

Lesson 3.6: Balancing Blood Alcohol

Theme: Medical Literacy

Making Connections to the Lesson

- (1) Which of the following was one of the main *mathematical* ideas of the lesson?
 - (i) Blood Alcohol Content (BAC) is affected by many different variables.
 - (ii) Multiplication undoes division.
 - (iii) The way you solve an equation that contains addition has nothing to do with the way to solve a different equation that contains subtraction.
 - (iv) An equation is a statement saying that two expressions are equal so an operation that changes the value of one side must also be done to the other side of the equation.
- (2) How is the idea of keeping an equation balanced similar to finding equivalent fractions?

Developing Skills and Understanding

- (3) Find the solution to each of the following:
 - (a) $3x + 5 = 14$
 - (b) $6x - 5 = 10$
 - (c) $2x - 1 = -7$
 - (d) $\frac{x}{4} + 3 = 8$
- (4) Recall that Blood Alcohol Content (BAC) is a measurement of how much alcohol is in someone's blood as a percentage. However, police and the public typically omit the language for % when quoting the BAC and simply say, "BAC is 0.04."

Write an interpretation of what each of the following BAC values means in terms of how much alcohol is in the bloodstream in the form of the amount of alcohol per 1,000 grams of blood. You may want to refer back to the example in the lesson.

 - (a) BAC = 0.1
 - (b) BAC = 0.02
- (5) Use information from the website http://en.wikipedia.org/wiki/Blood_alcohol_content to list effects on an individual having a BAC as given. Give at least three effects for each.
 - (a) BAC = 0.1
 - (b) BAC = 0.5
 - (c) BAC = 0.05

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Use the Widmark Equation, $B = -0.015t + \left(\frac{2.84N}{W \cdot g} \right)$, to solve Questions 6–8. Recall that $g = 0.68$

for men and $g = 0.55$ for women.

- (6) A male student had five glasses of wine at a party. He weighs 160 pounds. How long will it take before his BAC is 0.08?
- (i) 3.33 hours
 - (ii) 1.31 hours
 - (iii) –3.33 hours
- (7) Look up the BAC limit for the state in which you live.
- (a) How long should you wait after consuming two margaritas to ensure that your BAC is less than the legal limit for your state?
 - (b) If you drink alcohol over a period of 5 hours, how many drinks would you be able to consume and still ensure that your BAC is less than the legal limit for your state?
- (8) The percentage of Americans who are retired has been increasing over the last decade. This is causing some concern because health care, social security, and other costs will be the responsibility of a smaller group of people. That is, as the percentage of retired people increases, the percentage of working-age people decreases. The following model predicts the percentage of retired people based on demographic data:¹

$$R = \frac{t}{873.36} - 2.15$$

where R is the percentage (as a decimal) of Americans who are retired in the year t . Use this model to complete the table below.

Year	% of Retired People
	10%
	15%
	20%

¹Retrieved from www.census.gov/population/www/projections/2008projections.html

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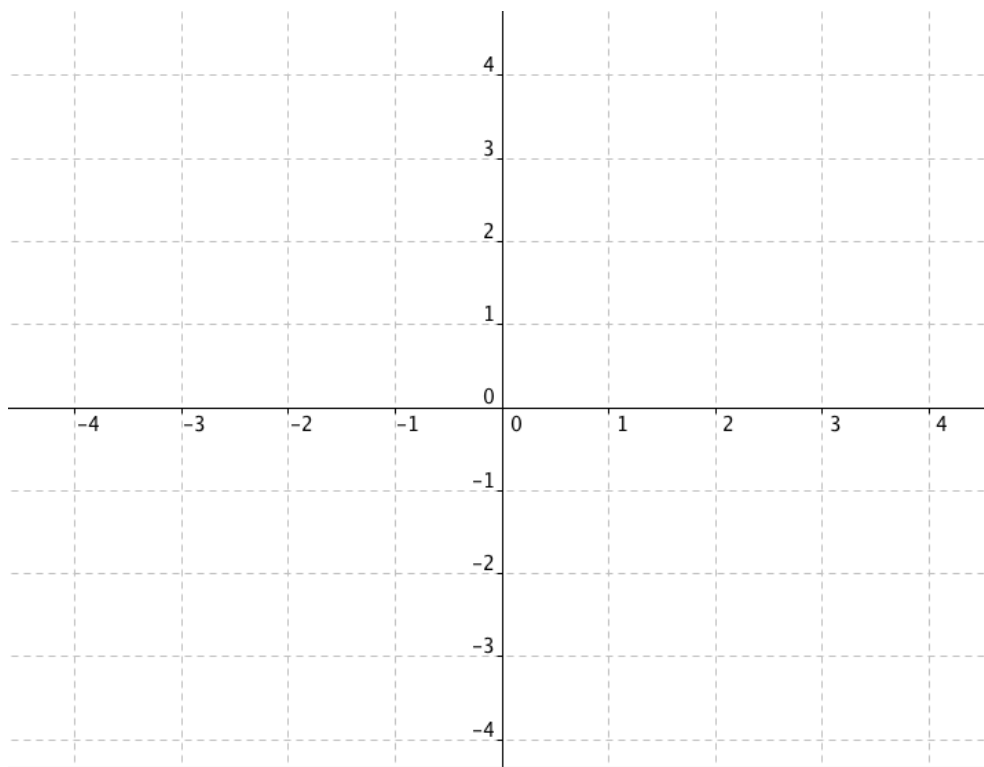
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Making Connections Across the Course

