LCDs of Rational Expressions

TEKS A.4.A

A **rational expression** is a fraction whose numerator and denominator are nonzero polynomials. The **least common denominator (LCD)** of two rational expressions is the least common multiple of the denominators. To find the LCD, follow these three steps:

STEP 1 **Write** each denominator as the product of its factors.

STEP 2 **Write** the product consisting of the highest power of each factor that appears in either denominator.

STEP 3 **Simplify** the product from Step 2 to write the LCD.

EXAMPLE

Find the least common denominator of the rational expressions.

a. $\frac{2}{5xy}$ and $\frac{2}{y^3}$

STEP 1 **Factors:**
$5xy = 5 \cdot x \cdot y$
$y^3 = y^3$

STEP 2 **Product:** $5 \cdot x \cdot y^3$

STEP 3 **LCD:** $5xy^3$

b. $\frac{3}{8x^2}$ and $\frac{1}{12x}$

Factors:
$8x^2 = 2^3 \cdot x^2$
$12x = 2^2 \cdot 3 \cdot x$

Product: $2^3 \cdot 3 \cdot x^2$

LCD: $24x^2$

c. $\frac{-1}{3x+6}$ and $\frac{x}{x^2-3x-10}$

Factors:
$3x + 6 = 3 \cdot (x + 2)$
$x^2 - 3x - 10 = (x + 2) \cdot (x - 5)$

Product: $3 \cdot (x + 2) \cdot (x - 5)$

LCD: $3(x + 2)(x - 5)$

PRACTICE

Find the least common denominator of the rational expressions.

1. $\frac{1}{2ab}$ and $\frac{4}{a^2}$
2. $\frac{5}{6k^2}$ and $\frac{6}{7k^2}$
3. $\frac{2}{z^3}$ and $\frac{2}{z^2}$
4. $\frac{4}{5x}$ and $\frac{-3}{10x}$
5. $\frac{m}{14}$ and $\frac{1}{18m}$
6. $\frac{19}{20xy}$ and $\frac{3}{16xy}$
7. $\frac{1}{3y^2}$ and $\frac{1}{3y}$
8. $\frac{-4}{9ab^2}$ and $\frac{2}{21a^2b}$
9. $\frac{n}{n+2}$ and $\frac{n^2}{n-2}$
10. $\frac{-1}{x-1}$ and $\frac{3}{x+3}$
11. $\frac{-8}{5n+5}$ and $\frac{4}{n+1}$
12. $\frac{y}{8}$ and $\frac{1}{2y+8}$
13. $\frac{1}{2m-6}$ and $\frac{2}{3m-9}$
14. $\frac{a}{n^2}$ and $\frac{-a}{n^2-6n}$
15. $\frac{1}{x-4}$ and $\frac{1}{(x-4)^2}$
16. $\frac{3}{4x+12}$ and $\frac{4}{6x+18}$
17. $\frac{1}{2n^3}$ and $\frac{-9}{10n^2+8n}$
18. $\frac{10}{15b-30}$ and $\frac{17b}{9b-18}$
19. $\frac{-5}{(k+3)^4}$ and $\frac{3}{(k+3)^2}$
20. $\frac{1}{y-5}$ and $\frac{8}{3y-15}$
21. $\frac{n^2}{10n+20}$ and $\frac{n}{7n+14}$
22. $\frac{20}{5z-40}$ and $\frac{1}{9z-56}$
23. $\frac{2a}{a^2+4a+4}$ and $\frac{2}{a+2}$
24. $\frac{1}{2z-6}$ and $\frac{-1}{z^2-z-6}$
25. $\frac{3k}{k-3}$ and $\frac{-k}{k^2-5k+6}$
26. $\frac{x}{x^2-9}$ and $\frac{-x}{x^2+3x-18}$
27. $\frac{m^2}{m^2-11m+28}$ and $\frac{-5}{m^2+5m-45}$