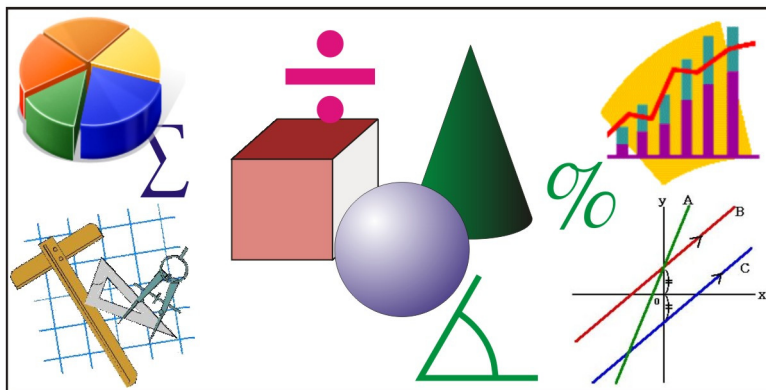


New Course!

Includes A Sample Final Exam with Answers

**RAVEN'S BRITISH COLUMBIA
FOUNDATIONS OF MATHEMATICS
& PRE-CALCULUS GRADE 10**

**STUDENT GUIDE AND
RESOURCE BOOK**



The Key to Student Success

One of a series of publications by Raven Research Associates
for Secondary and Elementary Mathematics

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SAMPLE FROM RAVENS FOUNDATIONS/PRE CALCULUS MATH 10

5.5 Multiplying Polynomials

- We learned to use the distributive property in multiplication. Now we apply this method to multiply polynomials.

$$\begin{aligned}(2x + y)(x - 5y) &= 2x(x - 5y) + y(x - 5y) \\ &= 2x^2 - 10xy + xy - 5y^2 \quad \text{add like terms} \\ &= 2x^2 - 9xy - 5y^2\end{aligned}$$

- Notice that 2x gets distributed, then y is distributed
- This method works for multiplying all polynomials even complicated ones.

e.g. $(3x + 2)(5x^2 - 6x + 2) = 3x(5x^2 - 6x + 2) + 2(5x^2 - 6x + 2)$

$$\begin{aligned}&= 15x^3 - 18x^2 + 6x + 10x^2 - 12x + 4 \\ &= 15x^3 - 8x^2 - 6x + 4\end{aligned}$$

- Notice that 3x gets distributed, then 2 is distributed.

Example 1

Multiply $(3a-2)(2a-7)$

Solution

$$\begin{aligned}(3a - 2)(2a - 7) &= 3a(2a - 7) - 2(2a - 7) \\ &= 6a^2 - 21a - 4a + 14 \\ &= 6a^2 - 25a + 14\end{aligned}$$

- A shorter and more convenient method for multiplying binomials is called **FOIL**. Examples are shown next.

Example 2

Expand $(7x + 2y)(2x - 5y)$

<i>F</i> (first terms)	$(7x)(2x)$	$\rightarrow 14x^2$	
<i>O</i> (outer terms)	$(7x)(-5y)$	$\rightarrow -35xy$	
<i>I</i> (inner terms)	$(2y)(2x)$	$\rightarrow 4xy$	<i>add</i>
<i>L</i> (last terms)	$(2y)(-5y)$	$\rightarrow -10y^2$	$\rightarrow -31xy$
$\therefore (7x + 2y)(2x - 5y) = 14x^2 - 31xy - 10y^2$			

Example 3

Expand $(a + 9)(a + 4)$

<i>F</i> : a^2	
<i>O</i> : $4a$	$= a^2 + 4a + 9a + 36$
<i>I</i> : $9a$	$= a^2 + 13a + 36$
<i>L</i> : 36	

Example 4

Expand $(x + 5)(x - 6)$	$F: x^2$	
	$O: -6x$	$= x^2 - 6x + 5x - 30$
	$I: 5x$	$= x^2 - x - 30$
	$L: -30$	

Example 5

Expand $(x + 4)(x - 4)$	$F: x^2$	
	$O: -4x$	$= x^2 + 4x - 4x - 16$
	$I: 4x$	$= x^2 - 16$
	$L: -16$	<i>Notice there is no middle term in this answer</i>

Example 6

Expand $(2x + 3)^2$	$F: 4x^2$	<i>Solution $(2x + 3)^2$ is really</i>
	$O: 6x$	$(2x + 3)(2x + 3)$
	$I: 6x$	$= 4x^2 + 12x + 9$
	$L: 9$	

Example 7

Expand $(2x - 3)^3$	$F: 4x^2$	$(2x - 3)^3$ is really
	$O: -6x$	$= (2x - 3)(2x - 3)(2x - 3)$
	$I: -6x$	<i>So use FOIL to multiply 2 brackets</i>
	$L: 9$	$\therefore (2x - 3)(2x - 3)(2x - 3)$
		$= (2x - 3)[4x^2 - 12x + 9]$
		<i>Now only the long distribution method can be used so</i>
		$(2x - 3)[4x^2 - 12x + 9]$
		$= 8x^3 - 24x^2 + 18x - 12x^2 + 36x - 27$
		$= 8x^3 - 36x^2 + 54x - 27$
		$\therefore (2x - 3)^3 = 8x^3 - 36x^2 + 54x - 27$

Verifying Correctness

- We can always verify to determine whether or not we have multiplied correctly by substituting numbers for the variables.
- For example, to check if we have multiplied $(x + 5)(x - 6)$ correctly to an answer of $x^2 - x - 30$ we can substitute any number. Using the number 7 we have as follows.

