Looking at Expressions

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Introduction

Last time we talked about the definition of an algebraic expression. Now we will look at some examples of algebraic expressions. I want you to think about how to read and see structure in the expressions.

Reading Algebraic Expressions

Consider each of the following expressions. Think about some things you can tell me about the expressions: any observations or properties you notice.

•
$$P(1 + \frac{r}{12})^{12n}$$

•
$$\frac{n(n+1)(2n+1)}{6}$$

•
$$L_0\sqrt{1 - \left(\frac{v}{c}\right)^2}$$

•
$$\frac{\sigma}{\sqrt{n}}$$

For example, notice that the first expression is linear function of P and an exponential function in R. The second expression is a cubic polynomial in n, with leading coefficient 1/3. The third expression has the value zero when v = c and the value L_0 when v = 0. And the fourth expression halves everytime n is quadrupled.

Writing problems about algebraic expressions

A person's monthly income is I, her monthly rent is R, and her monthly food expense is F. In 1–4, say whether the given pair of expressions is equal. If not, say which is larger, or that there is not enough information to decide. Briefly explain your reasoning in terms of income and expenses in each case.

- 1. I R F and I (R + F)
- 2. 12(R+F) and 12R+12F
- 3. I R F + 100 and I R (F + 100)
- 4. $\frac{R+F}{I}$ and $\frac{I-R-F}{I}$

To convert from miles to kilometers, Abby takes the number of miles, doubles it, then subtracts 20% from the result. Renato first divides the number of miles by 5, and then multiplies the result by 8.

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- (a) Write an algebraic expression for each method.
- (b) Use your answer to part (a) to decide if the two methods give the same answer.

If the tickets for a concert cost p each, the number of people who will attend is 2500 - 80p. Which of the following best describes the meaning of the 80 in this expression?

- (i) The price of an individual ticket.
- (ii) The slope of the graph of attendance against ticket price.
- (iii) The price at which no one will go to the concert.
- (iv) The number of people who will decide not to go if the price is raised by one dollar.

After a container of ice-cream has been sitting in a room for t minutes, its temperature in degrees Fahrenheit is

$$a - b2^{-t} + b,$$

where a and b are positive constants. Write this expression in a form that

- shows that the temperature is always greater than a.
- shows that the temperature is always less than a + b.
- If R_1 is fixed, is

$$\frac{R_1 + R_2}{R_1 R_2}$$

increasing or decreasing as a function of R_2 ?