

Objective Simplifying Expressions to Solve Problems

Warm-Up



Simplify each expression.

1. $-10 \div 2 \left(5 \frac{2}{3} \right)$

2. $-10 - 2 \left(-5 \frac{2}{3} \right)$

3. $-5 \left(\frac{\frac{3}{4}}{\frac{2}{3}} \right)$



Airline travel has come a long way since the days of Orville and Wilbur Wright. In 2015, there were approximately 9.1 million flights that took off from U.S. airports carrying approximately 895.5 million passengers. To transport this many passengers to and from their destinations, airlines have to make good estimations about the number of flights passengers will book, the size of the airplanes to use for a given route, and the approximate arrival time for each flight.

Tracking the accuracy of these estimations is important for airlines. Calculating **percent error** is one way to compare an estimated value to an actual value. To compute percent error, determine the difference between the estimated and actual values and then divide by the actual value.

$$\text{Percent Error} = \frac{\text{actual value} - \text{estimated value}}{\text{actual value}}$$

When planning which airplanes to use for a given route, airlines have to estimate how many people they think will book that particular flight. They want to be able to have enough seating to meet the demand but not have too big of a plane and waste the extra fuel needed.

1. An airline estimates that they will need an airplane that sits 224 passengers for the 6 A.M. flight from Washington, D.C., to Boston. Calculate the percent error for each number of actual passengers booked. Show your work.

a. 186 booked tickets

b. 250 booked tickets

Another challenge is accurately estimating the travel time for each flight. Having minimal error in these estimations allows airlines to keep their schedules accurate and passengers happy.

2. An airline estimates that the flight from Washington, D.C., to Boston takes 1 hour and 27 minutes. Calculate the percent error for each actual flight time. Show your work.

a. 1 hour and 11 minutes

b. 2 hours

3. What does a negative value for percent error indicate?

4. Vernice is told that the DC to Boston flight took 10 minutes longer than estimated. She calculated the percent error and got 10.3%. She later learns that she had been given the wrong information. The flight took 10 minutes less than estimated.

Vernice thinks that the percent error should just be -10.3% . Is she correct? Explain why or why not.



Recall that to evaluate an expression with a variable, substitute the value for the variable and then perform the operations.

WORKED EXAMPLE

Evaluate the expression $-12\frac{1}{2} - 3v$ for $v = -5$.

Estimate:

$$-12 - 3(-5) = -12 + 15 = 3$$

Substitute -5 for v and solve:

$$\begin{aligned} -12\frac{1}{2} - 3(-5) &= -12\frac{1}{2} - (-15) \\ &= -12\frac{1}{2} + 15 \\ &= 2\frac{1}{2} \end{aligned}$$

1. Evaluate the expression in the worked example for $v = -\frac{6}{7}$



LESSON 6.3b

Building a Wright Brothers' Flyer



Objective

Simplifying Expressions to Solve Problems

Practice

Write an expression with rational numbers to represent each situation and then solve. Show your work.

1. Jaxon's start-up business makes a profit of \$450 during the first month. However, the company records a profit of $-\$60$ per month for the next four months and profit of \$125 for the final month. What is the total profit for the first six months of Jaxon's business?
2. A diver is exploring the waters of the Great Barrier Reef.
 - a. She is currently -5 feet from the surface of the water and plans to explore a shipwreck that is at -75 feet from the surface. If she moves at a rate of -8 feet per minute, how many minutes does it take the diver to reach the shipwreck?
 - b. When she is done exploring the reef, she ascends at a rate of 5 feet per minute. Once she reaches a height of -30 feet, she must rest for 15 minutes to allow her body to adapt to the changing water pressure. She then continues to the surface at the same rate. How long will it take the diver to reach the surface?
3. The drain in your 45-gallon bathtub is partially clogged, but you need to take a shower. The showerhead had a flow rate of 2.25 gallons per minute, but the bathtub only drains at a rate of -0.5 gallons per minute. What is the longest shower you can take?
4. Tesha withdrew \$22.75 each week for four weeks from her savings account to pay for her piano lessons. By how much did these lessons change her savings account balance?

Calculate the percent error.

5. Jerri estimated that 30 people would attend the dinner event, but only 25 people attended.
6. Gene estimated the length of the fence to be 150 feet, but the actual measurement was 142 feet.

Evaluate each expression for the given value.

7. $\frac{5}{6}x$ for $x = -8$

8. $9\frac{1}{3} - m$ for $m = -1\frac{2}{3}$

9. $t \div \frac{3}{4}$ for $t = 9\frac{3}{4}$

10. $\frac{2}{5}k - 3\frac{1}{2}$ for $k = 15$

