



Solve the following word problems based on the chart below.

Estimated Population by Region (in millions)			
Year	North America	South America	Europe
1900	106	40	400
1950	221	100	392
1980	252	242	484
1998	301	508	508

- WN** 1. How much greater was the population in Europe in 1998 than in 1980?
- a. 24
b. 240
c. 992
d. 24,000,000
e. 37,000,000
- WN** 2. In 1998 how much smaller was the population of North America than the population of Europe?
- a. 207
b. 2,070
c. 20,700
d. 207,000
e. 207,000,000
- F** 3. In 1900 the population of North America was approximately what fraction of the population of Europe?
- a. $\frac{3}{4}$
b. $\frac{1}{2}$
c. $\frac{3}{8}$
d. $\frac{1}{4}$
e. $\frac{1}{8}$
- P** 4. By what percent did the population of South America grow between 1900 and 1950?
- a. 7.5%
b. $33\frac{1}{3}\%$
c. 50%
d. 100%
e. 150%

Rounding, Estimating, and Using a Calculator

In the last exercise, you learned to multiply numbers by 10, 100, and 1,000 in your head. Zeros make many multiplication problems easier.

EXAMPLE 1 $6 \times 40 =$

$$6 \times 40 = 240$$

STEP 1 Forget about the zero in 40, and multiply $6 \times 4 = 24$.

STEP 2 Bring along the 0 from 40.

EXAMPLE 2 $80(700) =$

$$80(700) = 56,000$$

STEP 1 Forget about the zeros in 80 and 700, and multiply $8 \times 7 = 56$.

STEP 2 Bring along the zeros from 80 and 700.

Multiply each problem in your head.



1. $40 \times 8 =$

$900 \times 60 =$

$(1200)(30) =$

2. $9(70) =$

$5(700) =$

$9 \cdot 6,000 =$

3. $(60)(5) =$

$(20)(800) =$

$(2)(13,000) =$

4. $70 \cdot 20 =$

$5 \times 400 =$

$7,000 \times 80 =$

To estimate an answer to a multiplication problem, try rounding the larger number to the *left-most* place. Sometimes this is called **front-end rounding**.

For example, if the larger number in a problem is 427, round 427 to the nearest hundred. If the larger number is 2,846, round 2,846 to the nearest thousand.

EXAMPLE 1 Estimate the answer to 9×427 .

$$9 \times 427 \approx 9 \times 400$$

STEP 1 Round 427 to the nearest hundred. Remember the symbol \approx means "is approximately equal to."

$$9 \times 400 = 3,600$$

STEP 2 Multiply 9×400 in your head.

EXAMPLE 2 Estimate the answer to $5 \times 2,846$.

$$5 \times 2,846 \approx 5 \times 3,000$$

STEP 1 Round 2,846 to the nearest thousand.

$$5 \times 3,000 = 15,000$$

STEP 2 Multiply $5 \times 3,000$ in your head.

 Round the larger number in each problem to the nearest *hundred* and multiply.

5. $4 \times 782 \approx$

$7(284) \approx$

$3(447) \approx$

6. $(912)(3) \approx$

$609 \times 2 \approx$

$8 \cdot 931 \approx$

7. $6 \cdot 472 \approx$

$(5)(872) \approx$

$189 \times 4 \approx$

 Round the larger number in each problem to the nearest *thousand* and multiply.

8. $2(4,281) \approx$

$(7,516)(4) \approx$

$4(5,693) \approx$

9. $7 \times 2,963 \approx$

$5 \cdot 3,772 \approx$

$8 \cdot 1,204 \approx$

10. $3 \cdot 6,059 \approx$

$9,461 \times 6 \approx$

$(2)(18,366) \approx$

To get a quick estimate for an answer, you can use front-end rounding for both numbers.

 In the next problems, round the left-most digit in *both* numbers and multiply the rounded numbers in your head. The first problem is started for you.

11. $28 \cdot 73 \approx 30 \cdot 70 =$

$57(243) \approx$

$(79)(4,123) \approx$

12. $12 \times 294 \approx$

$88 \times 32 \approx$

$231 \times 659 \approx$

13. $4,809 \cdot 71 \approx$

$726 \cdot 16 \approx$

$428 \cdot 973 \approx$

Using a Calculator

A calculator is a convenient tool for getting an exact answer.

