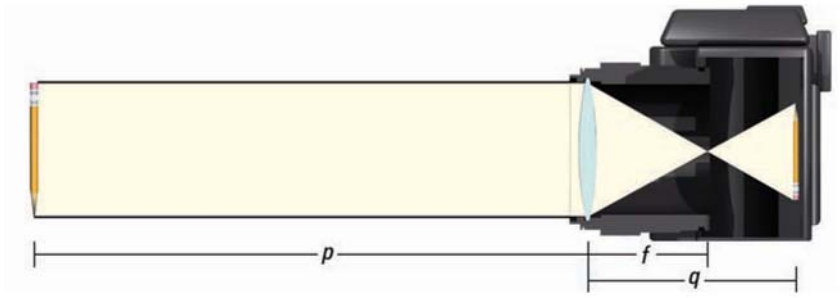
EXAMPLE 5 Simplify a complex fraction (Method 1)

PHYSICS Let f be the focal length of a thin camera lens, p be the distance between an object being photographed and the lens, and q be the distance between the lens and the film. For the photograph to be in focus, the variables should satisfy the *lens equation* below. Simplify the complex fraction.

Lens equation: $f = \dfrac{1}{\frac{1}{p} + \frac{1}{q}}$



Solution

$$f = \frac{1}{\frac{1}{p} + \frac{1}{q}} = \frac{1}{\frac{q}{pq} + \frac{p}{pq}} = \frac{1}{\frac{q+p}{pq}}$$ Write denominator as a single fraction.

$$= \frac{pq}{q+p}$$ Divide numerator by denominator.

EXAMPLE 6 Simplify a complex fraction (Method 2)

Simplify: $\dfrac{\frac{5}{x+4}}{\frac{1}{x+4} + \frac{2}{x}}$

Solution

The LCD of all the fractions in the numerator and denominator is $x(x + 4)$.

$$\frac{\frac{5}{x+4}}{\frac{1}{x+4} + \frac{2}{x}} = \frac{\frac{5}{x+4}}{\frac{1}{x+4} + \frac{2}{x}} \cdot \frac{x(x+4)}{x(x+4)}$$ Multiply numerator and denominator by the LCD.

$$= \frac{5x}{x + 2(x+4)}$$ Simplify.

$$= \frac{5x}{3x+8}$$ Simplify.

✓ GUIDED PRACTICE for Examples 5 and 6

Simplify the complex fraction.

11. $\dfrac{\frac{x}{6} - \frac{x}{3}}{\frac{x}{5} - \frac{7}{10}}$

12. $\dfrac{\frac{2}{x} - 4}{\frac{2}{x} + 3}$

13. $\dfrac{\frac{3}{x+5}}{\frac{2}{x-3} + \frac{1}{x+5}}$