$(x + 5)(x - 6)$	$x^2 - x - 30$
$= (7 + 5)(7 - 6)$	$= 7^2 - 7 - 30$
$= 12 \cdot 1$	$= 49 - 37$
$= 12$	$= 12$

\longleftrightarrow

Multiplying Numbers and Binomials

- There is a relationship between multiplication of binomials and the multiplication of two-digit numbers. For example, we will multiply 12×13 by writing it in binomial form.

Numbers in Binomial Form	Product of Binomials	Substituting
$(10 + 2)(10 + 3)$	$(x + 2)(x + 3)$	If $x = 10$
$= 100 + 30 + 20 + 6$	$= x^2 + 3x + 2x + 6$	$100 + 30 + 20 + 6$
$= 130 + 26$	$= x^2 + 5x + 6$	$= 100 + 50 + 6$
$= 156$		$= 156$

Exercises 5.5

Multiply and verify a few of your answers by substituting a number for the variable.

1. $(n - 7)(n - 1)$

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

3. $(x - 5)(x - 6)$

4. $(x - 11)(x - 2)$

5. $(t - 2)(1 - t)$

6. $(x + 8)(x - 5)$

7. $(x - \frac{1}{2})(x + \frac{1}{2})$

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

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

10. $(x + 1)(x - 20)$

11. $(5n - 1)(5n - 1)$

12. $(3x + 2)(x + 6)$

13. $(6x + 1)(x + 8)$

14. $(7r + 6y)(7r - 6y)$

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

16. $(4x - 1)(5x + 2)$

17. $(6x - 2)(3x - 2)$

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

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

20. $(4x - 1)(5x - 2)$

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

22. $(6x - y)(5x + 2y)$

23. $(4x - 3y)(3x - 2y)$

24. $(5x + 2y)(5x - 2y)$

25. $(4x + y)(x + 4y)$

26. $(\frac{1}{2}y + 2x)(\frac{1}{2}y - 2x)$

27. $(\frac{3}{2}xy + 3)(\frac{3}{2}xy - 3)$

28. $(0.2x + 5y)(0.2x + 5y)$

Expand

29. $(3x + 2)^2$

30. $(5x - 4)^2$

31. $(3x - 1)^3$

32. $(4x - 5)^3$

33. $(2a - 3b)^3$

Use the distribution method to multiply.

34. $(3a - 1)(2a^2 + 3a - 4)$

35. $(x - 3)(4x^2 - 7x + 12)$

36. $(2y - 5)(3y^2 + 7y - 9)$

37. $(2a - 3b)(4a^2 - a - 3)$

38. $(3a + 4)(a - 5)(2a + 8)$

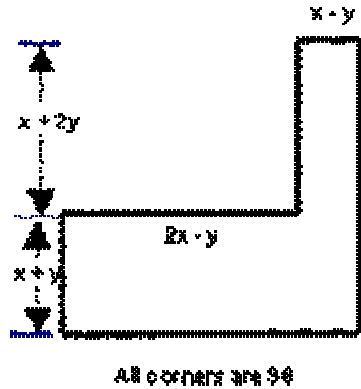
39. $(x - 7)(x + 8)(3x - 2)$

40. $(x - 5)(3x + 4)^2$

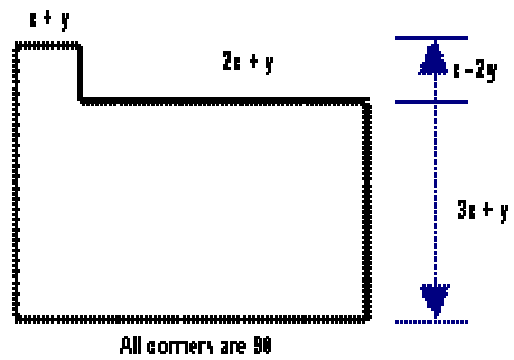
41. $(2x - 3)(2x + 3)^2$

Find the area of each region.

42.

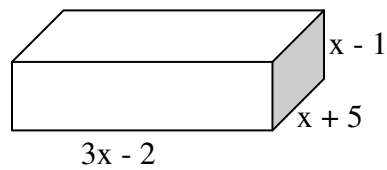


43.

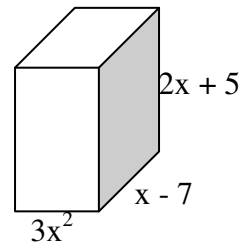


Find the volume of each rectangular prism below.

44.



45.



46. Which of the following are **incorrect** when multiplying?

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

b. $(x - 9)(x - 8)$
 $= x^2 - 17x - 72$

c. $(x - 10)(2x - 1)$
 $= 2x^2 - 11x - 11$

d. $(3x - 2)(2x - 3)$
 $= 5x^2 - 5x + 6$

47. For question #46 above, correct any that are incorrect.