

Practice

Form G

Factoring by Grouping

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

1. $12x^3 + 3x^2 + 20x + 5$

$3x^2, 5$

2. $6v^3 + 42v^2 + 5v + 35$

$6v^2, 5$

3. $8t^3 + 36t^2 + 2t + 9$

$4t^2, 1$

4. $10s^3 + 35s^2 + 6s + 21$

$5s^2, 3$

5. $9m^3 - 6m^2 + 12m - 8$

$3m^2, 4$

6. $8w^3 + 6w^2 - 28w - 21$

$2w^2, -7$

7. $7r^3 + 16r^2 - 9r - 72$

$r^2, -9$

8. $21x^3 - 28x^2 - 6x + 8$

$7x^2, -2$

Factor each expression.

9. $8j^3 + 4j^2 + 10j + 5$

$(4j^2 + 5)(2j + 1)$

10. $2m^3 + 8m^2 + 9m + 36$

$(2m^2 + 9)(m + 4)$

11. $10s^3 + 25s^2 + 8s + 20$

$(5s^2 + 4)(2s + 5)$

12. $6x^3 + 9x^2 + 2x + 3$

$(3x^2 + 1)(2x + 3)$

13. $21x^3 + 6x^2 - 28x - 8$

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

14. $8w^3 + 12w^2 + 10w + 15$

$(4w^2 + 5)(2w + 3)$

15. $18r^3 - 12r^2 + 21r - 14$

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

16. $36n^3 - 27n^2 - 8n + 6$

$(9n^2 - 2)(4n - 3)$

17. $110b^3 + 77b^2 - 60b - 42$

$(11b^2 - 6)(10b + 7)$

18. $64d^3 - 40d^2 - 24d + 15$

$(8d^2 - 3)(8d - 5)$

19. $10s^3 + 80s^2 - 7s - 56$

$(10s^2 - 7)(s + 8)$

20. $25j^3 + 15j^2 - 5j - 3$

$(5j^2 - 1)(5j + 3)$

21. $24c^3 - 84c^2 + 10c - 35$

$(12c^2 + 5)(2c - 7)$

22. $27f^3 + 9f^2 - 24f - 8$

$(9f^2 - 8)(3f + 1)$

Practice (continued)

Form G

Factoring by Grouping

Factor completely.

23. $32x^3 + 8x^2 + 48x + 12$

$4(2x^2 + 3)(4x + 1)$

25. $32k^4 - 16k^3 + 12k^2 - 6k$

$2k(8k^2 + 3)(2k - 1)$

27. $30b^4 - 45b^3 - 10b^2 + 15b$

$5b(3b^2 - 1)(2b - 3)$

29. $63j^4 + 84j^3 - 18j^2 - 24j$

$3j(7j^2 - 2)(3j + 4)$

31. $12e^4 + 18e^3 + 36e^2 + 54e$

$6e(e^2 + 3)(2e + 3)$

24. $45w^4 - 36w^3 + 15w^2 - 12w$

$3w(3w^2 + 1)(5w - 4)$

26. $6g^3 + 18g^2 + 60g + 180$

$6(g^2 + 10)(g + 3)$

28. $32m^3 + 72m^2 - 80m - 180$

$4(2m^2 - 5)(4m + 9)$

30. $96n^3 - 240n^2 - 168n + 420$

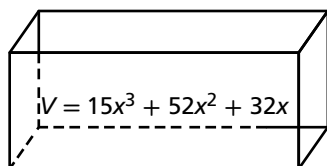
$12(4n^2 - 7)(2n - 5)$

32. $60a^5 - 72a^4 - 210a^3 + 252a^2$

$6a^2(2a^2 - 7)(5a - 6)$

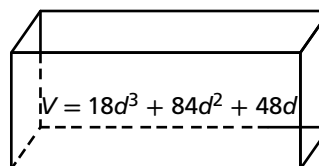
Find linear expressions for the possible dimensions of each rectangular prism.

33.



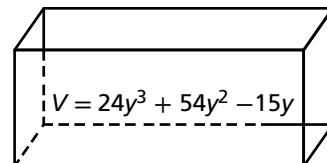
$x, 5x + 4, 3x + 8$

34.



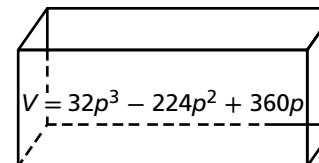
$6d, 3d + 2, d + 4$

35.



$3y, 4y - 1, 2y + 5$

36.



$8p, 2p - 5, 2p - 9$

37. A shipping box in the shape of a rectangular prism has a volume of $12x^3 + 32x^2 + 20x$. What linear expressions can represent possible dimensions of the box?

$4x, 3x + 5, x + 1$

38. **Error Analysis** Describe and correct the error made in factoring completely.

~~$$16x^4 + 24x^3 + 64x^2 + 96x = 4x(4x^3 + 6x^2 + 16x + 24)$$

$$= 4x[2x^2(2x + 3) + 8(2x + 3)]$$

$$= 4x(2x^2 + 8)(2x + 3)$$~~

In the first step, the GCF is $8x$, not $4x$.39. **Open-Ended** Write a 3-term expression for the volume of a rectangular prism that you can factor by grouping. Factor your polynomial.

Answers may vary. Sample: $x^5 + 4x^4 + 3x^3 = x^3(x + 3)(x + 1)$