For Problem 20, we are going to be playing a game called "Penny Bingo" to refresh our probability problem-solving skills.

1. Each player begins with a handful of pennies a gameboard (below).
2. The first player rolls two die and adds the numbers the die land on for a sum.
3. The first player covers the number on the gameboard that is the sum.
4. If the sum of the die is 7, the player removes one penny from the gameboard.
5. If the sum of the die is 7 on the first roll of the game, the turn passes to the next player.
6. If a player rolls a sum that is already covered, the turn passes to the next player. If the next player has the sum covered, the turn passes to the next player and so on.

The first player to cover their board with pennies wins!

2	3	4	5	6
8	9	10	11	12

Think about these questions as you play Penny Bingo:

What sums have the highest probability of being rolled? Why?

What sums have the least probability of being rolled? Why?

What number is best to remove a penny from if a 7 is rolled? Why?

Section 5.11 Another Method to Factor Trinomials

Practice Problems 5.11

For Problem 1-6, solve the problem given the trinomial $4x^2 + 8x + 3$ using the slide-and-divide method.

1. The first thing to do is slide __________ next to __________ and multiply the two numbers.

2. The new trinomial is ______________________________.

3. What is the factored form of the trinomial in Problem 2?

4. Next, you would divide the constants in each term by what number? __________

5. What is the final factored form of the original problem?

6. Prove your solution in Problem 5 by using the Distributive Property to check it.

For Problem 7-12, fill in the blank(s) and answer the question(s) given in regard to the trinomial $3x^2 + 10x + 8$ using the slide-and-divide method.

7. The first thing to do is slide __________ next to __________ and multiply the two numbers.

8. The new trinomial is ______________________________.

9. What is the factored form of the trinomial in Problem 8?

10. Next, you would divide the constants in each term by what number?

11. What is the final factored form of the original problem?

12. Prove your solution in Problem 11 by using the Distributive Property to check it.

For Problem 13-20, factor the trinomial given using the slide-and-divide method. (Check to see if you get the same solutions as Problem 13-19 in the previous section as these are the same problems.)

