4.2 Exercises

Multiply or divide as indicated. Write all answers in lowest terms. See Examples 1–4.

1. $\frac{m^3}{2} \cdot \frac{4m}{m^4}$

2. $\frac{3y^4}{5y} \cdot \frac{8y^2}{9}$

3. $\frac{6a^4}{a^3} \div \frac{12a^2}{a^5}$

4. $\frac{11p^3}{p^2} \div \frac{22p^4}{p}$

5. $\frac{6y^5x^6}{y^3x^4} \cdot \frac{y^4x^2}{3y^5x^7}$

6. $\frac{6p^2q^3}{4p^3q} \cdot \frac{18p^2q^3}{12p^3q^2}$

7. $\frac{25a^2b}{60a^3b^2} \div \frac{5a^2b^2}{16a^2b}$

8. $\frac{8s^4t^2}{5t^6} \div \frac{s^3t^2}{10s^2t^4}$

9. $\frac{(-3mn)^2 \cdot (4m^2n)^3}{16m^2n^4(mn^2)^3} \div \frac{24(m^2n^2)^4}{(3m^2n^3)^2}$

10. $\frac{(-4a^2b^3)^2 \cdot (3a^2b^4)^2}{(2a^2b^3)^4 \cdot (3a^3b)^2} \div \frac{(ab)^4}{(a^2b^3)^2}$

11. $\frac{(5pq^2)^2}{60p^3q^6} \div \frac{5p^2q^2}{16p^2q^3}$

12. $\frac{(6s^2t)^2}{(5^4t^5)^3} \div \frac{s^3t^2x^2}{3x^5t}$

13. $\frac{2r}{8r + 4} \cdot \frac{14r + 7}{3}$

14. $\frac{6a - 10}{5a} \cdot \frac{3}{9a - 15}$

15. $(7k + 7) \div \frac{4k + 4}{5}$

16. $(8y - 16) \div \frac{3y - 6}{10}$

17. $(z^2 - 1) \cdot \frac{1}{1 - z}$

18. $(y^2 - 4) \div \frac{2 - y}{8y}$

19. $\frac{p^2 - 36}{p + 1} \div \frac{6 - p}{p}$

20. $\frac{m^2 - 16}{5m} \cdot \frac{2}{4 - m}$

21. $\frac{6r - 5s}{3r + 2s} \cdot \frac{6r + 4s}{5s - 6r}$

22. $\frac{9y - 12x}{y + x} \div \frac{4x - 3y}{x + y}$

23. $\frac{m^2 + 6m + 9}{m^2 - 9} \cdot \frac{m^2 - 6m + 9}{m + 3}$

24. $\frac{k^2 - 4k + 4}{k^2 - 4} \div \frac{k^2 + 4k + 4}{k + 2}$

25. $\frac{2r^2 + 5r - 3}{r^2 - 1} \cdot \frac{r^2 - 2r + 1}{2r^2 - 7r + 3}$

26. $\frac{2p^2 + 9p + 10}{p^2 + 5p + 6} \cdot \frac{p^2 + 7p + 12}{2p^2 + 3p - 5}$

27. $\frac{a^2 - 16}{a^2 + a - 12} \cdot \frac{a^2 + 5a + 6}{a^2 - 2a - 8}$

28. $\frac{m^2 - 3m - 10}{m^2 + 3m + 2} \cdot \frac{m^2 - 2m - 3}{m^2 + 2m - 15}$

29. $\frac{6a^2 + a - 1}{6a^2 + 5a + 1} \div \frac{3a^2 + 2a - 1}{3a^2 + 4a + 1}$

30. $\frac{2n^2 + 5mn + 2m^2}{4n^2 - m^2} \cdot \frac{2n^2 + mn - m^2}{n^2 + nm - 2m^2}$

31. $\frac{15x^2 - xy - 2y^2}{15x^2 + 11xy + 2y^2} \div \frac{15x^2 + 4xy - 4y^2}{15x^2 + xy - 2y^2}$

32. $\frac{18w^2 + 3wx - 10x^2}{6w^2 + 11wx - 10x^2} \cdot \frac{6w^2 + 19wx + 10x^2}{3w^2 + 11wx + 6x^2}$

33. $\frac{6k^2 + kr - 2r^2}{6k^2 - 5kr + r^2} \div \frac{3k^2 + 17kr + 10r^2}{6k^2 + 13kr - 5r^2}$