- (9) Crown molding is a decorative trim installed over the joint between the walls of a room and the ceiling. It is similar to a baseboard used on the bottom joint between the walls and the floor, but there are no gaps, since doors do not extend to the full ceiling height. (If you are not sure that you understand the idea, do an Internet search to find an example picture of crown molding). Andy intends to install crown molding around the four sides of the dining room. The dining room ceiling is a rectangle with dimensions 14 feet 9 inches by 13 feet. The crown molding is sold in eight-foot lengths that cost \$24 for each 8-foot piece. He decides to purchase enough to allow for 10% waste due to possible loss in the corners.
- (a) What is the perimeter of the dining room? Perimeter is distance around the room.
 - (b) How many 8-foot boards are needed?
 - (c) If sales tax is $8\frac{1}{4}\%$, then what is the total cost?
- (10) For the following questions, you will need the formula for the perimeter of a rectangle. You can write your own or look one up.
- (a) Formula:
Variables:
 - (b) Andy's house is on a large lot. He got 100 yards of chain-link fence on sale. He wants to use all of the material to fence in an area in his backyard. He can only make the fenced area 60 feet wide and he wants it to be as long as possible. What is the longest length possible for the sides?

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- (11) Now, you will return to graphing on a coordinate plane in preparation for Module 4. Label the following items on the coordinate plane given below. For the points, place a dot at the location of the point and label it with the ordered pair.
- (a) Horizontal axis
 - (b) Vertical axis
 - (c) $(-2, 4)$
 - (d) $(2, -4)$
 - (e) $(-4, 2)$
 - (f) $(0, 3)$
 - (g) $(3, 0)$
 - (h) $(-\frac{2}{3}, 1)$
 - (i) $(3.2, 3.7)$



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Preparing for the Next Lesson (3.7)

(12) Ben has \$75 in his savings account. He plans to deposit \$35 per week to build his account balance.

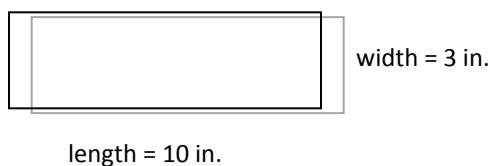
- (a) Complete the following equation to represent the amount of money (A) Ben will have in his account after any number of weeks. Use x as your input variable.

$$A =$$

- (b) What does your variable represent in this problem?
- (c) Which of the following values could be the value of the variable in this context?
- (i) 4.2
 - (ii) 3
 - (iii) 18
 - (iv) -5

- (d) Ben wants to use his savings to buy a computer for \$740. Use your algebraic expression to determine the number of weeks it will take him to save enough money to buy the computer.

The dimensions of a figure can be written as a ratio. The rectangle below has a length of 10 inches and a width of 3 inches.



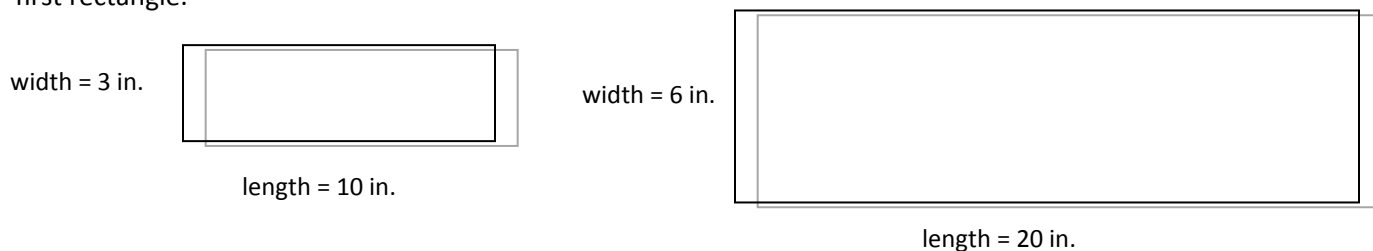
You can say that the ratio of the length to width is 10:3 or $\frac{10}{3}$.

It is also correct to say that the ratio of the width to length is 3:10 or $\frac{3}{10}$.

The important thing is to be consistent once you have set up your ratio.

You have learned previously that a fraction can be written in many equivalent forms (i.e., $\frac{10}{3} = \frac{20}{6}$).

However, a rectangle with a length of 20 inches and a width of 6 inches is obviously not the same as the first rectangle.

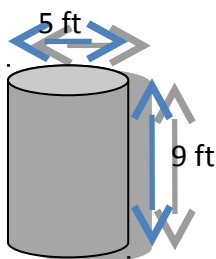


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While these figures are not *equivalent*, they are *proportional* to each other because their dimensions have the same ratio.

- (13) Use the figure below to answer the following questions.



- (a) Write the ratio of the dimensions of the cylinder shown above in the form of diameter to height.
- (b) Give the dimensions of a cylinder that would be proportional to the one shown.
- Diameter:
- Height:
- (14) Which of the following fractions has a ratio of 4:3? There may be more than one correct answer.
- (i) $\frac{24}{18}$
 - (ii) $\frac{16}{9}$
 - (iii) $\frac{9}{12}$
 - (iv) $\frac{20}{15}$
 - (v) $\frac{8.8}{6.6}$
- (15) You are expected to be able to do the following things for the next class. Rate how confident you are on a scale of 1–5 (1 = not confident and 5 = very confident).

Before beginning Lesson 3.7, you should understand the concepts and demonstrate the skills listed below:

Skill or Concept: I can ...	Rating from 1 to 5
Interpret the meaning of ratios including when written as fractions.	

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Understand the use of a variable to represent an unknown.	
Solve a two-step equation such as $2x + 9 = 13$.	

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