EXAMPLE Use a calculator to find the product of 7×286 .

Press the following keys on a calculator: **7** **×** **2** **8** **6** **=**

The calculator display should read **2002**.

Rounding and Estimating

Not all division problems are as difficult as those in the last exercise. Numbers that end in zeros are often easy to work with.

EXAMPLE $\frac{3,600}{9} = 400$

STEP 1 Forget about the zeros in 3,600, and divide $36 \div 9 = 4$.

STEP 2 Bring along the zeros from 3,600.



Divide each problem in your head.

- | | | |
|---------------------|-------------------|-------------------|
| 1. $1,200 \div 4 =$ | $1,600 \div 8 =$ | $2,100 \div 7 =$ |
| 2. $2,000 \div 5 =$ | $1,400 \div 2 =$ | $40,000 \div 4 =$ |
| 3. $480 \div 6 =$ | $3,300 \div 3 =$ | $7,200 \div 9 =$ |
| 4. $630 \div 7 =$ | $15,000 \div 5 =$ | $30,000 \div 6 =$ |

When both the dividend and the divisor end in zeros, you can *cancel* the zeros one-for-one.

EXAMPLE $\frac{7,200}{80} = 90$

STEP 1 Forget about the zeros in 7,200 and 80, and divide $72 \div 8 = 9$.

STEP 2 Cancel the zeros one-for-one, and bring along the remaining zero.



Divide each problem in your head.

- | | | |
|------------------------|--------------------|--------------------|
| 5. $240 \div 40 =$ | $8,100 \div 90 =$ | $45,000 \div 90 =$ |
| 6. $18,000 \div 200 =$ | $1,800 \div 30 =$ | $200 \div 20 =$ |
| 7. $2,400 \div 600 =$ | $4,900 \div 70 =$ | $3,500 \div 70 =$ |
| 8. $15,000 \div 50 =$ | $2,400 \div 300 =$ | $64,000 \div 80 =$ |

Sometimes you can round the dividend to a number that is easy to divide into. You can use the rounded number to estimate an answer to the original division problem.

EXAMPLE 1 Estimate the answer to the problem $539 \div 9$.

- | | |
|---------------------------------|---|
| $539 \div 9 \approx 540 \div 9$ | STEP 1 Round 539 to the nearest ten. |
| $539 \div 9 \approx 500 \div 9$ | STEP 2 Round 539 to the nearest hundred. |
| $540 \div 9 = 60$ | STEP 3 Since 540 divides evenly by 9, use the problem $540 \div 9$ to estimate the answer. |

EXAMPLE 2 Estimate the answer to the problem $209 \div 4$.

- | | |
|---------------------------------|---|
| $209 \div 4 \approx 210 \div 4$ | STEP 1 Round 209 to the nearest ten. |
| $209 \div 4 \approx 200 \div 4$ | STEP 2 Round 209 to the nearest hundred. |
| $200 \div 4 = 50$ | STEP 3 Since 200 divides evenly by 4, use the problem $200 \div 4$ to estimate the answer. |

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? Round each dividend to the nearest *ten* and the nearest *hundred*. Then decide which number is easier to divide. Use the easier rounded number to estimate the answer.

- | | |
|------------------|--------------|
| 9. $423 \div 7$ | $409 \div 4$ |
| 10. $329 \div 6$ | $492 \div 7$ |
| 11. $194 \div 5$ | $958 \div 8$ |
| 12. $212 \div 3$ | $716 \div 9$ |

? Round each dividend to the nearest *hundred* and the nearest *thousand*. Then decide which rounded number is easier to divide. Use the easier rounded number to estimate the answer.

- | | |
|--------------------|----------------|
| 13. $3,186 \div 4$ | $4,236 \div 8$ |
| 14. $3,186 \div 6$ | $2,095 \div 7$ |
| 15. $8,077 \div 9$ | $3,182 \div 5$ |
| 16. $1,790 \div 3$ | $4,773 \div 6$ |

ESTIMATING SUBTRACTION PROBLEMS

To estimate the answer to a subtraction problem, round each number to the same place.