13. $2b^2 + 5b + 3$

14. $3n^2 - 8n - 3$

15. $6m^2 + 5m - 6$

16. $3t^2 - 2t - 1$

17. $16x^2 - 8x + 1$

18. $3z^2 + 2z - 8$

19. $3m^2 - 19m + 20$

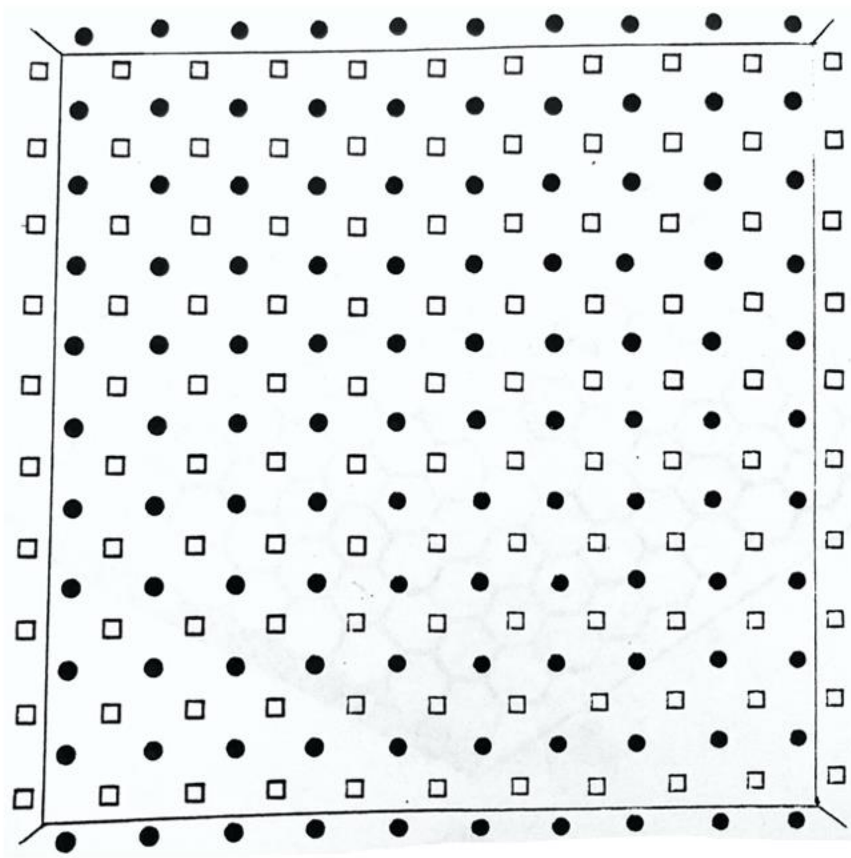
20. $3r^2 + 8r + 4$

We are going to end the section by playing a game called *Building Bridges*. Find a partner to play with. The goal of *Building Bridges* is to create an unbroken line from the black side to the black side by connecting squares with vertical or horizontal lines. Your partner tries to make an unbroken line from the white side to the white side by connecting black circles with vertical or horizontal lines.

Lines may be placed on the board anywhere at any time on your turn or your partner's turn. No diagonal lines may connect between squares or circles. Lines may not be crossed.

You and your partner both should use a marker or pencil of different color to connect your shapes.

The first one to make a bridge across the board wins!



Section 5.12 Completing the Square

Practice Problems 5.12

For Problem 1-6, solve the word problem given.

1. In $x^2 - 4x + 7$, the side length of the perfect square is $(x - 2)$. In $x^2 + 5x + 1$, the side length of the perfect square is $(x + 2.5)$. How does the constant term of the side length relate to the middle term of the original expression?

2. In the expression $x^2 + 8x - 5$, what are the perfect square side lengths?

3. When you multiply the perfect square (binomial square) or expand the product of the side lengths from Problem 2, what do you get?

4. How does the trinomial in Problem 3 relate to the trinomial in Problem 2? What do you have to do to the trinomial in Problem 3 to get the original trinomial in Problem 2?

5. Write the expression in Problem 2 as a binomial square plus or minus a constant using the completing the square method.

6. Use polynomial blocks to complete the square of $x^2 + 8x + 5$. Sketch your solution below.

For Problem 7-10, factor the trinomial given by completing the square.

