

6.2C Polynomial Multiplication

1. Thao, Louie and Monique were working on the following problems during class. Did they do the problems correctly or not? Explain what they did wrong and fix their mistakes.

Thao

$$\begin{aligned}
 & (x^2 - 7)(-3x^3 + 5x - 4) \\
 &= -3x^{\textcircled{6}} + 5x^{\textcircled{2}} - 4x + 21x^3 - 35x + 28 \\
 &= -3x^6 + 21x^3 + 5x^2 - 39x + 28 \\
 &\text{Used Product Property of Powers Incorrectly} \\
 &= -3x^5 + 5x^3 - 4x^2 + 21x^3 - 35x + 28 \\
 &= \boxed{-3x^5 + 26x^3 - 4x^2 - 35x + 28}
 \end{aligned}$$

Louie

$$\begin{aligned}
 & (x+7)(x-3) \\
 &= x^2 - 10x - 21 \\
 &\text{Error: } -3x + 7x = 4x \\
 &\boxed{x^2 + 4x - 21}
 \end{aligned}$$

Monique

$$\begin{aligned}
 & -3(2x^2 - 5x + 7) \\
 &= -6x^2 - 5x + 7 \\
 &\text{Didn't distribute the } -3 \text{ over the last 2 terms} \\
 &= \boxed{-6x^2 + 15x - 21}
 \end{aligned}$$

#2 - 11: Find each product. Your final answer should be in standard form.

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

$$\boxed{4x^3 - 20x^2 + 32x}$$

3. $-x^2(7x^3 - 13x + 20)$

$$\boxed{-7x^5 + 13x^3 - 20x^2}$$

4. $(x^2 - 6x - 7)(3x^2 - 9x + 14)$

$$\begin{aligned}
 &= 3x^4 - 9x^3 + 14x^2 \\
 &\quad - 18x^3 + 54x^2 - 84x \\
 &\quad - 21x^2 + 63x - 98 \\
 &= \boxed{3x^4 - 27x^3 + 47x^2 - 21x - 98}
 \end{aligned}$$

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

$$\boxed{x^3 + 7x^2 - 5x - 35}$$

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

$$\boxed{6x^3 - 8x^2 - 12x + 16}$$

7. $(x + 5)(x - 2)(3x - 7)$

$$\begin{aligned}
 & (3x - 7)(x^2 + 3x - 10) = \\
 & 3x^3 + 9x^2 - 30x \\
 & \quad - 7x^2 - 21x + 70 \\
 &= \boxed{3x^3 + 2x^2 - 51x + 70}
 \end{aligned}$$

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#2 – 11 (continued): Find each product. Your final answer should be in standard form.

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

$$36x^2 + 60x + 25$$

9. $(x^2 - 6x + 15)(5x - 4)$

$$5x^3 - 4x^2 - 30x^2 + 24x + 75x - 60$$

$$5x^3 - 34x^2 + 99x - 60$$

10. $2x^3(3x^3 - x^2 + 12x - 10)$

$$6x^6 - 2x^5 + 24x^4 - 20x^3$$

11. $(4x^3 - x^2 - 3)(2x^2 - x + 6)$

$$8x^5 - 4x^4 + 24x^3 - 2x^4 + x^3 - 6x^2 - 6x^2 + 3x - 18$$

$$8x^5 - 6x^4 + 25x^3 - 12x^2 + 3x - 18$$

#12 – 17: Find each product. Your final answer should be in standard form. Identify the y-intercept of the graph of the equation.

