

8.2 Multiplying & Factoring

* Use distributive property to multiply a monomial by a polynomial.

* Review Problem 1 on pg. 492

* Got it? 1)
$$5n(3n^3 - n^2 + 8)$$
$$15n^4 - 5n^3 + 40n$$

* Factoring - the process of finding factors (Reverse process of Distributive Property)

* ALWAYS factor out the GCF 1st
(Greatest Common Factor)
when factoring a polynomial

* Review Problem 2 on pg. 493

* Got it 2)
$$3x^4 - 9x^2 - 12x$$

$3x$ is the GCF

✓ check w/ Distributive Property

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

$$3x^4 - 9x^2 - 12x \checkmark$$

* Review Problem 3 on pg. 493

* Don't be a slacker, Factor out the Greatest Common Factor

* Got it 3) a) $9x^6 + 15x^4 + 12x^2$
 $3x^2(3x^4 + 5x^2 + 4)$

b) $-6x^4 - 18x^3 - 12x^2$

Factor GCF $6x^2$ or $-6x^2$

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

✓ product of a polynomial w/ \oplus
coefficients & a monomial

* Review Problem 4

* Got it 4) $A_1 = s^2$
 $= (6x)^2$
 $= 36x^2$

$A_2 = \pi r^2$
 $= \pi(3x)^2$
 $= \pi 9x^2$

$A_1 - A_2$ or $36x^2 - 9\pi x^2$

$9x^2(4 - \pi)$

8-2 Practice

Multiplying and Factoring

Form G

Simplify each product.

1. $2x(x + 8)$

2. $(n + 7)5n$

3. $6h^2(7 + h)$

4. $-b^2(b - 10)$

5. $-3c(8 + 2c - c^3)$

6. $y(2y^2 - 3y + 6)$

7. $4t(t^2 - 6t + 2)$

8. $-m(4m^3 - 8m^2 + m)$

9. $7j(-2j^2 - 8j - 3)$

10. $-t^2(2t^4 + 4t - 8)$

11. $2k(-3k^3 + k^2 - 10)$

12. $8a^2(-a^7 + 7a - 7)$

13. $4v^3(2v^2 - 3v + 5)$

14. $5d(-d^3 + 2d^2 - 3d)$

15. $11w(w^2 + 2w + 6)$

Find the GCF of the terms of each polynomial.

16. $15x + 27$

17. $6w^3 - 14w$

18. $63s + 45$

19. $72y^5 + 18y^2$

20. $-18q^3 - 6q^2$

21. $108f^3 - 54$

22. $b^3 + 5b^2 - 20b$

23. $9m^3 + 30m - 24$

24. $4p^3 + 12p^2 - 18p$

25. $2e^2 + 12e - 22$

26. $14b^3 + 21b^2 - 42b$

27. $-12x^3 + 24x^2 - 16x$

28. $8a^4 + 24a^3 - 40a^2$

29. $36j^3 - 3j^2 - 15j$

30. $12j^8 + 30j^4 - 6j^3$

Factor each polynomial.

31. $12x - 9$

32. $18s^2 + 54$

33. $108t^2 - 60t$

34. $-20w^2 + 16w$

35. $32y^3 + 8y^2$

36. $300d^2 - 175d$

37. $12n^3 - 36n^2 + 18$

38. $40t^3 + 25t^2 + 80t$

39. $42x^4 - 56x^3 + 28x^2$

40. $15c^4 + 24c^3 - 6c^2 + 12c$

41. $8m^3 + 14m^2 + 6m$

42. $10x^2 + 50x - 25$

43. $36p^4 + 14p^3 + 35p^2$

44. $9a^5 + 27a^4 + 63a^2$

45. $4b^4 + 20b^3 + 12b$

46. $x^6 - x^4 + x^2$

47. $34g^3 + 51g^2 + 17g$

48. $18h^4 - 27h^2 + 18h$

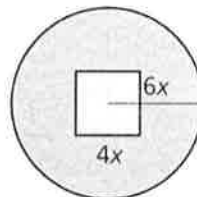
8-2 Practice

Form G

Multiplying and Factoring

(continued)

Area of a Circle = πr^2



49. A circular hedge surrounds a sculpture on a square base. The radius of the hedge is $6x$. The side length of the square sculpture base is $4x$. What is the area of the hedge? Write your answer in factored form.

50. Suppose you are making a giant chocolate chip cookie for a raffle. You roll out a square slab of cookie dough. Then you use a circular plate that touches the edges of the square slab of cookie dough and cut the cookie out of the dough. What is the area of the extra dough? Write your answer in factored form.

Simplify. Write in standard form.

51. $-3x(4x^2 - 6x + 12)$

52. $-7y^2(-4y^3 + 6y)$

53. $9a(-3a^2 + a - 5)$

54. $p(p + 4) - 2p(p - 8)$

55. $t(t + 4) + t(4t^2 - 2)$

56. $6c(2c^2 - 4) - c(8c)$

57. $-5m(2m^3 - 7m^2 + m)$

58. $2q(q + 1) - q(q - 1)$

59. $-n^2(-6n^2 + 2n)$

Factor each polynomial.

