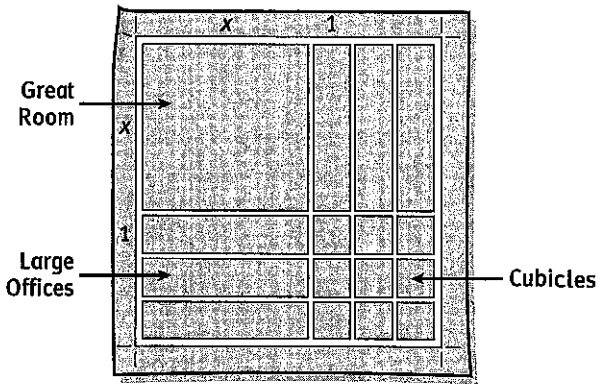
My Notes

Learning Targets:

- Factor a perfect square trinomial.
- Factor a difference of two squares.

SUGGESTED LEARNING STRATEGIES: Create Representations, Discussion Groups, Look for a Pattern, Sharing and Responding, Think-Pair-Share

Factor Steele Buildings can create many floor plans with different size spaces. In the diagram below the great room has a length and width of x units, and each cubicle has a length and width of 1 unit. Use the diagram below for Items 1–3.



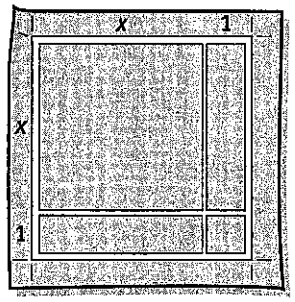
1. **Model with mathematics.** Represent the area of the entire office above as a sum of the areas of all the rooms.

2. Write the area of the entire office as a product of two binomials.

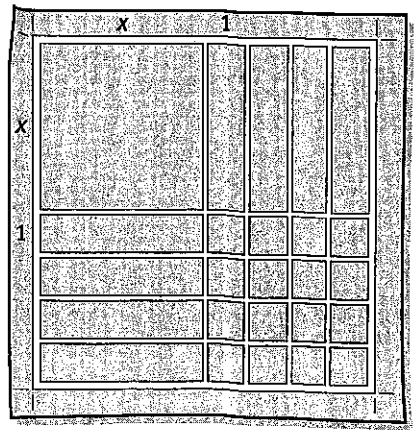
3. What property can you use to show how the answers to Items 1 and 2 are related? Show this relationship.

4. For each of the following floor plans, write the area of the office as a sum of the areas of all the rooms and as a product of binomials.

a.



b.



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c. What patterns do you observe?

5. Complete the following table. The first row has been done for you.

Polynomial	1st Factor	2nd Factor	First Term in Each Factor	Second Term in Each Factor
$x^2 + 6x + 9$	$(x + 3)$	$(x + 3)$	x	3
	$(x - 3)$	$(x - 3)$		
	$(x + 4)$	$(x + 4)$		
	$(x - 4)$	$(x - 4)$		
	$(x + 5)$	$(x + 5)$		
	$(x - 5)$	$(x - 5)$		

6. Express regularity in repeated reasoning. Describe any patterns that you observe in the table from Item 5.

7. Explain how to factor polynomials of the form $a^2 + 2ab + b^2$ and $a^2 - 2ab + b^2$.

Polynomials of the form $a^2 + 2ab + b^2$ and $a^2 - 2ab + b^2$ are called ***perfect square trinomials***.

Check Your Understanding

Factor each perfect square trinomial.

8. $x^2 - 14x + 49$ **9.** $m^2 + 20m + 100$ **10.** $y^2 - 16y + 64$

11. Complete the table by finding the polynomial product of each pair of binomial factors. The first row has been done for you.

1st Factor	2nd Factor	Polynomial
$(x + 3)$	$(x - 3)$	$x^2 - 9$
$(x + 4)$	$(x - 4)$	
$(x - 5)$	$(x + 5)$	
$(9 - x)$	$(9 + x)$	
$(2x - 7)$	$(2x + 7)$	
$(6x - 2y)$	$(6x + 2y)$	

My Notes

12. Describe any patterns you observe in the table from Item 11.

13. **a.** One factor of $36 - y^2$ is $6 + y$. What is the other factor?

b. One factor of $p^2 - 144$ is $p - 12$. What is the other factor?

c. Describe any patterns you observe.

14. Factor each of the following.

a. $49 - x^2$ **b.** $n^2 - 9$ **c.** $64w^2 - 25$

d. Describe any patterns you observe.

15. Explain how to factor a polynomial of the form $a^2 - b^2$.

A polynomial of the form $a^2 - b^2$ is referred to as the ***difference of two squares.***

Check Your Understanding

Factor each difference of two squares.

16. $x^2 - 121$ **17.** $16m^2 - 81$ **18.** $9 - 25p^2$

LESSON 26-2 PRACTICE

Identify each polynomial as a perfect square trinomial, a difference of two squares, or neither. Then factor the polynomial if it is a perfect square trinomial or a difference of two squares.

19. $z^2 + 6z + 12$ **20.** $4x^2 - 121$ **21.** $y^2 - 8y + 16$

22. $y^2 - 8y - 16$ **23.** $n^2 + 25$ **24.** $169 - 9x^2$

25. What factor would you need to multiply by $(4c + 7)$ to get $16c^2 - 49$?

26. What factor would you need to multiply by $(3d + 1)$ to get $9d^2 + 6d + 1$?

Factor completely. (*Hint*: First look for a GCF.)

27. $2x^2 + 8x + 8$ **28.** $3y^2 - 75$ **29.** $12x^2 - 12x + 3$

30. Use appropriate tools strategically. Explain how you can use your calculator to check that you have factored a polynomial correctly.