7. $x^2 + 6x - 2$

8. $a^2 - 16a - 32$

9. $4m^2 + 16m - 60$

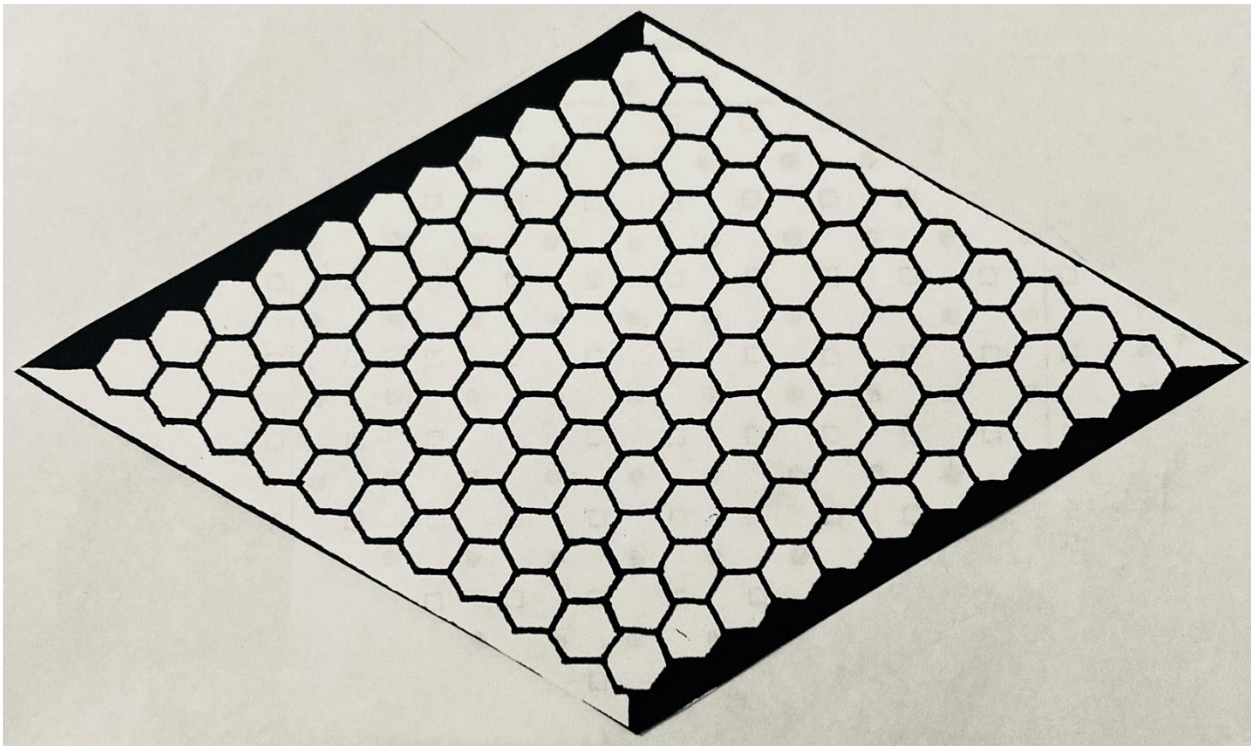
10. $t^2 + 10t + 9 = 0$

We will end this section by playing two games, the first of which is *MATHO*, which is like *BINGO* but with math! Below is the answer key for the *MATHO* game board. Play with a partner.
Fill in the solutions below in the 25 blank spaces on your game board. Use each one at a time. Once you solve each problem, place a penny or chip over the solution on your game board. Once you cover an entire *MATHO* row with column or diagonal chips, say *MATHO!* Clear your board and start over. If you play all the way through, both you and your partner will cover the entire board.

1. 2
2. $14a^2 - 6b$
3. Rational
4. $x = -4$
5. $r > -6$
6. $\{-4, -3, -2\}$
7. $x = -10$
8. $10, 12, 14$
9. $32, 64, 128$
10. $x < -1$ or $x \geq 2$
11. $-2 < x < 3$
12. $-4y - 1$
13. $12y - 3$
14. 4
15. -10
16. -6
17. $4m^2 - 16m$
18. $x^2 - x - 6$
19. Binomial
20. 1
21. 5
22. Trinomial
23. ± 3
24. $12x + 6$
25. $h = 30$ ft.

MATHO BOARD

We will end this section by playing a game called *Hex-It*.
This game is very much like *Building Bridges* as you try to make an unbroken chain from black to black and your partner (you will need one) tries to make an unbroken chain from white to white.
There is a winning strategy. Maybe you can figure it out.
A hexagon has six sides, which can be connected. You can use *x*s and your partner and use *o*s and you can color in the hexagon with one color and your partner can color in the hexagons with another color. The first to make an unbroken chain from one side to the other wins. Any hexagon can be marked anywhere on the board at any time on your turn or your partner's turn. It only has to connect from one side to the next for the win!



Section 5.13 Factoring Review

Practice Problems 5.13

For Problem 1-14, factor the polynomial given completely.

1. $5a + 30b$

2. $x^2y^2 + xy$

3. $8xy^2 - 24xy$

4. $x^2 + 11x + 24$

5. $n^2 - 9n + 20$

6. $m^2 - 3m - 70$

7. $3x^2 + 24x + 45$

8. $a^2 + 2a - 8$

9. $15x^2 - x - 28$

10. $3x^2 - 25$

11. $y^2 - 49$

12. $x^2 + 4x + 4$

13. $y^2 - 16y + 64$

14. $m^2 - n^2$

For Problem 15 and 16, use the slide-and-divide method to factor the polynomial given.

15. $3x^2 - 2x - 5$

16. $3x^2 - 14x + 16$

For Problem 17-20, multiply the polynomials given to solve the problem.

17. $(x-4)(x-4)$

18. $(7m+1)(2m-5)$

19. $(x-2)(x+3)$

20. $(3x-3)^2$

For Problem 21, solve the word problem.

21. Suppose you have a square deck in the back of your house. If the area of the deck is $d^2+12d+9$, what is the length and width of your deck in terms of d? Complete the square to solve the problem.

<u>Section 5.14 Module Review</u>

For Problem 1-3, answer true or false.