60. $15xy^4 + 60x^2y^3$

61. $8m^3n^4 + 32mn^2$

62. $26a^5b^2 + 51a^4$

63. $36j^2k^4 + 24j^4k^2$

64. $12w^4x^3 - 42wx^2$

65. $54c^2d^3 - 36c^3d^2$

66. $12st^4 + 46s^3t^4$

67. $9v^6w^3 + 33v^4w^5$

68. $11e^3f^3 + 132e^2f^4$

69. **Error Analysis** A student factored the polynomial at the right. Describe and correct the error made in factoring.

$$\begin{aligned} & \cancel{63x^4 - 14x^3 + 35x^2} \\ & \cancel{= 7x(9x^3 - 2x^2 + 5x)} \end{aligned}$$

70. **Reasoning** The GCF of two numbers j and k is 8. What is the GCF of $2j$ and $2k$? Justify your answer.

71. A cylinder has a radius of $3m^2n$ and a height of $7mn$. The formula for the volume of a cylinder is $V = \pi r^2 h$, where r is the radius and h is the height. What is the volume of the cylinder? Simplify your answer.

Key

8-2

Practice

Form G

Multiplying and Factoring

Simplify each product.

- | | | |
|---|---|--|
| 1. $2x(x + 8)$
$2x^2 + 16x$ | 2. $(n + 7)5n$
$5n^2 + 35n$ | 3. $6h^2(7 + h)$
$6h^3 + 42h^2$ |
| 4. $-b^2(b - 10)$
$-b^3 + 10b^2$ | 5. $-3c(8 + 2c - c^3)$
$3c^4 - 6c^2 - 24c$ | 6. $y(2y^2 - 3y + 6)$
$2y^3 - 3y^2 + 6y$ |
| 7. $4t(t^2 - 6t + 2)$
$4t^3 - 24t^2 + 8t$ | 8. $-m(4m^3 - 8m^2 + m)$
$-4m^4 + 8m^3 - m^2$ | 9. $7j(-2j^2 - 8j - 3)$
$-14j^3 - 56j^2 - 21j$ |
| 10. $-t^2(2t^4 + 4t - 8)$
$-2t^6 - 4t^3 + 8t^2$ | 11. $2k(-3k^3 + k^2 - 10)$
$-6k^4 + 2k^3 - 20k$ | 12. $8a^2(-a^7 + 7a - 7)$
$-8a^9 + 56a^3 - 56a^2$ |
| 13. $4v^3(2v^2 - 3v + 5)$
$8v^5 - 12v^4 + 20v^3$ | 14. $5d(-d^3 + 2d^2 - 3d)$
$-5d^4 + 10d^3 - 15d^2$ | 15. $11w(w^2 + 2w + 6)$
$11w^3 + 22w^2 + 66w$ |

Find the GCF of the terms of each polynomial.

- | | | |
|---|---|---|
| 16. $15x + 27$
3 | 17. $6w^3 - 14w$
2w | 18. $63s + 45$
9 |
| 19. $72y^5 + 18y^2$
18y ² | 20. $-18q^3 - 6q^2$
-6q ² | 21. $108f^3 - 54$
54 |
| 22. $b^3 + 5b^2 - 20b$
b | 23. $9m^3 + 30m - 24$
3 | 24. $4p^3 + 12p^2 - 18p$
2p |
| 25. $2e^2 + 12e - 22$
2 | 26. $14b^3 + 21b^2 - 42b$
7b | 27. $-12x^3 + 24x^2 - 16x$
4x |
| 28. $8a^4 + 24a^3 - 40a^2$
8a ² | 29. $36j^3 - 3j^2 - 15j$
3j | 30. $12j^8 + 30j^4 - 6j^3$
6j ³ |

Factor each polynomial.

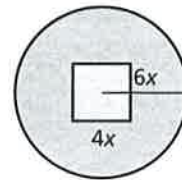
- | | | |
|--|--|---|
| 31. $12x - 9$
$3(4x - 3)$ | 32. $18s^2 + 54$
$18(s^2 + 3)$ | 33. $108t^2 - 60t$
$12t(9t - 5)$ |
| 34. $-20w^2 + 16w$
$-4w(5w - 4)$ | 35. $32y^3 + 8y^2$
$8y^2(4y + 1)$ | 36. $300d^2 - 175d$
$25d(12d - 7)$ |
| 37. $12n^3 - 36n^2 + 18$
$6(2n^3 - 6n^2 + 3)$ | 38. $40t^3 + 25t^2 + 80t$
$5t(8t^2 + 5t + 16)$ | 39. $42x^4 - 56x^3 + 28x^2$
$14x^2(3x^2 - 4x + 2)$ |
| 40. $15c^4 + 24c^3 - 6c^2 + 12c$
$3c(5c^3 + 8c^2 - 2c + 4)$ | 41. $8m^3 + 14m^2 + 6m$
$2m(4m^2 + 7m + 3)$ | 42. $10x^2 + 50x - 25$
$5(2x^2 + 10x - 5)$ |
| 43. $36p^4 + 14p^3 + 35p^2$
$p^2(36p^2 + 14p + 35)$ | 44. $9a^5 + 27a^4 + 63a^2$
$9a^2(a^3 + 3a^2 + 7)$ | 45. $4b^4 + 20b^3 + 12b$
$4b(b^3 + 5b^2 + 3)$ |
| 46. $x^6 - x^4 + x^2$
$x^2(x^4 - x^2 + 1)$ | 47. $34g^3 + 51g^2 + 17g$
$17g(2g^2 + 3g + 1)$ | 48. $18h^4 - 27h^2 + 18h$
$9h(2h^3 - 3h + 2)$ |

