

## Lesson 12: Estimating Digits in a Quotient

### Classwork

#### Discussion

Divide 150 by 30.

$$150 \div 30$$

$$15 \text{ tens} \div 3 \text{ tens}$$

$$150 \div 10 \div 3$$

$$150 \div 30$$

$$15 \div 3$$

$$= 5$$

$$\begin{array}{r} 5 \\ 30 \overline{)150} \\ \underline{-150} \\ 0 \end{array}$$

### Exercises 1–5

Round to estimate the quotient. Then, compute the quotient using a calculator, and compare the estimation to the quotient.

1.  $2,970 \div 11$

a. Round to a one-digit arithmetic fact. Estimate the quotient.

Estimation:  $3000 \div 10$

$$\cancel{10} \overline{)3000}$$

$$1 \overline{)3}$$

$$1 \overline{)300}$$

Estimate: 300.

b. Use a calculator to find the quotient. Compare the quotient to the estimate.

$$2970 \div 11 = 270$$

The quotient is very close to the estimate.

2.  $4,752 \div 12$

- a. Round to a one-digit arithmetic fact. Estimate the quotient.

Estimate:  $5,000 \div 10$

$$10 \overline{) 5000}$$

$$1 \overline{) 5}$$

$$1 \overline{) 500}$$

Estimate = 500

- b. Use a calculator to find the quotient. Compare the quotient to the estimate.

$$4752 \div 12 = 396$$

The quotient is fairly close to the estimate.

3.  $11,647 \div 19$

- a. Round to a one-digit arithmetic fact. Estimate the quotient.

$$12,000 \div 20$$

$$20 \overline{) 12000}$$

$$2 \overline{) 12}$$

$$2 \overline{) 1200}$$

Estimate = 600

- b. Use a calculator to find the quotient. Compare the quotient to the estimate.

$$11,647 \div 19 = 613$$

This quotient is very close to the estimate.

4.  $40,644 \div 18$

- a. Round to a one-digit arithmetic fact. Estimate the quotient.

$$18 \overline{)40,644}$$

$$20 \overline{)40,000}$$

$$2 \overline{)4} = 2$$

$$2 \overline{)4000}$$

$$\text{Estimate} = 2,000$$

- b. Use a calculator to find the quotient. Compare the quotient to the estimate.

$$40,644 \div 18 = 2,258$$

The quotient is close to the estimate.

5.  $49,170 \div 15$

- a. Round to a one-digit arithmetic fact. Estimate the quotient.

$$15 \overline{)49,170}$$

$$10 \overline{)50,000}$$

OR

$$20 \overline{)40,000}$$

$$1 \overline{)5} = 5$$

$$2 \overline{)4} = 2$$

$$1 \overline{)5000} = 5000$$

$$2 \overline{)4000} = 2000$$

Estimate could include 5,000 or 2,000.

- b. Use a calculator to find the quotient. Compare the quotient to the estimate.

$$49,170 \div 15 = 3,278$$

The quotient is somewhat close to the estimate; however, it is not as accurate as previous exercises' examples where the divisors were close to a multiple of 10.

**Example 3: Extend Estimation and Place Value to the Division Algorithm**

Estimate and apply the division algorithm to evaluate the expression  $918 \div 27$ .

$$27 \overline{) 917}$$

$$30 \overline{) 9000}$$

$$3 \overline{) 9} = 3$$

$$3 \overline{) 9000} = 3000$$

or

$$\rightarrow 3 \overline{) 900} = 30$$