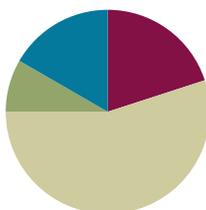# Lesson 17

Objective: Use basic facts to approximate quotients with two-digit divisors.

Suggested Lesson Structure

■ Fluency Practice   (12 minutes)
■ Application Problem   (5 minutes)
■ Concept Development   (33 minutes)
■ Student Debrief   (10 minutes)

   Total Time   **(60 minutes)**

Fluency Practice (12 minutes)

- Group Count by Multiples of 10 **5.NBT.2**   (5 minutes)
- Round to the Nearest Ten **5.NBT.4**   (2 minutes)
- Divide by Multiples of 10, 100, and 1,000 **5.NBT.6**   (5 minutes)

Group Count by Multiples of 10 (5 minutes)

Note: Counting by multiples of 10 helps students estimate quotients with two-digit divisors, which students practice during this lesson's Concept Development.

Repeat the process in Lesson 16 for 4 tens, 5 tens, and 7 tens.

Round to the Nearest Ten (2 minutes)

Note: Rounding to whole numbers and one decimal place prepares students to estimate quotients.

Repeat the process in Lesson 16 for the following possible sequence: 21, 37, 16, 54, 73, 65, 25.

Divide by Multiples of 10, 100, and 1,000 (5 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews content from Lesson 16.

   T: (Write $700 ÷ 10$.) Say the division sentence.
   S: $700 ÷ 10 = 70$.
   T: (Write $800 ÷ 20$.) Write $800 ÷ 20$ as a two-step division sentence taking out the ten.
   S: (Write $= 800 ÷ 10 ÷ 2$.)
   T: Below the two-step division sentence, rewrite it in one step after solving the first division problem.
   S: (Write $= 80 ÷ 2$.)

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   Lesson 17:   Use basic facts to approximate quotients with two-digit divisors.

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T: Write the answer below 80 ÷ 2.

S: (Write = 40.)

Repeat the process for the following possible sequence: 15,000 ÷ 30, 15,000 ÷ 300, 15,000 ÷ 3,000, 450,000 ÷ 50, and 21,000 ÷ 300.

Application Problem (5 minutes)

852 pounds of grapes were packed equally into 3 boxes for shipping. How many pounds of grapes were there in 2 boxes?

Note: The focus of this Application Problem is division with a one-digit divisor. This review encompasses both the meaning of and skill with division, which helps students as they learn to work with two-digit divisors.

$$
\begin{array}{r}
284 \\
3\overline{)852} \\
-6 \\
\hline
25 \\
-24 \\
\hline
12 \\
-12 \\
\hline
0
\end{array}
$$

$$
\begin{array}{r}
284 \\
\times 2 \\
\hline
568
\end{array}
$$

There were 568 pounds of grapes in two boxes.

Concept Development (33 minutes)

Materials: (S) Personal white board

Note: The word *whole* is used throughout the module to indicate the dividend. The choice of this term is two-fold. First, *whole* provides a natural scaffold for the fraction work that is to come in Modules 3 and 4. Second, the words *dividend* and *divisor* are easily confused. While the word *dividend* can certainly be included as well, students may find *whole* to be a more meaningful term.
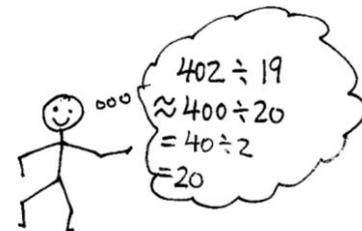
Problem 1: 402 ÷ 19

T: (Write 402 ÷ 19 on the board.) What's the whole in this problem?

S: 402.

T: What's the divisor?

S: 19.

T: Let's round the divisor first. What is 19 rounded to the nearest ten?

S: 20.

T: Let's record our estimation. (Under the original problem, write ≈ _____ ÷ 20 on the board.) We need to round our whole, 402, to a number that can easily be divided by 20. Turn and share your ideas with your partner. (Allow time for students to share.)

