Averages

To make sense of a group of numbers, we often look for the *average* value.
This is also called the *mean* value.

You will find averages used everywhere: weather patterns, class grades, gas mileage, stock prices, sports and so forth.

Averages give general information about collected facts. Average rainfall for a year does not tell the rainfall on any specific day, but it does help you compare rainfall from year-to-year or from place-to-place.

Calculating Averages

The average value is calculated by adding the values 'V' then dividing by how many there are.

$$\text{Average} = \frac{V_1 + V_2 + \ldots + V_n}{n}$$

This equation shows that averages are calculated by adding the first value (V_1) and the second value (V_2) and so forth up to n values, then divide by the number of values n.

Example: Find the average temperature for last weekend. Saturday's temperature reached 36°, and Sunday's temperature was 40°.

Answer: Add the two temperatures, and then divide by the number of values (two).

$$\text{Average Temperature} = \frac{36 + 40}{2} = 38°$$

Note that the average of only two values is exactly halfway between them.

By the way, the *sum* of the average values is always the same as the *sum* of the original values. Using the numbers from the example above:

Real Temps	Average Temps
36 **+ 40** **76**	**38** **+ 38** **76**

Finding the average of three scores takes a pencil and paper (or a calculator!)

Example: Esther's math grades during one section were 85, 93 and 95. Find her average math grade.

Answer: Add the three grades, then divide by three.

$$\text{Average Grade} = \frac{85+93+95}{3} = \frac{273}{3} = 91$$

Finding the average gas mileage (miles per gallon, or "mpg") for your car is calculated by dividing the total distance by the number of gallons consumed.

Example: Find the average miles per gallon (mpg) if your car can travel 234 miles on 12 gallons of gas.

Answer: Divide total miles by the number of gallons.

$$\text{Average Mpg} = \frac{\text{Total Miles}}{\text{Gallons}} = \frac{234}{12} = 19.5 \text{ mpg}$$

Example: Find the average miles per gallon (mpg) from the odometer readings when you fill the tank. On Monday you filled the tank, and noticed the odometer reading was 54,767. On Friday you filled the tank again with exactly 6 gallons of gas, and wrote down the new odometer reading of 54,905.

Answer: Find the total miles traveled, and divide by the number of gallons.

$$\text{Average Mpg} = \frac{\text{Total Miles}}{\text{Gallons}}$$

$$\text{Average Mpg} = \frac{\text{Ending Mile} - \text{Starting Mile}}{\text{Gallons}}$$

$$\text{Average Mpg} = \frac{54905 - 54767}{6} = \frac{138}{6}$$

$$\text{Average Mpg} = 23$$

Finding a Missing Value

Some problems may give you the average, and all but one of the values. You need to work backwards to find the missing value.

You can solve these problems by writing down what you know, and then solving for the unknown value.

Example: The average age of Stella Cathey's children is 22 years. They are named Jim, Frances and Carol as shown below. What is Carol's age?

Age of Stella's Children

Children	Age (Years)
Jim	23
Frances	24
Carol	?
Group Average	22

Answer: We know how to calculate the average for three values, so let's write that down:

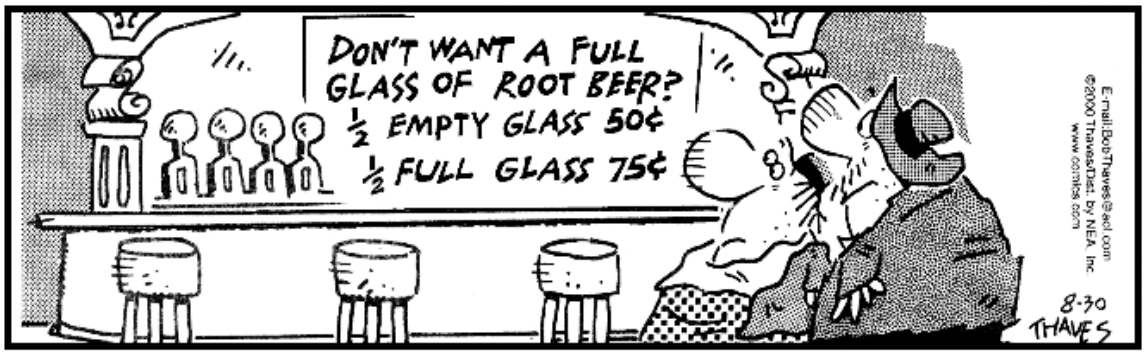
$$\text{Group Average Age} = \frac{23+24+?}{3} = 22$$

Now let's work backwards to find the unknown value:

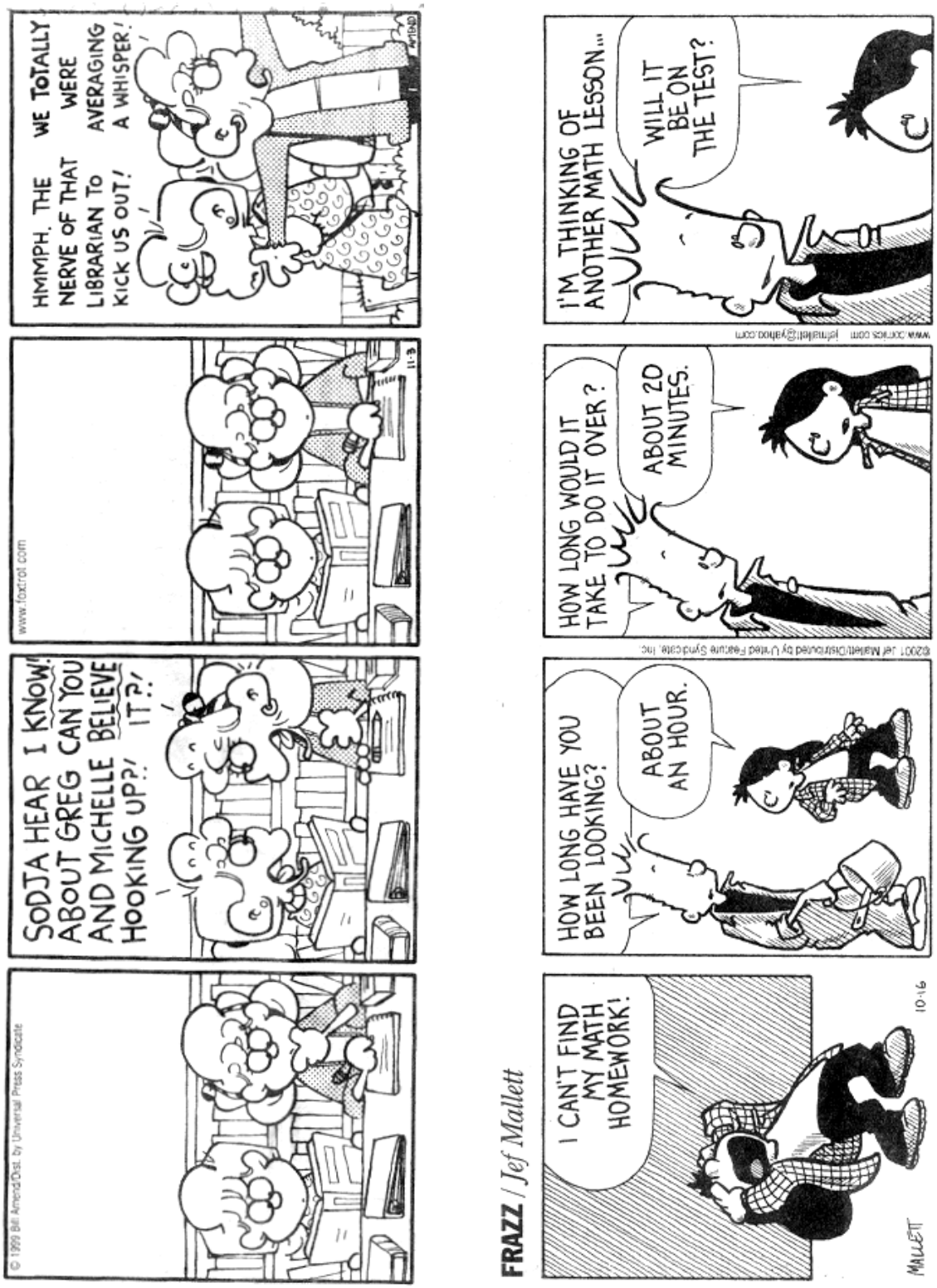
We know the sum divided by 3 is 22, so the sum is 66, as in $\frac{66}{3} = 22$.

The result of 23 + 24 is 47, so we have: 47 + ? = 66.
Therefore Carol's age must be 19.

Frank And Ernest - Bob Thaves



Just For Fun…


HMMPH. THE NERVE OF THAT LIBRARIAN TO KICK US OUT! WE TOTALLY WERE AVERAGING A WHISPER!
SODJA HEAR I KNOW! ABOUT GREG CAN YOU AND MICHELLE BELIEVE HOOKING UP?! IT?!
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www.foxtrot.com
FRAZZ / Jef Mallett
I CAN'T FIND MY MATH HOMEWORK!
HOW LONG HAVE YOU BEEN LOOKING?
ABOUT AN HOUR.
HOW LONG WOULD IT TAKE TO DO IT OVER?
ABOUT 20 MINUTES.
I'M THINKING OF ANOTHER MATH LESSON...
WILL IT BE ON THE TEST?
MALLETT

Just Average Homework

1) Lauren is a new member of the bowling league, and her teammates are very happy with her last three bowling scores. What is Lauren's average score?