1. A polynomial is called a trinomial if it has two terms.

2. A polynomial is called a cubic if it is to the fourth degree.

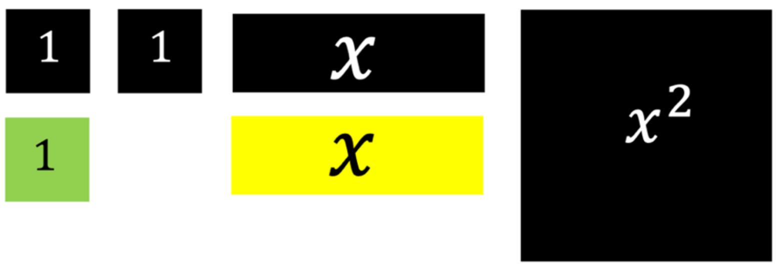
3. Polynomials cannot have integers for the degree of the exponent.

For Problem 4-6, answer yes or no to whether or not the expression given is a polynomial.

4. $\frac{3}{x}$ 5. $x^3 + 5$ 6. $\frac{x^2}{4}$

For Problem 7 and 8, combine like terms for the polynomial blocks to simplify the expression given. Remember, black shapes represent positive and colored shapes represent negative.

7.



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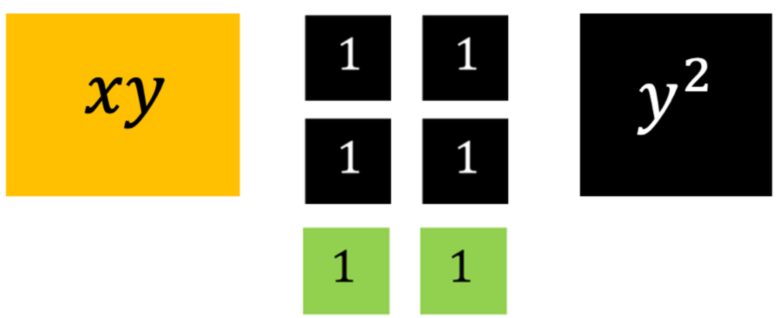


For Problem 9-11, multiply the binomial given.

9. $(y-6)(y+2)$

10. $(y+3)(y+7)$

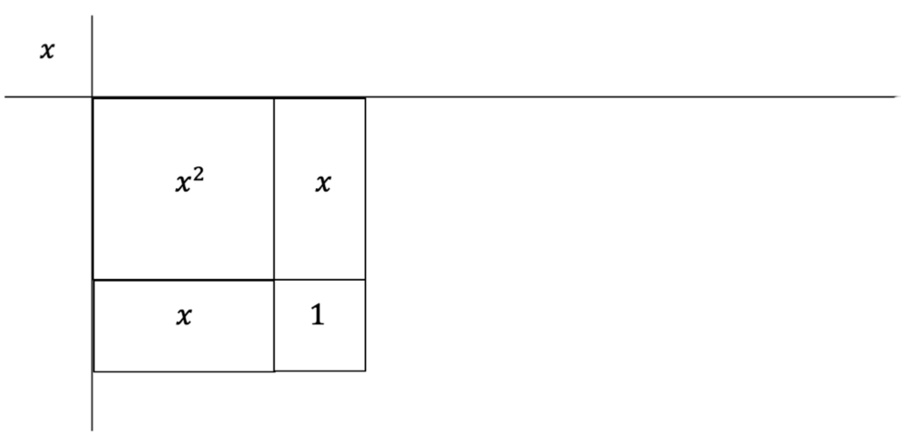
11. $(x-5)(x+5)$

For Problem 12-14, solve the word problem given.

12. Which of the products in Problem 9-11 is called a difference in squares?

13. If the binomials in Problem 9-11 represent the side lengths of a quadrilateral, the product represents the what of the quadrilateral?

14. What are the factors (side lengths) and the polynomial (area) in the t-frame below.



For Problem 15-19, factor the polynomial given using any method.

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

16. $x^2 + 2x - 8$

17. $4x^2 - 49$

18. $4x^2 + 4x + 4$

19. $5x^2 - 17x + 6$

For Problem 20, complete the square to factor the polynomial given.

20. $x^2 + 2x - 1$

<u>Section 5.15 Module 5 Test</u>

For Problem 1-3, fill in the blank.

1. In the polynomial $-x^2 + 2x - 4$, the coefficient of the term of the degree 2 is __________.

2. The polynomial $3x^5 - 4x^2 + 2$ is the degree of __________.

3. $3x^3 + 2x - 1$ is called a ______________________________ by the number of terms

For Problem 4-6, solve the multiple-choice problem given.