EXAMPLE 1 Estimate the answer to the problem $28,396 - 7,564$ by rounding each number to the nearest thousand.

$$\begin{array}{ll} 28,396 - 7,564 \approx & \text{STEP 1} \text{ Round each number to the} \\ 28,000 - 8,000 = & \text{nearest thousand.} \\ 20,000 & \text{STEP 2 Subtract the rounded numbers.} \end{array}$$

(The exact answer is 20,832.)

EXAMPLE 2 Use front-end rounding to estimate the answer to the problem $4,318 - 879$.

$$\begin{array}{ll} 4,318 - 879 \approx & \text{STEP 1 Round each number to the left-} \\ 4,000 - 900 = & \text{most digit.} \\ 3,100 & \text{STEP 2 Subtract the rounded numbers.} \end{array}$$

(The exact answer is 3,439.)

ESTIMATING MULTIPLICATION PROBLEMS

One way to estimate the answer to a multiplication problem is to round each number in the problem to the same place.

EXAMPLE 1 Estimate the answer to the problem 39×123 by rounding each number to the nearest ten.

$$\begin{array}{ll} 39 \times 123 \approx & \text{STEP 1 Round each number to the} \\ 40 \times 120 = & \text{nearest ten.} \\ 4,800 & \text{STEP 2 Multiply the rounded numbers.} \end{array}$$

(The exact answer is 4,797.)

EXAMPLE 2 Use front-end rounding to estimate the answer to the problem $57 \times 3,194$.

$$\begin{array}{ll} 57 \times 3,194 \approx & \text{STEP 1 Round each number to the left-} \\ 60 \times 3,000 = & \text{most digit.} \\ 180,000 & \text{STEP 2 Multiply the rounded numbers.} \end{array}$$

(The exact answer is 182,058.)

What Is Estimation?

A customer paid for 3 bags of potato chips with a \$20 bill. Each bag cost \$0.89. How much change should the customer receive?

- a. \$22.67 b. \$19.11 c. \$17.33 d. \$2.67 e. \$1.50

**Can you take a good guess on the answer to this problem?
Do you really need to multiply 0.89 by 3 to find the correct answer?**

Estimation is a skill that you probably already use in your everyday life. It is also a skill that is very useful when you take a test. When you estimate, you round numbers to make them easier to work with. You then get an answer that is “close” to the actual answer.

For example, in the problem above, what would happen if you said that \$0.89 is about \$1.00? You could then say that the chips cost about \$3.00, right?

$$\$20.00 - \$3.00 = \$17.00$$

You have figured out that the customer should get about \$17.00 in change from his purchase. Which answer choice is closest to \$17.00?

You are correct if you chose **c. \$17.33**. Now check by doing the computation.

$\begin{array}{r} \$0.89 \\ \times 3 \\ \hline \$2.67 \end{array}$	$\begin{array}{r} \$20.00 \\ - 2.67 \\ \hline \$17.33 \end{array}$
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When you are doing any kind of math problem, look for numbers that can be changed slightly to make them easier to work with. Just remember that your answer will be only an estimate, not an exact answer. But in many cases, an estimate is all you will really need.

 Practice estimating by finding easy numbers that the following numbers are close to.

EXAMPLE 38 is close to 40.

1. 88 is close to ____.
2. 1,001 is close to ____.
3. 82 is close to ____.
4. 58 is close to ____.
5. 196 is close to ____.
6. 149 is close to ____.
7. 3,899 is close to ____.
8. 203 is close to ____.

 Find an estimate for each problem below. Remember to use numbers that are easy to work with.

EXAMPLE A 185-foot antenna was placed atop a building that is 804 feet high. How many feet off the ground is the tip of the antenna?

185 is about 200. 804 is about 800.

$200 + 800 = 1,000$ feet high

9. Lyle drove 21 miles on Monday, 48 miles on Tuesday, 97 miles on Wednesday, and 101 miles on Thursday. Approximately how many miles did he drive in all?
Estimate: _____
10. A 79-inch rubber tube is divided into 4 equal lengths. About how long is each piece of rubber?
Estimate: _____
11. Susan bought 19 jars of baby food for her daughter Ashley. Each jar cost \$0.98. Approximately how much money did Susan spend on baby food?
Estimate: _____
12. It took Bev 34 minutes to drive to school to pick up Doug. She then drove 58 minutes to get to Hannah's guitar lesson, and another 29 minutes home. About how many *hours* was Bev in the car?
Estimate: _____