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

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

$$3x^5 + 9x^4 + 6x^3 + 18x^2 - 4x^3 - 12x^2 - 8x - 24$$

$$y = 3x^5 + 9x^4 + 2x^3 + 6x^2 - 8x - 24$$

y-intercept: -24

13. $y = (3x - 7)^2$

$$y = 9x^2 - 42x + 49$$

y-intercept: 49

14. $y = 3(-2x + 15)(4x^2 - 1)$

$$3(-8x^3 + 2x + 60x^2 - 15)$$

$$y = -24x^3 + 180x^2 + 6x - 45$$

15. $y = (x^2 + 1)(x^2 - 4x + 11)$

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

$$y = x^4 - 4x^3 + 12x^2 - 4x + 11$$

y-intercept: -45

y-intercept: 11

16. $y = (8 - x^2)(x + 3)$

$$8x + 24 - x^3 - 3x^2$$

$$y = -x^3 - 3x^2 + 8x + 24$$

17. $y = (5x - 3)(x^2 - 7x + 11)$

$$5x^3 - 35x^2 + 55x - 3x^2 + 21x - 33$$

$$y = 5x^3 - 38x^2 + 76x - 33$$

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y-intercept: 24y-intercept: -33

18. What information about the graph of a polynomial is easily found when the equation is in standard form?

- a) The end behavior is determined by looking at the degree (the highest exponent which should be the 1st term) and the leading coefficient.
 b) The y-intercept is the constant, or last term in standard form.

19. The average amount of bananas (in pounds) eaten per person each year in the United States from 1995 to 2000 can be modeled by $f(x) = -0.298x^3 - 2.73x^2 + 7.05x + 78.45$ where x is the number of years since 1995. Graph the function using a graphing utility.

a) What is the y-intercept? Explain the meaning in the context of the problem.

78.45; In 1995, the average amount of bananas (in pounds) eaten per person in the US was 78.5

b) Is this function increasing or decreasing? Explain the meaning of this in the context of the problem.

Increasing from 1995 to 1996, then decreasing amount of bananas consumed from 1996 to 2000.

20. From 2005 through 2013, the number of paperback books N (in millions) sold in the United States and the average price per book P (in dollars) can be modeled by $N(t) = 1.36t^2 + 2.53t + 1076$ and $P(t) = 0.314t + 3.42$ where t is the number of years since 2005.

a) Write a function for the total revenue (amount of money made) R received from the sales of paperback books.

$$R(t) = (0.314t + 3.42)(1.36t^2 + 2.53t + 1076)$$

$$0.427t^3 + 0.794t^2 + 337.864t$$

$$4.651t^2 + 8.653t + 3679.92$$

$$R(t) = 0.427t^3 + 5.445t^2 + 346.517t + 3679.92$$

b) What was the total revenue from paperback books in 2005?

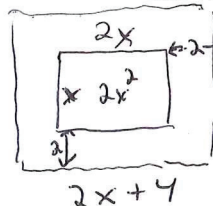
\$ 3679.92 millions or

\$ 3679,920,000

c) What point on the graph represents this value?

y-intercept

21. A rectangular swimming pool is twice as long as it is wide. A small concrete walkway surrounds the pool. The walkway is a constant 2 feet wide and has an area of 196 square feet. Find the dimensions of the pool.



$$A(\text{pool} + \text{sidewalk}) - A_{\text{pool}} = A_{\text{sidewalk}}$$

$$(x+4)(2x+4) - 2x^2 = 196$$

$$2x^2 + 12x + 16 - 2x^2 =$$

$$12x + 16 = 196$$

$$\left(\begin{array}{l} \text{width } x = 15 \text{ feet} \\ \text{length } 2x = 30 \text{ feet} \\ \text{of pool} \end{array} \right)$$

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22. The revenue (revenue = profit - cost) in dollars from the sale of scooters can be represented by

$$R(x) = (-x^2 + 6000)(x - 40) \text{ where } x \text{ is the number of scooters sold.}$$

- a) Put the equation in standard form.

$$R(x) = -x^3 + 40x^2 + 6000x - 240000$$

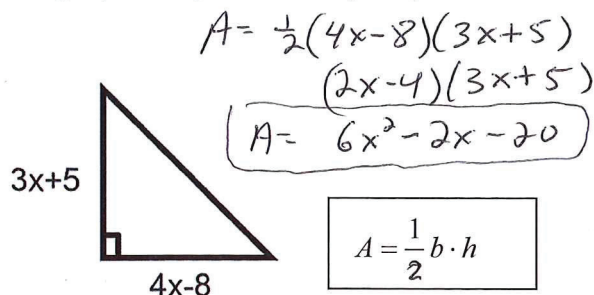
- b) If they do not sell any scooters, what is the revenue?

$$R(0) = \$-240,000$$

- c) Does this number make sense? Why?

yes; negative \$ for revenue means the costs were higher than the sales (which was \$0.)

