

Simplify each expression. Write answers with *positive* exponents only.

1. $a^7 \cdot a^2$
 a^9

2. $a^4 \cdot a^3$
 a^7

3. $(a^7)^2$
 a^{14}

4. $(a^4)^3$
 a^{12}

5. $(-x^5)^2$
 x^{10}

6. $(-x^2)^5$
 $-x^{10}$

7. $(xy^2)^4$
 x^4y^8

8. $(x^2y^3)^5$
 $x^{10}y^{15}$

9. $(2t^5)^3$
 $8t^{15}$

10. $(3rs^3t^5)^2$
 $9r^2s^6t^{10}$

11. $(-2r^3st^2)^3$
 $-8r^9s^3t^6$

12. $5x^3 \cdot 2x^2$
 $10x^5$

13. $-2r^5 \cdot 6r^8$
 $-12r^{13}$

14. $(4bd^2)(b^3d^5)$
 $4b^4d^7$

15. $(-6b^4d^3)(2bd)$
 $-12b^5d^4$

16. $\frac{n^{12}}{n^3}$
 n^9

17. $\frac{6n^2}{3n^5}$
 $\frac{2}{n^3}$

18. $\frac{m^6n^4}{m^2n}$
 m^4n^3

19. $\frac{-8s^4t}{16st^4}$
 $-\frac{1s^3}{2t^3}$

20. $\frac{15p^3q^2}{618p^2q^7}$
 $\frac{5p}{6q^5}$

21. $\left(\frac{x^3}{9}\right)^2 \frac{x^6}{81}$

22. $\left(\frac{2x^4}{5y^3}\right)^3 \frac{8x^{12}}{125y^9}$

*23. $(-r)^2(-r)^6(-r^4)$
 $r^2 \cdot r^6(-r^4)$
 $-r^{12}$

*24. $(2r^2)^3(3r)^2$
 $(8r^6)(9r^2)$
 $72r^8$

25. $\left(\frac{3}{x^5y^{-3}}\right)^{-2} \left(\frac{x^5y^{-3}}{3}\right)^2 = \frac{x^{10}}{9y^6}$

Mixed Answers: ~~a^9~~ ; ~~a^9~~ ; ~~a^{12}~~ ; ~~a^{14}~~ ; ~~$-x^{10}$~~ ; ~~x^{10}~~ ; ~~x^4y^8~~ ; ~~$x^{10}y^{15}$~~ ; ~~n^9~~ ; ~~m^4n^3~~ ; ~~$10x^5$~~ ; ~~$-r^{12}$~~ ; ~~$-12r^{13}$~~ ; ~~$72r^8$~~ ; ~~$8t^{15}$~~ ; ~~$-12b^5d^4$~~ ; ~~$4b^4d^7$~~ ; ~~$-8r^9s^3t^6$~~ ; ~~$9r^2s^6t^{10}$~~ ; ~~$\frac{5p}{6q^5}$~~ ; ~~$\frac{x^6}{81}$~~ ; ~~$\frac{8x^{12}}{125y^9}$~~ ; ~~$-\frac{s^3}{2t^3}$~~ ; ~~$\frac{2}{n^3}$~~ ; ~~$\frac{a^5}{16}$~~ ; ~~$-6xy^2 + \frac{12x^5}{y} - 3x^2y$~~ ; ~~$\frac{x^{10}}{9y^6}$~~ ; ~~$x^2y^4$~~

Simplify each expression. Write answers with positive exponents only.