> **NOTES ON**
> **MULTIPLE MEANS**
> **OF ENGAGEMENT:**
>
> Allow students to continue to use place value disks or charts to represent the division by multiples of 10 if this scaffold is necessary.
>
> Additionally, students may need to continue to record the division sentences in two steps similar to the fluency activity. For example, Problem 1's estimate could be written as 400 ÷ 20 = 400 ÷ 10 ÷ 2 = 40 ÷ 2 = 20.

402 ÷ 19
≈ 400 ÷ 20
= 40 ÷ 2
= 20

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T: How can we round 402?

S: I can round 402 to 400. → I can use mental math to divide 400 by 20.

T: (Fill in the blank to get ≈ 400 ÷ 20.) What is 400 divided by 20? Turn and share.

S: 400 divided by 10 is 40. 40 divided by 2 is 20. → 400 divided by 2 equals 200. 200 divided by 10 equals 20.

T: Yes. We know that 400 divided by 20 is equal to 40 divided by 2. (Write 40 ÷ 2 below 400 ÷ 20.) What is our estimated quotient?

S: 20.

Problem 2: 149 ÷ 71

T: (Write 149 ÷ 71 on the board.) Take out your personal white board. To estimate the quotient, what do we do first?

S: Round the divisor.

T: Do it now.

S: (Round to 70.)

T: (Write ≈ _____ ÷ 70 on the board.) Now, round the whole, 149. Usually when we round, we round to place value units. But, since we're dividing, it'd be really nice if our whole was a multiple of the divisor. So, let's round it to the nearest multiple of 70. Count with me by seventies. (Write the multiples as students count out loud.)

S: 70, 140, 210, 280.

T: Our whole is between which of these?

S: 140 and 210.

T: We are rounding to the *nearest* multiple of 70. 149 is closest to which multiple of 70?

S: 140.

T: (Fill in ≈ 140 ÷ 70.) 140 divided by 70 is the same as 14 divided by what? Say the division sentence.

S: 14 ÷ 7 = 2.

T: How do you know?

S: 140 ÷ 70 = 140 ÷ 10 ÷ 7. → Dividing by 70 is the same as dividing by 10 and then dividing by 7. → If I put parentheses like this (140 ÷ 10) ÷ 7, it's easy to see the two expressions are equal.

T: So, what's 140 ÷ 70?

S: 2.

T: (Record = 14 ÷ 7 = 2.) Good. Our estimated quotient is 2.

> **NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:**
>
> Having students write the multiples in a vertical or horizontal list as they count can provide helpful support.


$149 \div 71$
$\approx 140 \div 70$
$= 14 \div 7$
$= 2$
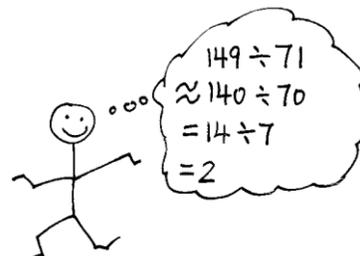
Problem 3: 427 ÷ 58

T: (Write 427 ÷ 58 on the board.) Work with a partner to round the divisor and the whole. Then, estimate the quotient.

T: What's the estimated divisor?

S: 60.

T: So, 60 will be our unit. Let's count by sixties and stop when we find a multiple near 427.

S: 60, 120, 180, 240, 300, 360, 420, … stop!

T: To what number should we round the whole?

S: 420.

T: What's the next multiple of 60?

S: 480.

T: Is 427 closer to 420 or 480?

S: 420.

T: Then, let's use 420 as our estimated whole. 420 divided by 60 is the same as what division equation?

S: 42 ÷ 6 = 7.

T: Share with your partner how you know.

S: 420 ÷ 60 = 420 ÷ 10 ÷ 6. → It's 42 tens divided by 6 tens. It's like 10 divided by 10 is 1, so you are just left with 42 divided by 6. → If I write 42 × 10 ÷ 10 ÷ 6, it's easy to see that multiplying by 10 and dividing by 10 equals 1, so we are left with 42 divided by 6. → 420 ÷ 60 = 42 ÷ 6.

