

**Adding and Subtracting Rational Expressions**

1. Simplify each of the following for all permissible values of  $x$ .

a.  $\frac{3}{x} + \frac{4}{x} + \frac{6}{x}$

b.  $\frac{2}{x^2} + \frac{5}{x^2} - \frac{y}{x^2}$

c.  $\frac{5x}{x+1} + \frac{3x}{x+1}$

d.  $\frac{2x+1}{7} - \frac{x-4}{7}$

e.  $\frac{3x+8}{5} - \frac{3-2x}{5}$

f.  $\frac{2x^2-5}{2x+1} - \frac{9x}{2x+1}$

g.  $\frac{x+1}{3-x} + \frac{2x+3}{x-3}$

h.  $\frac{2x+1}{10x} + \frac{3x-2}{10x} - \frac{5x+4}{10x}$

2. Simplify each of the following for all permissible values of  $x$ .

a.  $\frac{3x}{4} + \frac{5x}{7}$

b.  $\frac{x}{3} - \frac{2y}{5} + \frac{3x}{2}$

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

d.  $\frac{6x}{5} - \frac{3x-10}{15}$

e.  $\frac{x-3}{7} - \frac{4x+7}{2}$

f.  $\frac{x+3}{5} + 3 - \frac{2x-2}{8}$

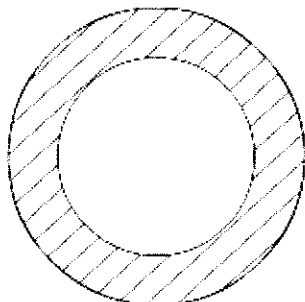
g.  $\frac{2x+3y}{4} - \frac{3x+4y}{5} + \frac{x-y}{10}$

h.  $\frac{3}{x+2} + \frac{4}{x+1}$

i.  $\frac{x+5}{x-4} + \frac{2x-3}{x+1}$

j.  $\frac{6x+8y}{4} - \frac{3x+4y}{8}$

3. Given the following concentric circles. If the diameter of the smaller circle is  $\frac{d}{2}$  and the diameter of the larger circle is  $\frac{d}{2} + 6$ ,



- Write an expression for the area of the small circle in terms of  $d$ .
  - Write an expression for the circumference of the large circle in terms of  $d$ .
  - Write an expression for the shaded region in terms of  $d$ .
4. A rectangular prism has dimensions of  $\frac{2x + 3}{4}$  by  $\frac{3x + 2}{6}$  by  $\frac{6x + 4}{3}$ .  
Find an expression for the surface area in terms of  $x$ .
5. Find the LCM for each of the following. Leave in factored form.