4. Which of the expressions is not a polynomial?

a) $-4x^2 - 8$ b) $\sqrt{x} + 4$

c) $5x^6 + 4x^3 + 2x$ d) $\frac{x}{2} + 1$

5. Which of the expressions is a binomial square?

a) $2x^2 + 4$ b) $(3 + x)^2$

c) $m^2 + n^2$ d) $4x^2 + 9y^2$

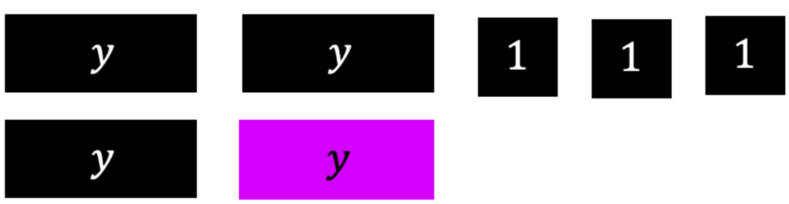
6. Which of the expressions is a difference of squares?

a) $(x - 3)^2$ b) $(4x - 9)^2$

c) $x^2 - 9$ d) $x - y^2$

For Problem 7 and 8, combine like terms for the polynomial blocks given to simplify the expression. Remember, black shapes represent positive and colored shapes represent negative.

7.



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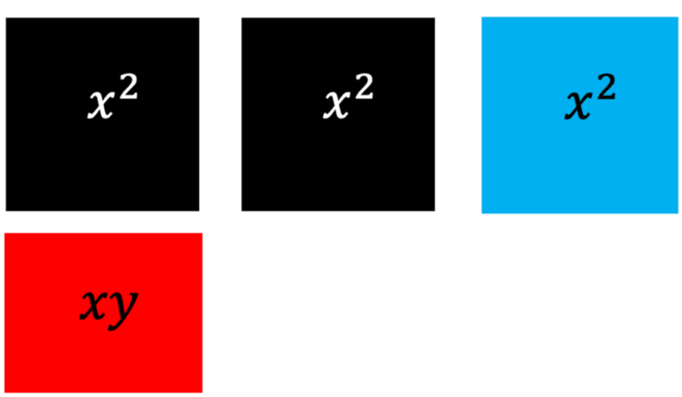


For Problem 9-11, multiply the binomials given.

9. $(x-3)(x+4)$

10. $(x+3)(x+3)$

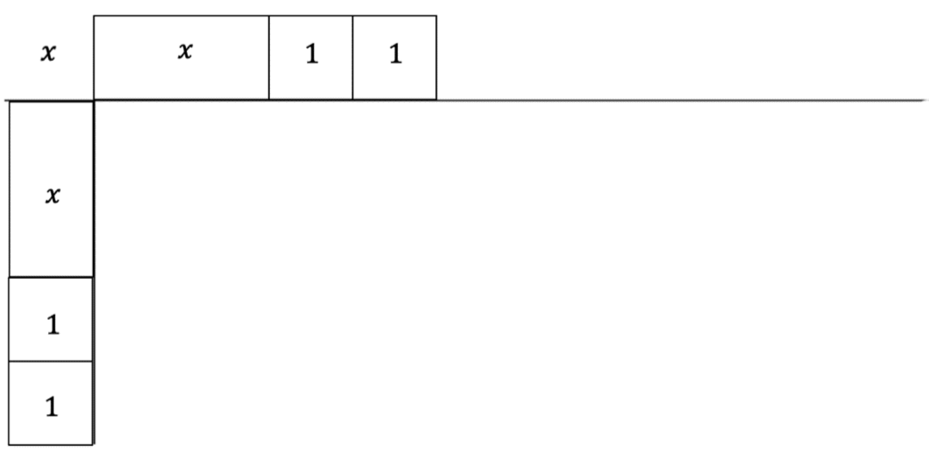
11. $(y-4)(y+4)$

For Problem 12-14, solve the word problem given.

12. Which of the products in Problem 9-11 is called a binomial square?

13. If the product represents the area of a square or rectangle, what do the binomials in Problem 9-11 represent?

14. Given the factors (side lengths), find the polynomial in the t-frame below.



For Problem 15-19, factor the polynomial given.

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

16. $x^2 + 5x + 6$

17. $x^2 - 9x + 20$

18. $x^2 - 36$

19. $3x^2 - x - 10$

For Problem 20, complete the square to factor the polynomial given.

20. $x^2 - 6x + 14$