Rational Functions

Work within a small group to answer these questions. Do not race through the exercises on your own. Always make sure that your entire group feels good about a question and answer before you move to the next exercise. Ask your group mates for explanations if you feel uncertain about something, and offer your explanations to others when you understand an exercise but someone else may not.

1. Simplify each of the rational expressions below. It is important to note any restrictions on the simplified version of the expression.

   a) $\dfrac{18t^3}{6t}$

   b) $(x+2)\dfrac{x-6}{x+2}$

   c) $\dfrac{(3x+2)(x-7)}{x(x-7)}$

   d) $\dfrac{30x^2-7x-15}{6x^2+7x-10}$

   e) $\dfrac{4m-n}{3n-12m}$

   f) $\dfrac{2}{x-3}\cdot\dfrac{x}{x+1}$

g) $\dfrac{(x-5)(x+3)}{3x-1} \cdot \dfrac{x(3x-1)}{x-5}$

h) $\dfrac{x^2+4x+4}{(x-3)(x^2-1)} \cdot \dfrac{x^2-2x-3}{x^2-4}$

2. The area of a rectangle is $5x^2+12x+4$ and its width W is $x+2$. Find (and simplify) the length L of the rectangle.

3. There are $x+4$ bakers who *each* bake x^2-9 cupcakes. The cupcakes are to be distributed evenly among the bakers plus an additional x^2-16 guests. How many cupcakes does each person get to eat (in terms of x)?

4. Engineers are building a curved section of freeway onramp that needs to be banked. They have discovered that if the speed of cars is about 40 mph, then there is a relation between the radius R of the curve and the slope m of the banking. $m(R) = \dfrac{1600-2R}{15R}$. Plot this rational function using your calculator. What happens to m if R is large? What radius would yield a banking of 10%?

5. Pretend that you have become the teacher of a math lesson, and a student has submitted:

$$\begin{aligned} &\frac{x+4}{x} \\ =&\frac{\cancel{x}+4}{\cancel{x}} \\ =&1+4 \\ =&5 \end{aligned}$$

Discuss within your group how you should respond. What should you write on this student's paper to do the best job of preventing them from making the same mistake in the future?

6. Simplify each of the rational expressions below. It is important to note any restrictions on the simplified version of the expression.

a) $\frac{4z^2}{r^3} \cdot \frac{5r}{2z} \cdot \frac{r}{z}$

b) $\frac{x^2+x}{2x+6} \div \frac{x}{x+3}$

c) $\frac{5x^2}{x-2} \div \frac{10x^3}{5x-10}$

d) $\frac{x^2+x-12}{2x^2-9x-5} \div \frac{x^2+7x+12}{2x^2-7x-4}$

e) $\frac{x+1}{y-2} \div \frac{2x+2}{y-2}$

f) $\frac{x+1}{y-2} \div \frac{2x+2}{y-2} \div \frac{x-3}{x}$