8-2 Practice (continued)

Multiplying and Factoring

Form G

49. A circular hedge surrounds a sculpture on a square base. The radius of the hedge is $6x$. The side length of the square sculpture base is $4x$. What is the area of the hedge? Write your answer in factored form. $4x^2(9\pi - 4)$



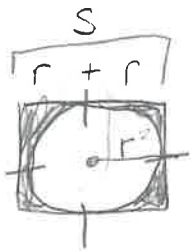
$$A = \pi r^2$$

$$\pi r^2 - lw$$

$$\pi(6x)^2 - 4x(4x)$$

$$36\pi x^2 - 16x^2$$

$$4x^2(9\pi - 4)$$



50. Suppose you are making a giant chocolate chip cookie for a raffle. You roll out a square slab of cookie dough. Then you use a circular plate that touches the edges of the square slab of cookie dough and cut the cookie out of the dough. What is the area of the extra dough? Write your answer in factored form. $r^2(4 - \pi)$

Simplify. Write in standard form.

- | | | |
|---|--|--|
| 51. $-3x(4x^2 - 6x + 12)$
$-12x^3 + 18x^2 - 36x$ | 52. $-7y^2(-4y^3 + 6y)$
$28y^5 - 42y^3$ | 53. $9a(-3a^2 + a - 5)$
$-27a^3 + 9a^2 - 45a$ |
| 54. $p(p + 4) - 2p(p - 8)$
$-p^2 + 20p$ | 55. $t(t + 4) - t(4t^2 - 2)$
$-4t^3 + t^2 + 6t$ | 56. $6c(2c^2 - 4) - c(8c)$
$12c^3 - 8c^2 - 24c$ |
| 57. $-5m(2m^3 - 7m^2 + m)$
$-10m^4 + 35m^3 - 5m^2$ | 58. $2q(q + 1) - q(q - 1)$
$q^2 + 3q$ | 59. $-n^2(-6n^2 + 2n)$
$6n^4 - 2n^3$ |

Factor each polynomial.

- | | | |
|--|---|---|
| 60. $15xy^4 + 60x^2y^3$
$15xy^3(y + 4x)$ | 61. $8m^3n^4 + 32mn^2$
$8mn^2(m^2n^2 + 4)$ | 62. $26a^5b^2 + 51a^4$
$a^4(26ab^2 + 51)$ |
| 63. $36j^2k^4 + 24j^4k^2$
$12j^2k^2(3k^2 + 2j^2)$ | 64. $12w^4x^3 - 42wx^2$
$6wx^2(2w^3x - 7)$ | 65. $54c^2d^3 - 36c^3d^2$
$18c^2d^2(3d - 2c)$ |
| 66. $12st^4 + 46s^3t^4$
$2st^4(6 + 23s^2)$ | 67. $9v^6w^3 + 33v^4w^5$
$3v^4w^3(3v^2 + 11w^2)$ | 68. $11e^3f^3 + 132e^2f^4$
$11e^2f^3(e + 12f)$ |

69. **Error Analysis** A student factored the polynomial at the right. Describe and correct the error made in factoring.

The student did not find the correct GCF. $7x^2(9x^2 - 2x + 5)$

$$\begin{aligned} &63x^4 - 14x^3 + 35x^2 \\ &= 7x(9x^3 - 2x^2 + 5x) \end{aligned}$$

70. **Reasoning** The GCF of two numbers j and k is 8. What is the GCF of $2j$ and $2k$? Justify your answer. 16 The GCF will be the product of 2 and 8.

71. A cylinder has a radius of $3m^2n$ and a height of $7mn$. The formula for the volume of a cylinder is $V = \pi r^2 h$, where r is the radius and h is the height. What is the volume of the cylinder? Simplify your answer. $63\pi m^5 n^3$

$$V = \pi r^2 h$$

$$V = \pi (3m^2n)^2 (7mn)$$

$$V = \pi (9m^4n^2) (7mn)$$

$$V = \pi (63m^5n^3)$$

Still has a factor of "x"

$$8(j) \quad 8(k)$$

$$(2j) \quad 2k$$

$$(16)$$