a.  $4x + 6$ ,  $2x + 3$

b.  $5x + 25$ ,  $2x + 10$

c.  $x - 3$ ,  $x^2 - 9$

d.  $8 - x$ ,  $x - 8$

e.  $x + 6$ ,  $x^2 + 12x + 36$

f.  $x^2 + 4x + 3$ ,  $x^2 + 3x + 2$

g.  $2x^2 + 2x - 24$ ,  $4x + 16$

6. Simplify each of the following for all permissible values of  $x$ .

a. 
$$\frac{5}{3x} - \frac{4}{2xy}$$

b. 
$$\frac{4}{2x^2} - \frac{2}{x} + \frac{5}{4x^2}$$

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

d. 
$$\frac{2x+5}{2x^2y} + \frac{3x-2}{6xy^2}$$

e. 
$$\frac{5}{x-3} + \frac{4}{2(x-3)}$$

f. 
$$\frac{2}{x^2-16} - \frac{3}{2x+8}$$

g. 
$$\frac{2}{5x+15} + \frac{4}{x+3} - \frac{6}{5x+5}$$

h. 
$$\frac{7}{x-1} - \frac{3}{1-x}$$

7. Simplify each of the following for all permissible values of  $x$ .

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

b. 
$$\frac{x}{3} - \frac{x+2}{x+1} + 2$$

c. 
$$\frac{2}{x} + \frac{x+5}{x-5} - 5$$

d. 
$$\frac{x+3}{x+7} - 2 + \frac{x}{x-1}$$

8. Simplify each of the following for all permissible values of  $x$ .

a. 
$$\frac{5x-1}{25x^2-1} + \frac{3x+2}{9x^2-4}$$

b. 
$$\frac{x+1}{x^2-5x-6} - \frac{3x}{x^2+2x+1}$$

c. 
$$\frac{x+5}{x^2+2x-8} + \frac{x-1}{x^2+x-6} - \frac{x}{x^2+7x+12}$$

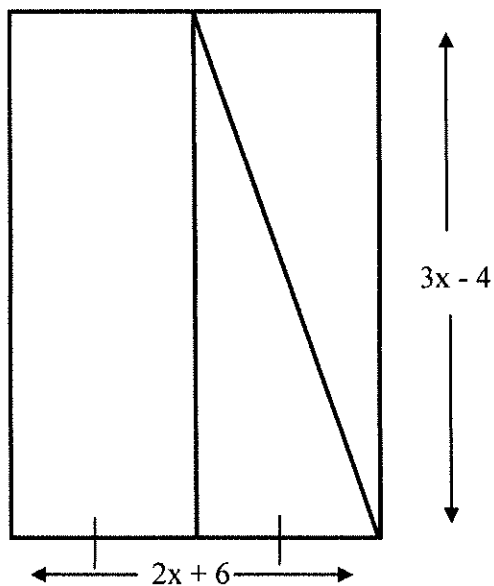
d. 
$$\frac{x+3}{x^2-3x-18} + \frac{x-4}{x^2-36} - \frac{3}{x+5}$$

$$e. \frac{x+1}{8x^2+2x-1} - \frac{x+3}{6x^2+7x+2} + \frac{x-5}{12x^2+5x-2}$$

$$f. \frac{4-3x}{9x^2-16} + \frac{9-2x}{4x^2-81}$$

$$g. \frac{x}{6x^2+7x-5} + \frac{x+3}{6x^2+5x-4} + \frac{5}{9x^2+24x+16}$$

9. Find an expression for the ratio of the area of the rectangle to the area of the triangle.



10. Find an expression for the length of the rectangle if the width is  $\frac{x^2 - 9}{2x + 4}$  and the area

$$\text{is } \frac{2x^2 + 7x + 3}{x^2 - 4}.$$

**ANSWERS**

1a.  $\frac{13}{x}$

1b.  $\frac{7-y}{x^2}$

2a.  $\frac{41x}{28}$

2b.  $\frac{55x-12y}{30}$

1c.  $\frac{8x}{x+1}$

1d.  $\frac{x+5}{7}$

2c.  $\frac{7x-2}{4}$

2d.  $\frac{3x+2}{3}$

1e.  $x+1$

1f.  $x-5$

2e.  $\frac{-26x-55}{14}$

2f.  $\frac{77-x}{20}$

1g.  $\frac{x+2}{x-3}$

1h.  $-\frac{1}{2x}$

2g.  $\frac{-3y}{20}$

2h.  $\frac{7x+11}{(x+2)(x+1)}$

2i.  $\frac{3x^2-5x+17}{(x-4)(x+1)}$

2j.  $\frac{9x+12y}{8}$

3a.  $\frac{\pi d^2}{16}$

4.  $\frac{162x^2+291x+122}{36}$

5a.  $LCM = 2(2x+3)$

5b.  $LCM = 10(x+5)$

3b.  $\frac{\pi d + 12\pi}{2}$

5c.  $LCM = (x+3)(x-3)$

5d.  $LCM = -(x-8)$

3c.  $\frac{3\pi(d+6)}{2}$

5e.  $LCM = (x+6)(x+6)$

5f.  $LCM = (x+3)(x+1)(x+2)$

5g.  $LCM = 4(x+4)(x-3)$

6a.  $\frac{5y-6}{3xy}$

6b.  $\frac{13-8x}{4x^2}$

7a.  $\frac{-x^2-7x+2}{(x+1)(x+5)}$

7b.  $\frac{x(x+4)}{3(x+1)}$

6c.  $\frac{23x+11}{10x}$

6d.  $\frac{3x^2+6xy-2x+15y}{6x^2y^2}$

7c.  $\frac{-2(2x^2-16x+5)}{x(x-5)}$

7d.  $\frac{-3x+11}{(x+7)(x-1)}$

6e.  $\frac{7}{x-3}$

6f.  $\frac{16-3x}{2(x+4)(x-4)}$

6g.  $\frac{16x+4}{5(x+3)(x+1)}$

6h.  $\frac{10}{x-1}$

8a.  $\frac{8x-1}{(5x+1)(3x-2)}$

8b.  $\frac{-2x^2+20x}{(x-6)(x+1)(x+1)}$

9. 4

8c.  $\frac{x^2+13x+11}{(x-2)(x+3)(x+4)}$

8d.  $\frac{118+12x-x^2}{(x-6)(x+6)(x+5)}$

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

8e.  $\frac{x^2-15x}{(2x+1)(4x-1)(3x+2)}$

8f.  $\frac{-5x-13}{(3x+4)(2x+9)}$

8g.  $\frac{18x^3+108x^2+152x+35}{(3x+5)(2x-1)(3x+4)(3x+4)}$