

• Finding an Average

Power Up

facts

Power Up F

count aloud

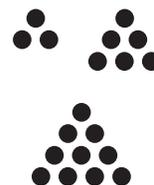
Count up and down by 3s between 3 and 36.

mental math

- a. **Estimation:** Estimate the sum of \$89 and \$58.
- b. **Measurement:** 870 grams plus 130 grams is one kilogram. How many grams is one kilogram?
- c. **Number Sense:** $1\frac{1}{2} + 1\frac{1}{2}$
- d. **Number Sense:** $3\frac{1}{3} - 2$
- e. **Fractional Parts:** $\frac{1}{3}$ of the 15 coins are dimes. What is the total value of the dimes?
- f. **Percent:** 25% of 16 ounces is how many ounces?
- g. **Time:** It takes 8 seconds to print one page. How many seconds will it take to print 34 pages? (*Think:* 8×34 .)
- h. **Calculation:** $6 \times 5, + 3, \div 3, + 4, \div 3, + 1, \div 3$

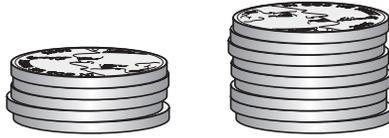
problem solving

Choose an appropriate problem-solving strategy to solve this problem. The numbers 3, 6, and 10 may be called **triangular numbers**. This is because 3 objects, 6 objects, and 10 objects can each be arranged in a triangular pattern. What are the next three triangular numbers?



New Concept

Below we show two stacks of nickels. In one stack there are 5 nickels, and in the other stack there are 9 nickels. If some nickels were moved from the taller stack to the shorter stack so that the stacks were even, how many nickels would be in each stack?



One way to answer this question is to first **find the total** number of nickels and then divide the total into two **equal groups**. Since there are 5 nickels in one stack and 9 nickels in the other stack, there are 14 nickels in all. Dividing 14 nickels into 2 equal groups, we find that there would be 7 nickels in each stack.

Math Language

An *average* is a way to describe a set of data using one number.

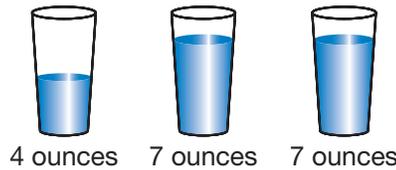
When we even up the number of members in groups, we are finding the **average** number of members per group. Finding an average is a two-step process.

Step 1: Combine to find the total.

Step 2: Separate the total into equal groups.

Example 1

If water is poured from glass to glass until the amount of water in each glass is the same, how many ounces of water will be in each glass?



The *total amount* of water will be *divided equally* among the three glasses. Finding the total amount of water is a problem about combining. It has a “some and some more” (addition) pattern. We add and find that the total amount of water is 18 ounces.

$$\begin{array}{r} 4 \text{ ounces} \\ 7 \text{ ounces} \\ + 7 \text{ ounces} \\ \hline \boxed{18} \text{ ounces} \end{array}$$

Finding the amount for each glass is an “equal groups” problem. “Equal groups” problems have multiplication patterns. We divide 18 ounces by 3 and find that there will be **6 ounces of water** in each glass.

$$\begin{array}{r} n \text{ ounces in each glass} \\ \times 3 \text{ glasses} \\ \hline 18 \text{ ounces in all 3 glasses} \end{array} \qquad \begin{array}{r} \boxed{6} \\ 3 \overline{)18} \end{array}$$

Analyze If we added a fourth glass with 6 ounces of water in it, would the average amount of water in each glass change? Why or why not?

Example 2

Brad's sister timed him as he swam laps. Brad's lap times in seconds are 80, 85, 90, 85, and 90. What is the average of Brad's lap times?

Thinking Skill

Analyze

How could you estimate Brad's average lap time?

Finding an average takes two steps. The first step is to find the total. To do this, we add Brad's times.

$$80 + 85 + 90 + 85 + 90 = 430$$

The second step is to separate the total into equal groups. Brad swam five laps, so we divide the total into five equal parts.

$$430 \div 5 = 86$$

We find that Brad's average time is **86**. Notice that although none of Brad's times were 86, the sum of the five times, 430, is the same as if he swam every lap in 86 seconds.

Lesson Practice

Solve each two-step problem by combining and then forming equal groups:

- a. The number of players on the four squads was 5, 6, 9, and 8. If the squads were changed so that the same number of players were on each squad, how many players would each squad have?

