8-2: MULTIPLYING AND FACTORING

Lesson Objectives:

- *Multiplying a polynomial by a monomial*
- *Factor a monomial from a polynomial*

1 Distributing a Monomial

You can use the Distributive Property for multiplying powers with the same base when multiplying by a monomial.

EXAMPLE 1: MULTIPLYING A MONOMIAL AND A TRINOMIAL

Simplify each expression.

1. $-2g^2\left(3g^3+6g-5\right)$

$-2g^2(3g^3)+(-2g^2)(6g)-(-2g^2)(5)$

$(-2\cdot3)(g^2g^3)+(-2\cdot6)(g^2g)-(-2\cdot5)g^2$

$-6g^5+(-12g^3)-(-10g^2)$

$-6g^5-12g^3+10g^2$

2. $4b\left(5b^2+b+6\right)$

$20b^3+4b^2+24b$

3. $-7h\left(3h^2-8h-1\right)$

$-21h^3+56h^2+7h$

4. $2x^3\left(x^2-6x+5\right)$

$2x^5-12x^4+10x^3$

5. $4x^3\left(x-3\right)$

$4x^4-12x^3$

6. $-x^2\left(-2x^2+3x-2\right)$

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

7. $4d^3\left(2d^2-3d+7\right)$

$8d^5-12d^4+28d^3$

8. $4\left(x^2-3\right)-x\left(x+1\right)$

$4x^2-12-x^2-x$

$3x^2-x-12$

Divisibility Tests

2: even #
3: add digits, divide by 3
4: if last 2 digits are divisible by 4
5: ends in 0, 5
6: divisible by both 2 & 3
7: TD's
8: last 3 digits divisible by 8
9: sum of digits is divisible by 9
10: ends in 0.

2 Factoring a Monomial From a Polynomial

PRIME #s: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47

Factoring a polynomial reverses the multiplication process. To factor a monomial from a polynomial, first find the greatest common factor (GCF) of its terms.

GCF (using prime factorization)
Product of all common factors using their smallest exponent

EXAMPLE 2: FINDING THE GREATEST COMMON FACTOR

Find the GCF of each.

9. 22, 44

$2\cdot11^1$ $2^2\cdot11$

GCF: $2\cdot11$

22

22: $1\cdot22$, $2\cdot11$

44: $1\cdot44$, $2\cdot22$, $4\cdot11$

10. 14, 35

$2\cdot7^1$ $5\cdot7$

GCF: 7

11. 16, 24

2^4 $2^3\cdot3$

GCF: 2^3

8

LCM: $2^4\cdot3$

48

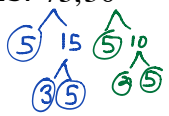
12. 57, 95

$3\cdot19^1$ $5\cdot19$

GCF: 19

$\frac{5+7}{3}=\frac{12}{3}$

13. $75, 50$

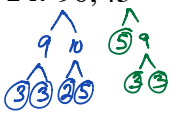


$3 \cdot 5^2 \quad 2 \cdot 5^2$

GCF: 5^2

25

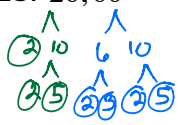
14. $90, 45$



$2 \cdot 3^2 \cdot 5, \quad 3^2 \cdot 5$

GCF: $3^2 \cdot 5 = 45$

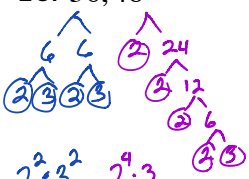
15. $20, 60$



$2^2 \cdot 5, \quad 2^2 \cdot 3 \cdot 5$

GCF: $2^2 \cdot 5 = 20$

16. $36, 48$



$2^2 \cdot 3^2, \quad 2^4 \cdot 3$

GCF: $2^2 \cdot 3 = 12$

17. $36y^2, 21y^3$

$2^2 \cdot 3^2 \cdot y^2, \quad 3 \cdot 7 \cdot y^3$

GCF: $3 \cdot y^2 = 3y^2$

18. $33b^2, 22b^2$

$11b^2$

19. $33x, 44x^2y^2$

$11x$

20. $49x^2y^2, 21y^3$

21

$1 \cdot 21$

$3 \cdot 7$

$7y^2$

18

$1 \cdot 18$

$2 \cdot 9$

$3 \cdot 6$

24

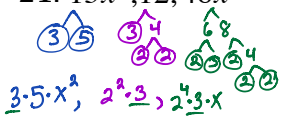
$1 \cdot 24$

$2 \cdot 12$

$3 \cdot 8$

$4 \cdot 6$

21. $15x^2, 12, 48x$



$3 \cdot 5 \cdot x^2, \quad 2^2 \cdot 3, \quad 2^4 \cdot 3 \cdot x$

GCF: 3

22. $10v^3, 45v^3, 35v$

$5v$

23. $45xy^3, 18xy^2, 18x^2y$

$9xy$

24. $24y^2, 36y, 24x^2y$

$12y$

To factor a polynomial completely, you must factor until there are no common factors other than 1.

EXAMPLE 3: FACTORING OUT THE GCF (writing as multiplication; a factor)

Factor each polynomial completely.

25. $4x^3 + 12x^2 - 16x$

$4x\left(\frac{4x^3}{4x} + \frac{12x^2}{4x} - \frac{16x}{4x}\right)$

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

26. $8x^2 - 12x$

$4x(2x - 3)$

27. $5d^3 + 10d^2$

$5d^2(d + 2)$

28. $6m^4 - 12m^2 - 24m$

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

29. $8x + 10$

$2(4x + 5)$

30. $6h^2 - 8h$

$2h(3h - 4)$

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

$x^2(x - 5)$

32. $6a^3 - 12a^2 + 14a$

$2a(3a^2 - 6a + 7)$

33. $2w^4 + 6w^3 - 4w^2$

$2w^2(w^2 + 3w - 2)$

34. $18c^4 - 9c^2 + 7c$

$c(18c^3 - 9c + 7)$

35. $16m^3 - 8m^2 + 12m$

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

36. $108x^3y^2 - 90x^2y^3 + 27xy$

27

1 ~~27~~

3 (9)

$9xy(12x^2y - 10xy^2 + 3)$

(37) $5c^3 + 10c^2 + 5c$

$5c(c^2 + 2c + 1)$

Due Tue

1. go over HW
2. 8-2 L.Q.
3. Review for 8-1 & 8-2 Quizlet ✓

Ch. 8 TEST 1 ✓

Name _____ ***8-2 Practice Worksheet*** Period _____

Simplify each product.

1. $9k(7k+4)$
2. $-p^2(p-11)$
3. $-5c^3(9c^2-8c-5)$
4. $-4x^6(10x^3+3x^2-7)$

Find the GCF of the terms of each polynomial.

5. $6a^2-8a$
6. x^3+7x^2-5x
7. $9x^3-6x^2+12x$

Factor each polynomial.

8. v^2+4v
9. $2t^2-10t^4$
10. $6p^6+24p^5+18p^3$
11. $13ab^3+39a^2b^4$
12. $7g^2k^3-35g^5k^2$
13. $9m^{12}-36m^7+81m^5$

Simplify. Write in standard form.

14. $x^2(x+1)-x(x^2-1)$
15. $4t(3t^2-4t)-t(7t)$

16. Factor n^2-n

Suppose *n* is an integer. Is n^2-n *always, sometimes,* or *never* even?