23. Write an expression for the area of the triangle. Simplify the expression completely.

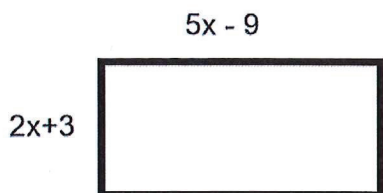


24. Write an expression for the product of 3 more than 4 times the square of a number and 7 less than five times the number. Simplify.

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

$$20x^3 - 28x^2 + 15x - 21$$

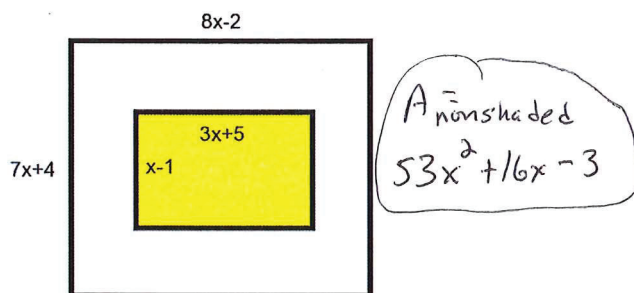
25. Write an expression for the area of the box. Simplify.



$$(5x-9)(2x+3) =$$

$$10x^2 - 3x - 27$$

26. Write an expression for the area of the part of the floor not covered by the rug. Simplify.



$$A = (8x-2)(7x+4) - (3x+5)(x-1)$$

$$(56x^2 + 18x - 8) - (3x^2 + 2x - 5) =$$

27. Think of a number. Subtract 7. Multiply by 3. Add 30. Divide by 3. Subtract the original number. The result is always 3. Use a polynomial equation to illustrate this number trick.

$$\frac{3(n-7) + 30}{3} - n = 3$$

$$\frac{3n - 21 + 30}{3} - n$$

$$\frac{n - 7 + 10}{3} - n$$

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28. Find the missing term.

a) $(x+5)(x+\underline{3}) = x^2 + 8x + 15$

b) $(\underline{2x})(x^2 + 3x - 7) = 2x^3 + 6x^2 - 14x$

c) $(x-6)(x+\underline{-7}) = x^2 - 13x + 42$

d) $(x+\underline{3})(x^2 + 2x + 4) = x^3 + 5x^2 + 10x + 12$

29. The side of a cube is represented by $x+1$. Write an expression for the volume of the cube. Simplify.

$$\begin{aligned}
 (x+1)^3 &= (x+1)(x+1)(x+1) \\
 &= (x+1)(x^2 + 2x + 1) = x^3 + 2x^2 + x \\
 &\quad \quad \quad x^2 + 2x + 1 \\
 &= \boxed{x^3 + 3x^2 + 3x + 1}
 \end{aligned}$$

30. Let an integer be represented by x . Write an expression for the product of three consecutive integers starting with x . Simplify.

$$\begin{aligned}
 &x(x+1)(x+2) \\
 &x(x^2 + 3x + 2) = \boxed{x^3 + 3x^2 + 2x}
 \end{aligned}$$

31. $N(f)$ represents the number of bags of chips that are sold when the school store has f flavors available for sale and $P(f)$ is the price, in dollars, of a bag of chips when there are f flavors available for sale. Write a sentence explaining what $N(f) \cdot P(f)$ means.

The #bags of various flavored chips times the price/bag gives the amount of money collected from the sales.

Section 6.2C

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