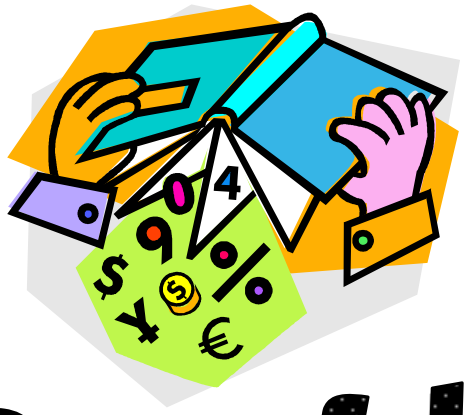
Mathematics:



"A Story of Units"

Parent Handbook

GRADE 3

MODULE 2

Grade 3 • Module 2

Place Value and Problem Solving with Units of Measure

OVERVIEW

In this 25-day module, students explore measurement using kilograms, grams, liters, milliliters, and intervals of time in minutes. Students begin by learning to tell and write time to the nearest minute using analog and digital clocks in Topic A. They understand time as a continuous measurement through exploration with stopwatches and use the number line, a continuous measurement model, as a tool for counting intervals of minutes within 1 hour. Students see that an analog clock is a portion of the number line shaped into a circle. They use both the number line and clock to represent addition and subtraction problems involving intervals of minutes within 1 hour.

Kilograms and grams are introduced in Topic B, measured on digital and spring scales. Students use manipulatives to build a kilogram and then decompose it to explore the relationship between the size and weight of kilograms and grams . An exploratory lesson relates metric weight and liquid volume measured in liters and milliliters, highlighting the coherence of metric measurement. Students practice measuring liquid volume using the vertical number line and graduated beaker. Building on Grade 2's estimation skills with metric length, students in Grade 3 use kilograms, grams, liters, and milliliters to estimate the liquid volumes and weights of familiar objects. Finally, they use their estimates to reason about solutions to one-step addition, subtraction, multiplication, and division word problems involving metric weight and liquid volume given in the same units.

More experienced with measurement and estimation using different units and tools, students further develop their skills by learning to round in Topic C. They measure, and then use place value understandings and the number line as tools to round two-, three-, and four-digit measurements to the nearest ten or hundred.

Students measure and round to solve problems in Topics D and E. In these topics they use estimations to test the reasonableness of sums and differences precisely calculated using standard algorithms. From their work with metric measurement students have a deeper understanding of the composition and decomposition of units. They bring this to every step of the addition and subtraction algorithms with two- and three-digit numbers as 10 units are changed for 1 unit or 1 unit is changed for 10 units. Both topics end in problem solving involving metric units or intervals of time. Students round to estimate, and then calculate precisely using the standard algorithm to add or subtract two- and three-digit measurements given in the same units.

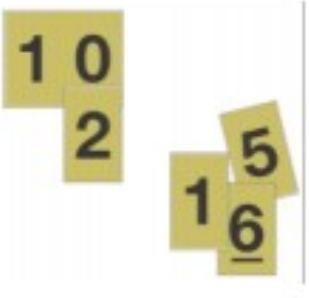
Terminology

New or Recently Introduced Terms and Symbols

- About (with reference to rounding and estimation, an answer that is not precise)
- Addend (the numbers that are added together in an addition equation, e.g., in 4 + 5, the numbers 4 and 5 are the addends)
- Analog clock (a clock that is not digital)
- Capacity (the amount of liquid that a particular container can hold)
- Compose (change 10 smaller units for 1 of the next larger unit on the place value chart)
- Continuous (with reference to time as a continuous measurement)
- Endpoint (used with rounding on the number line; the numbers that mark the beginning and end of a given interval)
- Gram (g, unit of measure for weight)
- Halfway (with reference to a number line, the midpoint between two numbers, e.g., 5 is halfway between 0 and 10)
- Interval (time passed or a segment on the number line)
- Kilogram (kg, unit of measure for mass)
- Liquid volume (the space a liquid takes up)
- Liter (L, unit of measure for liquid volume)
- Milliliter (mL, unit of measure for liquid volume)
- Plot (locate and label a point on a number line)
- Point (a specific location on the number line)
- Reasonable (with reference to how plausible an answer is, e.g., “Is your answer reasonable?”)
- Rename (regroup units, e.g., when solving with the standard algorithm)
- Round (estimate a number to the nearest 10 or 100 using place value)
- Second (a unit of time)
- Standard algorithm (for addition and subtraction)
- ≈ (Symbol used to show than an answer is approximate)