Score Card	
Game 1	123
Game 2	139
Game 3	128
Player Name: **Lauren**	

a) We know Lauren bowled _____ games.

b) The scores of her games were _____, _____ and _____.

c) The total of her games' scores was _____.

d) Lauren's average score for these games was _____.

2) Sam took some spelling tests in December to prepare for the national spelling bee. What was his average score?

March – Spelling Test Scores				
SAM	96	90	87	91

a) We know Sam took _____ tests.

b) His test scores were _____, _____, _____ and _____.

c) The total of his test scores was _____.

d) Sam's average spelling score was _____.

3) Find the average for each set of numbers.

a) 30, 50 Average = _____

b) 24, 34, 44 Average = _____

c) 317, 202, 10, 431 Average = _____

d) 95, 38, 21, 49, 77 Average = _____

4) Solve these average problems.

a) Alley McBowl paid $8.34 to bowl 3 games. What was the average amount she paid for each game?

b) If the bowling alley snack bar sold 738 bags of chocolate-covered bowling pins in 6 months, how many bags should bald Mr. Gutterball expect to sell in an average month?

c) Mr. Striker drives the team's car for bowling. He loves to bowl so much that he drives a shiny new black rounded Volkswagen Beetle with three holes in the roof. His small car can travel 384 miles on 12 gallons of gas. What is his average gas mileage?

d) Ms. Primly Pinner drives 12 miles to the bowling alley, and it takes 20 minutes (1/3 of an hour). What is her average speed in miles per hour?

5) Find the missing values using averages.

a) *Example:* The average of 34 and __?__ is 42. What is the missing value?
Solution:

$$\frac{34+?}{2} = 42$$
$$34+? = 2\times 42$$
$$34+? = 84$$
$$? = 50$$

b) The average of 16, 22 and __?__ is 42. What is the missing value?

c) The average of 10, -12, -14 and __?__ is 1. What is the missing value?

d) The average of 196, 169 and __?__ is $169\frac{2}{3}$. What is the missing value?

e) The bowling team has four players. If the first three players' scores were 100, 105 and 120, then what must be the fourth player's score to have an average of 120 points?

f) The sponsor pays for the team's lunch, and will happily pay an average of $6 per person. If the first three players have spent $5.50, $6.50 and $5.75, then how much may the fourth player spend to keep the average at $6 per person for the team?

6) Solve these problems about average rates.

a) On the average, suppose 106 people will shop in Math'R'Us each day. How many people will shop in Math'R'Us in 60 days?

b) Amazon.com keeps track of all its sales on computer. Last year it sold an average of 41 ½ special feature DVD's per day of Mr. Hansen's math club lectures recorded in AlgebraVision® format. At this rate, how many total DVDs will they expect to sell this year?

c) Math Depot is selling $20 calculators. The first one is regular price, but if you buy *two* the second one is 50% off. (They're competing fiercely with Office Math stores.) What is the average price per calculator with this special deal?

What is the average percent *discount* on each calculator?
(It doesn't sound as good as "50% off" does it!)

d) MP3.com is selling "I Love Math" albums by Dr. Dimento[1] in a special promotion. When you buy the first three albums, then Album 2^2 is free. If all the albums are normally $10 each, then what is the average percent *discount* per album?

[1] By the way, his real name is "Barry Hansen"!

7) Mental Math: do these in your head, and write down the answers.
Leave all answers as reduced fractions, and in terms of radicals and pi.

a) What is $12 - (-64)$?

b) This math symbol looks like the number 8 lying on its side. What does the symbol stand for?

c) What is $\frac{1}{8} + \frac{1}{2}$?

d) What is $10 \div \frac{1}{7}$?

Hint: Recall how to find the reciprocal and multiply.

e) What is your name?

f) Which is greater: 6 nickels + 1 dime + 2 quarters
or: 4 nickels + 8 dimes?

g) In England, a person's weight is measured in stones. One stone equals 20 pounds, so how many pounds are 2 ¾ stones?

h) Turn your chair around, and work backward to solve this problem:

The Backward Boy has a backward backyard, because it's in his front yard!
He has 3 times as many apple trees as shrubs.
He has 5 more shrubs than swimming pools.
He only has one swimming pool, right in the middle of his front yard.
How many apple trees does the Backward Boy have in his yard?

Did you check your work? It's okay to use a calculator (but not mine!) for checking results.

