

EXERCISES

Practice and Problem Solving

For more practice, see *Extra Practice*.

A Practice by Example

Example 1
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Find the GCF of the first two terms and the GCF of the last two terms for each polynomial.

1. $2m^3 + 6m^2 + 3m + 9$

2. $10p^3 - 25p^2 + 4p - 10$

3. $2z^3 + 12z^2 - 5z - 30$

4. $6n^3 + 3n^2 + 2n + 1$

Factor each expression.

5. $6n^3 + 8n^2 + 3n + 4$

6. $14t^3 + 21t^2 + 16t + 24$

7. $27t^3 + 45t^2 - 3t - 5$

8. $13y^3 - 8y^2 + 13y - 8$

9. $45x^3 + 20x^2 + 9x + 4$

10. $10w^3 + 16w^2 - 15w - 24$

Example 2
(page 497)

Factor completely.

11. $12v^3 - 32v^2 + 6v - 16$

12. $7q^4 - 4q^3 + 28q^2 - 16q$

13. $20m^3 - 18m^2 + 40m - 36$

14. $6x^4 + 4x^3 - 6x^2 - 4x$

15. $12y^3 - 20y^2 + 30y - 50$

16. $9c^3 - 12c^2 + 18c - 24$

Example 3
(page 497)

Factor by grouping.

17. $12p^2 + 16p + 5$

18. $16t^2 + 24t + 9$

19. $18n^2 + 57n - 10$

20. $9w^2 - 27w + 20$

21. $24m^2 + 8m - 2$

22. $36v^2 - 9v - 7$

23. $6x^2 + 11x - 10$

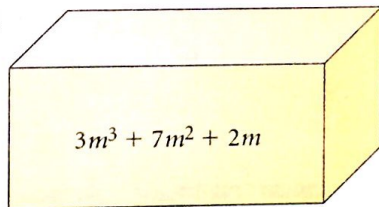
24. $20v^2 - 41v + 9$

25. $63q^2 - 52q - 20$

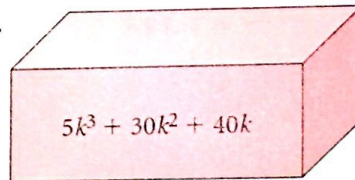
Example 4
(page 498)

Find expressions for the possible dimensions of each rectangular prism.

26.



27.



B Apply Your Skills

Factor completely.

28. $7h^3 - 35h^2 - 42h$

29. $60t^3 - 200t^2 - 66t + 220$

30. $8d^3 + 16d^2 + 24d + 48$

31. $12x^2 - 4xy - 56y^2$

32. $54r^3 - 45r^2 + 9r$

33. $150k^3 + 350k^2 + 180k + 420$

34. a. Factor $(28x^3 - 7x^2) + (36x - 9)$.

b. Factor $(28x^3 + 36x) + (-7x^2 - 9)$.

c. **Critical Thinking** Why can you factor the same polynomial using different pairs of terms?


Write each expression in standard form and factor.

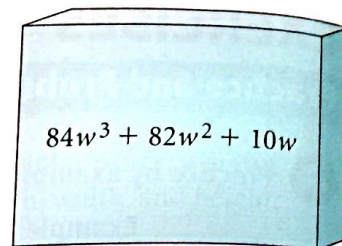
35. $-8w + 49w^2 + 14w^3 - 28$

36. $2m^3 + 16 - m - 32m^2$


37. $-6 + 44t^3 - 4t^2 + 66t$

38. $2 - 50x - x^2 + 25x^3$

-  **39. Geometry** The polynomial shown at the right represents the volume of the rectangular prism. Factor the polynomial to find possible expressions for the length, width, and height of the prism.



- 40. Open-Ended** Write a four-term polynomial that can be factored by grouping. Factor your polynomial.

-  **41. Writing** Describe how to factor the expression $10x^3 - 15x^2 + 2x - 3$ by grouping.

 **Challenge**

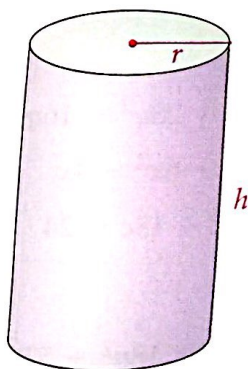
Factor by grouping.


42. $30m^5 + 24m^3n - 35m^2n^2 - 28n^3$

43. $x^2p + x^2q^5 + yp + yq^5$

44. $h^3 + 11h^2 - 4h - 44$

45. $w^6 - w^4 - 9w^2 + 9$



-  **46. Geometry** The polynomial $2\pi x^3 - 12\pi x^2 + 18\pi x$ represents the volume of a cylinder. The formula for volume of a cylinder is $V = \pi r^2 h$.

a. Factor $2\pi x^3 - 12\pi x^2 + 18\pi x$.

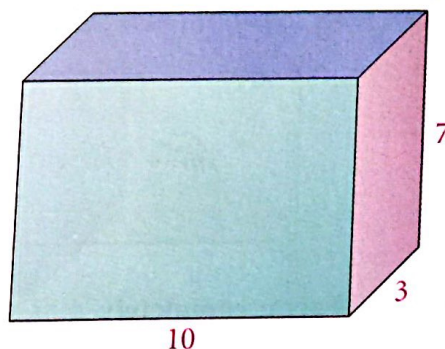
b. Based on your answer to part (a), write an expression for a possible radius of the cylinder.

The number 63 can be written as $2^5 + 2^4 + 2^3 + 2^2 + 2^1 + 2^0$. For exercises 47 and 48, factor each expression by grouping. Then simplify the powers of 2 to write 63 as the product of two numbers.

47. $(2^5 + 2^4 + 2^3) + (2^2 + 2^1 + 2^0)$

48. $(2^5 + 2^4) + (2^3 + 2^2) + (2^1 + 2^0)$

- 49. a. Open-Ended** For the rectangular prism below, let $x = 3$. Write linear expressions for the length, width, and height of the prism.



- b.** Using your answers from part (a), write a polynomial that represents the volume of the prism.