Real-World Connections

32. An auto race consists of 8 laps. A driver completes the first 3 laps at an average speed of 185 mi/h and the remaining laps at an average speed of 200 mi/h.

a. Let d represent the length of one lap. Write an expression in terms of d that represents the time in hours that it takes the driver to complete the race.

b. What is the driver's average speed during the race to the nearest mile per hour?

Add or subtract. Identify any x-values for which the expression is undefined.

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

34. $\frac{2x}{x^2-36} + \frac{x+4}{x+6}$

35. $\frac{2}{x^2-x-20} + \frac{3}{x^2+7x+12}$

36. $\frac{7x}{x^2-5x} + \frac{x^2}{x-5}$

37. $\frac{2x}{x-1} - \frac{9}{x-2}$

38. $\frac{2x+3}{3x+4} - \frac{x}{9x+12}$

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

40. $\frac{6}{x^2+4x-32} - \frac{x-5}{x-4}$

41. $\frac{x+7}{x^2+13x+42} - \frac{10x}{x^2+8x+7}$

42. **Environment** The junior and senior classes of a high school are cleaning up a beach. Each class has pledged to clean 1600 m of shoreline. The junior class has 12 more students than the senior class.

a. Let s represent the number of students in the senior class. Write and simplify an expression in terms of s that represents the difference between the number of meters of shoreline each senior must clean and the number each junior must clean.

b. If there are 48 seniors, how many more meters of shoreline must each senior clean than the number each junior must clean? Round to the nearest tenth of a meter.

c. **Multi-Step** If it takes each student about 10 min to clean 15 m of shoreline, approximately how much sooner will the junior class finish than the senior class?

LINK Architecture

Andrea Palladio stated that his preferred room shapes were squares, circles, and rectangles with precise length-to-width ratios. Some of these shapes can be seen above in Il Redentore church that Palladio designed.

Simplify. Assume that all expressions are defined.

43. $\frac{\frac{4}{x+2}}{\frac{x+2}{6}}$

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

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

46. **Architecture** The Renaissance architect Andrea Palladio preferred that the length and width of rectangular rooms be limited to certain ratios. These ratios are listed in the table. Palladio also believed that the height of a room with vaulted ceilings should be the harmonic mean of the length and width.

a. The harmonic mean of two positive numbers a and b is equal to $\frac{2}{\frac{1}{a} + \frac{1}{b}}$. Simplify this expression.

b. Complete the table for a rectangular room with a width of 30 feet that meets Palladio's requirements for its length and height. If necessary, round to the nearest tenth.

c. **What if...?** A Palladian room has a length-to-width ratio of 4:3. If the length of this room is doubled, what effect should this change have on the room's width and height, according to Palladio's principles?

Rooms with a Width of 30 ft

Length-to-Width Ratio	Length (ft)	Height (ft)
2:1		
3:2		
4:3		
5:3		
$\sqrt{2}$:1		

47. **Critical Thinking** Write two expressions whose sum is $\frac{x-3}{x+2}$.