

Simplify.

10) $\frac{1}{2x} + \frac{1}{2x} = \frac{2}{2x}$

$\frac{1}{x}$

11) $\frac{d-3}{2d+1} + \frac{d-1}{2d+1}$

$\frac{d-3+d-1}{2d+1} = \frac{2d-4}{2d+1}$

12) $\frac{5y+2}{xy^2} + \frac{2x-4}{4xy}$

$\frac{5y+2}{xy^2} + \frac{2(x-2)}{4xy}$

$\frac{2(5y+2) + y(x-2)}{2xy^2}$

$\frac{10y+4+xy-2y}{2xy^2}$

$\frac{8y+xy+y}{2xy^2}$

13) $\frac{5x}{x^2-9} + \frac{2}{x+4}$

$\frac{5x}{(x+3)(x-3)} + \frac{2}{x+4}$
 $\frac{5x(x+4) + 2(x^2-9)}{x(x+4)(x^2-9)}$

14) $\frac{-3x}{x^2-9} + \frac{4}{2x-6}$

$\frac{-3x}{(x+3)(x-3)} + \frac{4 \cdot 2}{2(x-3)} \cdot \frac{(x+3)}{(x+3)}$

$\frac{-x+6}{x^2-9}$

21) $\frac{2x}{x^2-x-2} - \frac{4x}{x^2-3x+2}$

$\frac{2x}{(x-1)(x-2)(x+1)} - \frac{4x}{(x-2)(x-1)(x+1)}$
 $\frac{2x^2-2x-4x^2-4x}{(x-1)(x-2)(x+1)}$

$\frac{-2x^2-6x}{(x-1)(x-2)(x+1)}$

19) $\frac{3x+9}{x} - \frac{x^2+3x}{8}$

$\frac{3(x+3)}{x} - \frac{x(x+3)}{8}$
 $\frac{x^2-24}{3x(x+3)}$

22) $\frac{x}{2} \cdot \frac{1}{y}$

$\frac{1}{x} \cdot \frac{y}{2} = \frac{y}{2x}$

23) $\frac{1-\frac{4}{5}}{\frac{3}{5}} = \frac{\frac{5-4}{5}}{\frac{3}{5}} = \frac{1}{3}$

$\frac{3}{4} \cdot \frac{5}{7} = \frac{15}{28}$

24) $\frac{x+y}{3}$

$\frac{2}{x+y} \cdot \frac{1}{3}$

$\frac{2}{3(x+y)}$

26) $\frac{1}{\frac{y}{x} + \frac{x}{y}} \cdot \frac{1}{\frac{x+y}{y}}$

$\frac{y}{x+y}$

28) $\frac{\frac{2}{x+y}}{\frac{5}{x+y}}$

$\frac{2}{x+y} \cdot \frac{x+y}{5}$

$\frac{2}{5}$

$x+y \neq 0$

29) $\frac{\frac{3}{x-4}}{\frac{x-4}{x-4} - \frac{2}{x-4}}$

$\frac{3}{x-4} \cdot \frac{x-4}{x-6}$

$\frac{3}{x-6}$

$x \neq 4$

$$34) \frac{4}{x^2-9} + \frac{7}{x+3} \frac{(x-3)}{(x-3)}$$

$$\frac{4+7x-21}{(x+3)(x-3)}$$

$$\frac{7x-17}{(x+3)(x-3)}$$

$$35) \frac{x+2}{x-1} + \frac{x-3}{2x+1}$$

$$\frac{(x+2)(2x+1) + (x-3)(x-1)}{(2x+1)(x-1)}$$

$$\frac{2x^2+5x+2+x^2-4x+3}{(2x+1)(x-1)}$$

$$36) \frac{x}{2x^2} + \frac{1}{2x} \cdot \frac{x}{x}$$

$$\frac{x+x}{2x^2} = \frac{2x}{2x^2}$$

$$\frac{x}{x^2}$$

$$\frac{1}{x}$$

$$47) \frac{\frac{y}{xy} - \frac{1}{y^2} \cdot \frac{x}{x}}{\frac{1}{x^2y} - \frac{1}{xy^2} \cdot \frac{x}{x}}$$

$$\frac{\frac{y-x}{xy^2}}{\frac{y-x}{x^2y^2}}$$

$$\frac{y-x}{xy^2} \cdot \frac{x^2y^2}{y-x} = \boxed{x}$$

$y \neq 0$
 $x \neq 0$
 $y-x \neq 0$

$$48) \frac{\frac{2}{x+4} + 2}{1 + \frac{3}{x+4}}$$

$$\frac{2+2(x+4)}{x+4}$$

$$\frac{x+4+3}{x+4}$$

$$\frac{2+2x+8}{x+4} \cdot \frac{x+4}{x+7}$$

$$\frac{2x+10}{x+7}$$

$x \neq -4$

53) a. If you jog 12 miles at a rate of 4 mph and walk the same route back at a rate of 3 mph, you have traveled 24 miles in 7 hours, and your overall average rate is $\frac{24}{7}$ mph. What is your overall average rate if you traveled d miles at 3 mph and d miles at 4 mph?

$$\text{Avg Rate} = \frac{\text{total distance}}{\text{total time}} = \frac{2d}{\frac{d}{3} + \frac{d}{4}} = \frac{2d}{\frac{4d+3d}{12}}$$

$$d = rt$$

$$d = 3t_1 \quad t_1 = \frac{d}{3}$$

$$d = 4t_2 \quad t_2 = \frac{d}{4}$$

$$= 2d \cdot \frac{12}{7d} = \boxed{\frac{24}{7} \text{ mph}}$$

b. Find your average speed if you traveled to a city at 50 mph and returned at 40 mph.

$$d = rt$$

$$t_1 = \frac{d}{50}$$

$$t_2 = \frac{d}{40}$$

$$\frac{2d}{\frac{d}{50} + \frac{d}{40}} = \frac{2d}{\frac{40d+50d}{2000}} = 2d \cdot \frac{2000}{90d} = \frac{4000}{90} = \frac{400}{9}$$

$$= \boxed{44.4 \text{ mph}}$$

c. You travel to a city at x mph and the return trip is b mph faster. Express your average rate in terms of x and b .

$$d = rt$$

$$d = x \cdot t_1$$

$$d = (x+b)t_2$$

$$t_1 = \frac{d}{x}$$

$$t_2 = \frac{d}{x+b}$$

$$\frac{2d}{\frac{d}{x} + \frac{d}{x+b}} = \frac{2d}{\frac{d(x+b)+dx}{x(x+b)}}$$

$$= 2d \cdot \frac{x(x+b)}{d(2x+b)} = \boxed{\frac{2x(x+b)}{2x+b}}$$