**Activity 4.4.1 Rational Expressions I**

1. The concentration of a given substance in a mixture is determined by the ratio of the amount of the substance to the total quantity. For example, if 6 cups of lemonade contains 1 cup of pure lemon juice, the concentration of lemon juice in the lemonade is 1/6.

Suppose we have 12 cups of lemonade that contains only 1 cup of pure lemon juice and we decide it is too weak. So we will add x cups of pure lemon juice.

1. Write an expression that contains x for the amount of lemon juice present after x cups have been added.
2. Write an expression that contains x for the total amount of lemonade present after the x cups have been added.
3. Now write an expression for the concentration of lemon juice in the lemonade after x cups have been added.
4. Ignore the context and give the domain of the expression in part c.
5. Now consider the context and give the domain of the expression in part c.
6. If we keep adding lemon juice, what is the end behavior of the function defined by your expression in part c?
7. Interpret the end behavior in terms of this context.
8. If you own a retail store you purchase merchandise at a wholesale cost, W and then sell it at a retail price also called the selling price, S. The retailer must sell the merchandise for more than he paid for it. The retailer’s markup is the difference between the selling price S and the wholesale price W.
9. If Sam owns a store and purchases a pair of men’s shorts for $30 and sells them for $55, what is the amount of markup?
10. In the retail business the term percent markup is often used. This percentage, P, known as percent markup requires that we find what percent the markup is of the selling price. For the shorts Sam purchased in part a, what is the percent markup?
11. The rational expression W/(1 – P) defines the selling price, S where W is the wholesale cost, and P is the percent markup but expressed as a decimal. Consider for our shorts S = 30/(1 - .45) . Make a table For S

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P | 0 | 0.01 | 0.05 | 0.10 | 0.25 | 0.5 | 0.75 | 0.95 | 0.99 |
| S |  |  |  |  |  |  |  |  |  |

1. Can the percent markup ever be 100%, that is can P = 1?
2. Can the percent markup P be greater than 1?
3. Does this function have a vertical asymptote? \_\_\_\_ If so what is the equation that defines it?
4. As P gets closer to 1 from the left, written P→1-, say P increases by .01 near 1, say from .94 to .95 to .96, what happens to the Selling Price?
5. What is a practical domain for this problem?
6. A container holds b balls numbered 1, 2, 3, …, b and only one ball has the winning number.
7. Write an expression for drawing the winning ball.
8. Write an expression for the complement, that is of not drawing a winning ball.
9. Suppose a second container holds 2 fewer balls than the one above and three of its balls are winning balls. Write an expression for drawing a winning ball from the first container and a winning ball from the second container.