T: What is our estimated quotient? What's 420 divided by 60?

S: 7.

T: Yes. The estimated quotient is 7.
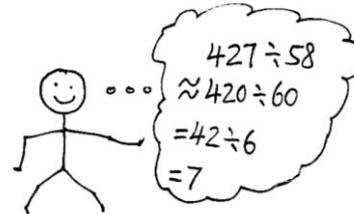
Problem 4: 293 ÷ 42

T: (Write 293 ÷ 42 on the board.) Round the divisor.

S: 40.

T: (Write ≈ _____ ÷ 40 on the board.) So, 40 is our unit. Round the whole to a multiple of 40. Whisper the multiples of 40 to your neighbor. Stop when you hear a multiple that is near our whole.

S: 40, 80, 120, 160, 200, 240, 280, 320.

T: I see you went past 293. Our total is between which two multiples of 40?

S: 280 and 320.

T: Visualize a number line. Which multiple is closer to 293?

S: 280.

T: Finish the division problem on your board. Compare your work with a neighbor.

T: Tell me how to estimate the quotient.

S: 280 ÷ 40 = 28 ÷ 4 = 7.
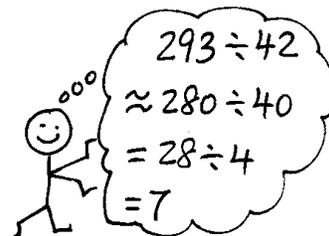
Problem 5: 751 ÷ 93

T: (Write 751 ÷ 93 on the board.) Work independently to round the divisor and the whole. Then, estimate the quotient.

T: Share your work with a neighbor.

T: What was your estimated divisor?

S: 90.

T: And the estimated whole?

S: 720.

T: Tell me how to estimate the quotient.

S: 720 ÷ 90 = 72 ÷ 9 = 8.

751 ÷ 93
≈ 720 ÷ 90
= 72 ÷ 9
= 8
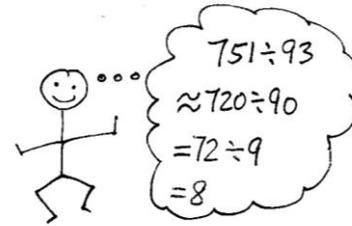
Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.

Student Debrief (10 minutes)

Lesson Objective: Use basic facts to approximate quotients with two-digit divisors.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

Any combination of the questions below may be used to lead the discussion.

▪ Look back at the divisors in Problem 1 (l), (m), and (n). What did you notice about them? How did the 5 in the ones place affect the way you rounded?

▪ In Problem 1(o), did anyone leave the divisor 11 unrounded? Is it always necessary to round? (There are several correct estimations including 660 ÷ 10, 660 ÷ 11, or 600 ÷ 10, as shown in student work.)

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 17 Problem Set 5•2

Name ___Janice___ Date _____

1. Estimate the quotient for the following problems. Round the divisor first.

a. 609 ÷ 21	b. 913 ÷ 29	c. 826 ÷ 37
≈ 600 ÷ 20 = 30	= 900 ÷ 30 = 30	= 800 ÷ 40 = 20
d. 141 ÷ 73	**e.** 241 ÷ 58	**f.** 482 ÷ 62
= 140 ÷ 70 = 2	= 240 ÷ 60 = 4	= 480 ÷ 60 = 8
g. 656 ÷ 81	**h.** 799 ÷ 99	**i.** 635 ÷ 95
= 640 ÷ 80 = 8	= 800 ÷ 100 = 8	= 600 ÷ 100 = 6
j. 311 ÷ 76	**k.** 648 ÷ 83	**l.** 143 ÷ 35
= 320 ÷ 80 = 4	= 640 ÷ 80 = 8	= 160 ÷ 40 = 4

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- Do we follow our typical rounding rules when estimating with division? Why not? (We do not always follow our typical rules of rounding to certain place value units because we are looking for easy multiples of our divisor. Sometimes that means we choose a number that is farther away from our actual whole than rounding by place value would produce.)

