Solving Equations Containing Rational Expressions -
Section 7.3 – 7.4 in MATH 101

Class Strategy:

Discovery Learning Activity: Students do Activity 5.4 (Blood – Alcohol Levels) –
Mathematics in Action – Algebraic, Graphic, & Trigonometric Problems Solving –
Second Edition - The Consortium For Foundation Mathematics

In 1992, the U.S. Department of Transportation recommended that states adopt 0.08% blood – alcohol concentration as the legal measure of drunk driving. If you assume that a regular 12-ounce beer is 5% alcohol by volume and that the normal bloodstream contains 5 liters (or 169 ounces) of fluid, your maximum blood – alcohol concentration, \( B \), can be approximately modeled by the function having the equation

\[
B = \frac{600n}{w(169 + 0.6n)}
\]

where \( n \) is the number of beers consumed in one hour and \( w \) is your body weight in pounds.

1.a. Replace \( w \) with your body weight. Write an equation for \( B \) in terms of \( n \).

b. Complete the following table using your equation from part a.

<table>
<thead>
<tr>
<th>Number of Beers, ( n )</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood – Alcohol Concentration, ( B )</td>
<td></td>
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<td></td>
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</table>

2. According to this model, how many beers can you consume in one hour without exceeding the recommended legal measure of drunk driving?
3.a. A football player friend of yours weighs 232 pounds. Rewrite the equation for B in terms of n. What is his maximum blood-alcohol level if he drinks four beers in one hour?

b. Complete the following table using your equation in part a.

<table>
<thead>
<tr>
<th>Number of Beers, n</th>
<th>1</th>
<th>2</th>
<th>3</th>
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4.a. Your 232-pound football player friend is given a breathalyzer test. The result is a blood-alcohol concentration of 0.05%. Using the blood-alcohol concentration function, write an equation that can be solved to determine the number of beers your friend consumed in the previous hour.
Instructor Led Discussion:

Example 1:

Method 1: Solve \( \frac{16}{x+3} = 2 \), by multiplying both sides by the LCD

\[
\frac{16}{x+3} = 2
\]

\[
(x+3) \cdot \frac{16}{x+3} = 2(x+3)
\]

16 = 2x + 6
10 = 2x
5 = x

check: \( \frac{16}{5+3} = \frac{16}{8} = 2 \)

Method 2: Solve \( \frac{16}{x+3} = 2 \), by cross multiplying

\[
\frac{16}{x+3} = \frac{2}{1}
\]

2(x+3) = 16 \cdot 1
2x + 6 = 16
2x = 10
x = 5

Student Practice:

5.a. \( \frac{45}{x} = 9 \)  
b. \( \frac{23}{x+2} = 15 \)
c. \[ \frac{13}{x} = \frac{2}{5} \]  

6.a. Solve the equation in problem 4a using an algebraic approach.
Continue with ILD:

1. Solve \( \frac{-2}{3x} + \frac{8}{3} = \frac{2}{x} \)

2. Solve \( \frac{2}{x+1} + \frac{1}{3x+3} = \frac{2}{3} \)

3. Solve \( \frac{2}{x} + 1 = \frac{3}{x^2} \)

4. Solve \( \frac{8}{x+2} = 1 + \frac{2}{x} \)
Solving Equations Containing Rational Expressions

1. Multiple both sides of the equation by the _____________________

2. Distribute; that is, multiply every term of the equation by the _________________

3. Multiply by canceling common _______________________

4. Solve the resulting equation (it should have no fraction) ____________________

Example 1: \[ \frac{5}{3} - \frac{2}{3x} = \frac{6}{x} \]

Example 2: \[ \frac{3}{5} - \frac{1}{x-1} = \frac{7}{5x-5} \]

Example 3: \[ \frac{x^2}{x+100} = 50 \]