34. $\frac{16m^2 - 9n^2}{16m^2 - 24mn + 9n^2} \div \frac{16m^2 + 24mn + 9n^2}{16m^2 - 16mn + 3n^2}$

35. $\frac{ac - ad + bc - bd}{ac + ad + bc + bd} \cdot \frac{mc + md - nc - nd}{mc - md + nc - nd}$

36. $\frac{pr + ps + qr + qs}{pr - ps - qr + qs} \cdot \frac{pr + ps - qr - qs}{pr - ps + qr - qs}$

37. $\frac{am - an + bm - bn}{am + an - bm - bn} \div \frac{am - an - 3bm + 3bn}{am + an - 3bm - 3bn}$

38. $\frac{12 + 4y - 3x - xy}{24 + 8y - 3x - xy} \cdot \frac{32 + 8y - 4x - xy}{16 - 4y - 4x + xy}$

39. $\frac{m^3 + m + m^2 + 1}{m^3 + m^2 + mn^2 + n^2} \div \frac{m^3 + m + m^2n + n}{2m^2 + 2mn - mn^2 - n^3}$

40. $\frac{a^4 - a^3 + a^2 - a}{2a^3 + 2a^2 + a + 1} \cdot \frac{2a^3 - 8a^2 + a - 4}{a^3 - 4a^2 + a - 4}$

41. $\frac{x^2 + 2x + 1}{x - 2} \cdot \frac{x^2 - 5x + 6}{x + 1} \cdot \frac{5x - 20}{x - 3}$

42. $\frac{2z^2 - z - 15}{z^2 - z - 20} \cdot \frac{z - 5}{2z + 5} \cdot \frac{z + 12z + 35}{z^2 + 4z - 21}$

43. $\frac{p^2 - q^2}{(p - q)^2} \div \frac{p^2 - 2pq + q^2}{p^2 - pq + q^2} \cdot \frac{(p - q)^4}{p^3 + q^3}$

44. $\frac{(g + h)^2}{g - h} \cdot \frac{g^3 - h^3}{g^2 - h^2} \div \frac{g^2 + gh + h^2}{(g - h)^2}$

45. $\frac{6k^2 - 13k - 5}{k^2 + 7k} \cdot \frac{k^3 + 6k^2 - 7k}{2k - 5} \cdot \frac{k^2 - 5k + 6}{3k^2 - 8k - 3}$

46. $\frac{2r^3 + 3r^2 - 2r}{3r - 15} \cdot \frac{r^2 - 3r - 10}{2r^3 - r^2} \cdot \frac{5r^2 - 10r}{3r^2 + 12r + 12}$

47. $\frac{x^3 - y^3}{(x + y)(x^2 - xy + y^2)} \cdot \frac{x^3 + y^3}{(x - y)(x^2 + xy + y^2)}$

48. $\frac{(3p - q)(9p^2 + 3pq + q^2)}{27p^3 - q^3} \cdot \frac{(3p + q)(9p^2 - 3pq + q^2)}{27p^3 + q^3}$

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1. 2 **3.** $a^4/2$ **5.** $2y/x^3$ **7.** $4/(3a^3b^2)$ **9.** $27/(2mn^7)$ **11.** $4/(3pq)$ **13.** $7r/6$
15. 35/4 **17.** $-(z + 1)$ or $-z - 1$ **19.** $-p(p + 6)/(p + 1)$ **21.** -2 **23.** $m - 3$
25. $(r + 3)(r - 1)/[(r + 1)(r - 3)]$ **27.** $(a + 3)/(a - 3)$ **29.** 1 **31.** $(3x - y)/(3x + 2y)$
33. $(2k + 5r)/(k + 5r)$ **35.** $(m - n)/(m + n)$ **37.** $(a + b)/(a - b)$
39. $(2m - n^2)/(m^2 + n^2)$ **41.** $5(x + 1)(x - 4)$ **43.** $p - q$ **45.** $(k - 1)(k - 2)$ **47.** 1
49. $x^2(x - 2 + y)/(x - 2 - y)$ **51.** $(a + 5)(a - 1)/(3a^2 - 2a + 1)$ **53.** 1/2 **55.** 3/4
57. 11/48 **59.** $-11/40$