5	6
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9	8
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- b. When the class lined up, there were 11 students in one line and 17 students in the other line. If the lines were rearranged to have the same number of students, how many students would be in each line?

- c. This picture shows three stacks of books. If the stacks were equal, how many books would be in each stack?



- d. Here are Shauna's game points:

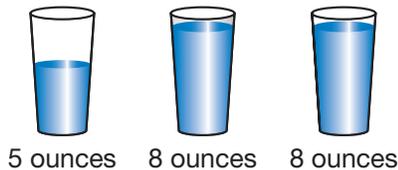
8, 9, 7, 9, 8, 10, 6, 7

What is the average of Shauna's game points?

*1. **Represent** Draw a quadrilateral so that the sides that intersect are perpendicular.
(31, 32)

2. **Represent** Kimberly is 5 years older than Loh. Miguel is 2 years older than Loh. Miguel is 13 years old. How old is Kimberly? Draw a pair of rectangles for each comparison.

*3. **Analyze** If water is poured from glass to glass until the amount of water in each glass is the same, how many ounces of water will be in each glass? (First use an addition pattern to find the total amount of water. Then use a multiplication pattern to divide the total equally.)
(50)



4. **Represent** Draw a diagram to illustrate and solve this problem:
(46)
How many minutes is $\frac{3}{5}$ of an hour?

*5. How many minutes is 2 hours 15 minutes?
(47)

6. Four hundred years is how many centuries?
(21, 28)

*7. **Represent** Use digits to write fifty-four thousand, nine hundred nineteen.
(7)

*8. **Represent** Draw a rectangle. Shade seven eighths of it. What percent of the rectangle is not shaded?
(Inv. 3, 37)

9. There were 15 children in one line and 11 children in another line. After some children moved from the longer line to the shorter line, there were the same number of children in each line. How many children were there in each line?
(50)

10. $342 + 67 + 918 + 897 + 42$
(6)

11. $\$53.87 - \27.59
(13)

12. $\$34.28 \times 60$
(29)

13. $7 \times 57 \times 10$
(18, 29)

14. $(4 + 7 + 7) \div 3$
(24)

15. $(5 + 6 + 9 + 8) \div 4$
(24)

16. $4206 \div 7$
(34)

17. $\$60.24 \div 6$
(34)

18. $1000 \div 9$
(26)

19. $6d = 180$
(26, 34)

20. $1\frac{1}{7} + 2\frac{2}{7} + 3\frac{3}{7}$
(41)

21. $9\frac{9}{10} - \left(7\frac{7}{10} - 5\frac{5}{10}\right)$
(24, 41)

22. $(10 \times 43) + (2 \times 43)$
(24, 29)

23. What month is 10 months after July?
(28)

24. **Multiple Choice** When we count by hundreds, we find that 1236 is closest to which of the following numbers?
(33)

A 1100

B 1200

C 1300

D 1000

25. Use the information below to answer parts **a–c**. You may draw a map.
(35)

From Safara's house, Arcadia Park is 4 miles north, Legg Lake is 5 miles south, the ocean is 32 miles west, and the mountain cabin is 98 miles east.

a. Safara's family went to the ocean one Saturday. They left home at 9 a.m. and returned home at 4 p.m. How long were they gone?

b. How far is it from Arcadia Park to Legg Lake?

c. How far did they travel when they went to the mountain cabin and then back home?

26. Dexter kept a record of his bike rides. On average, how far did Dexter ride each day?

(50)

Monday	5 miles to park
Tuesday	8 miles to river
Wednesday	8 miles to river
Thursday	6 miles to bridge
Friday	8 miles to river

27. Seven hundred megabytes of data can be stored on a compact disc. Write an equation that shows the amount of data that can be stored on five compact discs. Use a to represent the amount of data.

(17)

28. **Predict** A sequence of letters of the alphabet is shown below:

(1, Inv. 4)

c, f, i, l, o

What letter represents the eighth term of the sequence?

29. The length of the North Canadian River in New Mexico and Oklahoma is 200 miles longer than twice the length of the Rock River in Illinois and Wisconsin. The Rock River is 300 miles long. What is the length of the North Canadian River?

(49)

30. **Estimate** The Giessbach waterfall in Switzerland has a height of 984 feet. The Tully waterfall in Australia has a height of 885 feet. Explain how to estimate the height difference of the waterfalls.

(33)

Early Finishers

Real-World Connection

In his first four games, Neil had bowling scores of 112, 126, 98, and 118. What score must Neil bowl in his fifth game to have an average of 120 for all five games?