- How can you use place value disks or two-step division sentences to justify your answer in Problem 3? (This problem provides an opportunity for students to discuss division by multiples of 10.)

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

Lesson 17:   Use basic facts to approximate quotients with two-digit divisors.

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Name _____   Date _____

1. Estimate the quotient for the following problems. Round the divisor first.

a. 609 ÷ 21	b. 913 ÷ 29	c. 826 ÷ 37
≈ 600 ÷ 20	≈ _____ ÷ _____	≈ _____ ÷ _____
= 30	= _____	= _____

d. 141 ÷ 73	e. 241 ÷ 58	f. 482 ÷ 62
≈ _____ ÷ _____	≈ _____ ÷ _____	≈ _____ ÷ _____
= _____	= _____	= _____

g. 656 ÷ 81	h. 799 ÷ 99	i. 635 ÷ 95
≈ _____ ÷ _____	≈ _____ ÷ _____	≈ _____ ÷ _____
= _____	= _____	= _____

j. 311 ÷ 76	k. 648 ÷ 83	l. 143 ÷ 35
≈ _____ ÷ _____	≈ _____ ÷ _____	≈ _____ ÷ _____
= _____	= _____	= _____

m. 525 ÷ 25	n. 552 ÷ 85	o. 667 ÷ 11
≈ _____ ÷ _____	≈ _____ ÷ _____	≈ _____ ÷ _____
= _____	= _____	= _____

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Lesson 17:   Use basic facts to approximate quotients with two-digit divisors.

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2. A video game store has a budget of $825, and would like to purchase new video games. If each video game costs $41, estimate the total number of video games the store can purchase with its budget. Explain your thinking.

3. Jackson estimated 637 ÷ 78 as 640 ÷ 80. He reasoned that 64 tens divided by 8 tens should be 8 tens. Is Jackson's reasoning correct? If so, explain why. If not, explain a correct solution.

Name _____ Date _____

Estimate the quotient for the following problems.

a. 608 ÷ 23 ≈ _____ ÷ _____ = _____	b. 913 ÷ 31 ≈ _____ ÷ _____ = _____
c. 151 ÷ 39 ≈ _____ ÷ _____ = _____	d. 481 ÷ 68 ≈ _____ ÷ _____ = _____

Name _____   Date _____

1. Estimate the quotient for the following problems. The first one is done for you.

a. 821 ÷ 41 ≈ 800 ÷ 40 = 20	b. 617 ÷ 23 ≈ _____ ÷ _____ = _____	c. 821 ÷ 39 ≈ _____ ÷ _____ = _____
d. 482 ÷ 52 ≈ _____ ÷ _____ = _____	e. 531 ÷ 48 ≈ _____ ÷ _____ = _____	f. 141 ÷ 73 ≈ _____ ÷ _____ = _____
g. 476 ÷ 81 ≈ _____ ÷ _____ = _____	h. 645 ÷ 69 ≈ _____ ÷ _____ = _____	i. 599 ÷ 99 ≈ _____ ÷ _____ = _____
j. 301 ÷ 26 ≈ _____ ÷ _____ = _____	k. 729 ÷ 81 ≈ _____ ÷ _____ = _____	l. 636 ÷ 25 ≈ _____ ÷ _____ = _____
m. 835 ÷ 89 ≈ _____ ÷ _____ = _____	n. 345 ÷ 72 ≈ _____ ÷ _____ = _____	o. 559 ÷ 11 ≈ _____ ÷ _____ = _____

Lesson 17:   Use basic facts to approximate quotients with two-digit divisors.

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2. Mrs. Johnson spent $611 buying lunch for 78 students. If all the lunches cost the same, about how much did she spend on each lunch?

3. An oil well produces 172 gallons of oil every day. A standard oil barrel holds 42 gallons of oil. About how many barrels of oil will the well produce in one day? Explain your thinking.