1. $(r^3s^5)(2r^2s)^6$

$(r^3s^5)(64r^{12}s^6)$
 $(64r^{15}s^{11})$

2. $(-5a^3b^6)^2(-2ab^5)^3$
 $(25a^6b^{12})(-8a^3b^{15})$
 $-200a^9b^{27}$

3. $(-p^3)(pq^3)(-p^2q)$
 p^6q^4

4. $-x^4(7x^4-x^3+10x+8)$
 $-7x^8+x^7-10x^5-8x^4$

5. $-3x^4(5x^2+3x-2)$
 $-15x^6-9x^5+6x^4$

6. $x^3y^2(x^2-5xy-2y^2)$
 $x^5y^2-5x^4y^3-2x^3y^4$

7. $t^3 \cdot t^{k-1}$
 $t^{3+k-1} = t^{k+2}$

8. $x^{m-2} \cdot x^{m+2} \cdot x$
 $x^{m-2+m+2+1}$
 x^{2m+1}

9. $(a^t)^2(a^{3t})^4$
 $a^{2t} \cdot a^{12t} = a^{14t}$

10. $\frac{5xy}{12} \cdot \frac{8x^2}{16y^3}$
 $\frac{4x^3y}{3y^3}$
 $\frac{4x^3}{3y^2}$

11. $\frac{p^3}{q} \left(\frac{3q^4}{-p} \right)^2$
 $\frac{p^3}{q} \cdot \frac{9q^8}{p^2} = 9q^7p$

12. $\left(\frac{3x}{4y^3} \right)^2 \left(\frac{2y^5}{x^4} \right)^3$
 $\frac{9x^2}{216y^6} \cdot \frac{8y^{15}}{x^{12}}$

13. $\frac{(x^2y^3)^2}{(x^3y)^2}$
 $\frac{x^4y^6}{x^6y^2}$
 $\frac{y^4}{x^2}$

14. $\frac{(3ab^3c)^2}{(2a^3bc^2)^3}$
 $\frac{9a^2b^6c^2}{8a^9b^3c^6}$
 $\frac{9b^3}{8a^7c^4}$

15. $\frac{5x(8x^4)^2}{4x^9}$
 $\frac{5x(64x^8)}{14x^9}$
 $\frac{9y^9}{2x^{10}}$
 $\frac{80x^9}{x^9} = 80$

16. $10^{-2} \frac{1}{10^2} = \frac{1}{100}$

17. $(-4)^{-1} = -\frac{1}{4}$

18. $17^0 = 1$

19. $5t^{-3} = \frac{5}{t^3}$

20. $-8a^{-2} = -\frac{8}{a^2}$

21. $(-8a)^{-2} = \frac{1}{(-8a)^2} = \frac{1}{64a^2}$

22. $2^{-1} \cdot 2^0 \cdot h^{-5} = \frac{1}{2} \cdot \frac{1}{h^5} = \frac{1}{2h^5}$

23. $(-2)^2 \cdot (-2)^{-5} = 4 \cdot \left(\frac{-1}{2^5} \right) = \frac{4}{32} = \frac{1}{8}$

24. $\left(\frac{5^{-2}}{25} \right)^3 = \frac{1}{15625}$

25. $\frac{3^2}{3^{-2}} = 3^2 \cdot 3^2 = 3^4 = 81$

26. $\frac{x^{-5}}{x^{-2}} = \frac{x^2}{x^3} = \frac{1}{x^3}$

27. $\frac{s^{-3}t^{-4}}{s^{-2}t^0} = \frac{s^2}{s^3t^4} = \frac{1}{st^4}$

Answers: $64r^{15}s^{11}$; $-200a^9b^{27}$; p^6q^4 ; $-7x^8+x^7-10x^5-8x^4$; $-15x^6-9x^5+6x^4$; $x^5y^2-5x^4y^3-2x^3y^4$; t^{k+2} ; x^{2m+1} ; a^{14t} ; $\frac{4x^3}{3y^2}$; $9pq^7$; $\frac{9y^9}{2x^{10}}$; $\frac{y^4}{x^2}$; $\frac{9b^3}{8a^7c^4}$; 80 ; $\frac{1}{100}$; $-\frac{1}{4}$; 1 ; $\frac{5}{t^3}$; $-\frac{8}{a^2}$; $\frac{1}{64a^2}$; $\frac{1}{2h^5}$; $-\frac{1}{8}$; $\frac{1}{15625}$; 81 ; $\frac{1}{x^3}$; $\frac{1}{st^4}$