ACTIVITY 26 PRACTICE

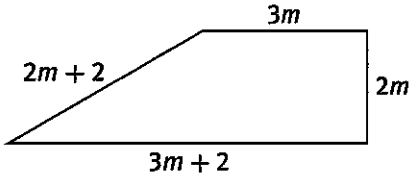
Write your answers on notebook paper.
Show your work.

Lesson 26-1

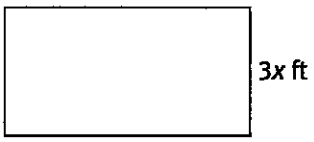
1. What is the greatest common factor of the terms in the polynomial $24x^8 + 6x^5 + 9x^2$?
   A. 3 **B.** $3x^2$
   C. $6x$ **D.** $6x^2$

Factor a monomial (the GCF) from each polynomial.

2. $15x^4 + 20x^3 + 35x$
3. $12m^3 - 8m^2 + 16m + 8$
4. $32y^2 + 48y - 16$
5. $x^5 + x^4 + 3x^3 + 3x^2$
6. Which of these polynomials cannot be factored by factoring out the GCF?
   A. $7x^2 + 14x + 21$ **B.** $49x^3 + 21x^2 + x$
   C. $x^2 + 14x + 7$ **D.** $35x^3 + 28x^2 + 7x$
7. The figure shows the dimensions of a garden plot in the shape of a trapezoid. Write and simplify a polynomial for the perimeter of the plot. Then factor the polynomial completely.



8. The area of the rectangle shown below is $6x^2 + 9x$ square feet. The width of the rectangle is given in the figure. What is the length of the rectangle? Justify your answer.



9. Marcus saw the factorization shown below in his textbook, but part of the factorization was covered by a drop of ink. What expression was covered by the drop of ink?

$$-24x^5 - 16x^3 = -8x^3(\blacksquare + 2)$$

10. Write a polynomial with four terms that has a GCF of $4x^2$.

Lesson 26-2

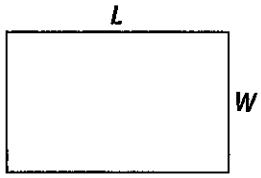
Identify each polynomial as a perfect square trinomial, a difference of two squares, or neither. Then factor the polynomial if it is a perfect square trinomial or a difference of two squares.

11. $9x^2 - 121$
12. $m^2 - 16m + 64$
13. $y^2 + 12y - 36$
14. $16z^2 + 25$
15. $25 - 144p^2$
16. $x^2 + 50x + 625$

Factor completely.

17. $2x^2 - 32$
18. $32 - 8p$
19. $3x^3 + 12x^2 + 12x$
20. $4y^3 - 32y^2 + 64y$
21. $5x^4 - 125x^2$
22. What factor would you need to multiply by $(4x - 1)$ to get $16x^2 - 8x + 1$?
    A. $4x - 1$ **B.** $4x + 1$
    C. $4x^2$ **D.** $4x$

Use the rectangle for Items 23–25.



23. The area of a rectangle is $64b^2 - 4$ and $W = 8b - 2$. What is L?
24. The area of another rectangle is $144c^2 - 4$ and $L = 12c + 2$. What is W?

25. Suppose the area of a rectangle is $4x^2 - 4x + 1$ and $L = 2x - 1$.
a. What is W?
b. What must be true about the rectangle in this case? Explain.

26. The area of a square window is given by the expression $m^2 - 16m + 64$. Which expression represents the length of one side of the window?
A. $m - 4$ **B.** $m + 4$
C. $m - 8$ **D.** $m + 8$

27. What value of k makes the polynomial $x^2 + 6x + k$ a perfect square trinomial?
A. 3 **B.** 6
C. 9 **D.** 36

28. Consider the following values of c in the polynomial $36x^2 + c$.
I. $c = -25$
II. $c = 25$
III. $c = -36$

Which value or values of c make it possible to factor the polynomial?
A. I only
B. I and II only
C. I and III only
D. I, II, and III

29. Write a perfect square trinomial that includes the term $9x^2$.

30. The polynomial $x^2 + bx + 25$ is a perfect square trinomial. What is the value of b? Is there more than one possibility? Explain.

31. Sasha and Pedro were asked to factor the polynomial $9x^2 - 9$ completely and explain their process. Their work is shown below. Has either student factored the polynomial completely? Explain. If not, give the complete factorization.

Sasha's Work

$9x^2 - 9 = (3x + 3)(3x - 3)$
I used the fact that $9x^2 - 9$ is a difference of two squares.

Pedro's Work

$9x^2 - 9 = 9(x^2 - 1)$
I factored out the GCF.

32. Which of the following polynomials has $m - 4$ as a factor?
A. $m^2 - 4$ **B.** $m^2 + 16$
C. $m^2 - 8m + 16$ **D.** $m^2 - 8m - 16$

33. Given that $x^2 + \square + 100$ is a perfect square trinomial, which of these could be the missing term?
A. $10x$ **B.** $20x$
C. $50x$ **D.** $100x$

34. Factor $x^4 - 81$ completely. (*Hint*: Use the fact that $x^4 = (x^2)^2$ to factor $x^4 - 81$ as a difference of two squares. Then consider whether any of the resulting factors can be factored again.)

35. Use the method in Item 34 to factor $y^8 - 625$ completely.

MATHEMATICAL PRACTICES
Reason Abstractly and Quantitatively

36. Could a product in the form $(a + b)(a - b)$ ever be equal to $a^2 + b^2$? Justify your answer.