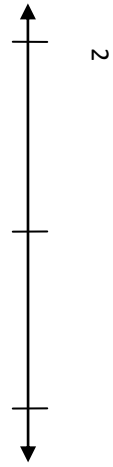
Familiar Terms and Symbols

- Centimeter (cm, unit of measurement)
- Divide (e.g., $4 \div 2 = 2$)
- Estimate (approximation of the value of a quantity or number)
- Horizontal (with reference to how an equation is written, e.g., $3 + 4 = 7$ is written horizontally)
- Measure (a quantity representing a weight or liquid volume, or the act of finding the size or amount of something)
- Mental math (calculations performed in one's head, without paper and pencil)
- Meter (m, unit of measurement)
- Minute (a unit of time)
- Multiply (e.g., $2 \times 2 = 4$)
- Number line (may be vertical or horizontal)
- Simplifying strategy (transitional strategies that move students toward mental math, e.g., "make ten" to add 7 and 6, $(7 + 3) + 3 = 13$)
- Unbundle (regroup units, e.g., in the standard algorithm)
- Vertical (with reference to how an equation is written; equations solved using the standard algorithm are typically written vertically)



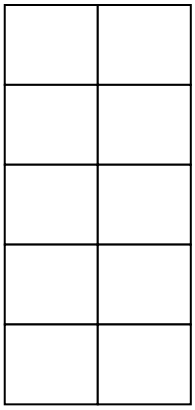
Hide Zero cards

Spring scale

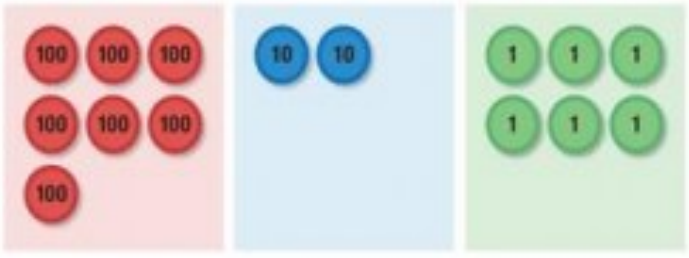


Vertical number

Pan balance



Ten-frame



Sample place value chart without headings.
Number disks are shown in each column.

Lesson 1

Objective: Explore time as a continuous measurement using a stop-watch.

Remember fastest means the shortest amount of time. Students can use timers on cell phones, microwaves, or counting seconds to determine what activities they can do in a set amount of time.

Remember to practice multiplication facts. Try to memorize them in order3x1=3, 3x2=6, 3x3=9 and so on. Students can skip count both up and down to reinforce fluency.

Lesson 2

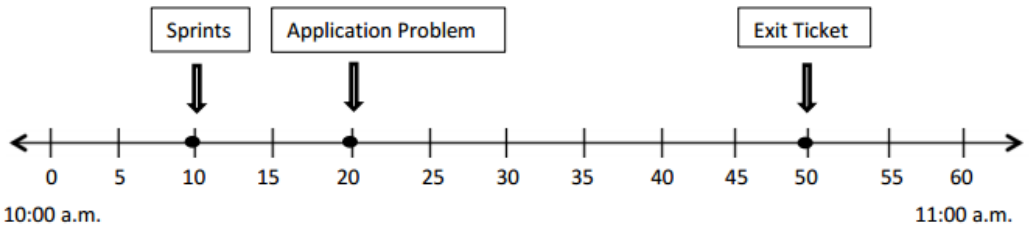
Objective: Relate skip-counting by 5 on the clock and telling time to a continuous measurement model, the number line.

Think about a clock as a circular number line. If we stretch it out it looks like the number line below.

Sprints– 10:10

Application Problem– 10:20

Exit Ticket– 10:50

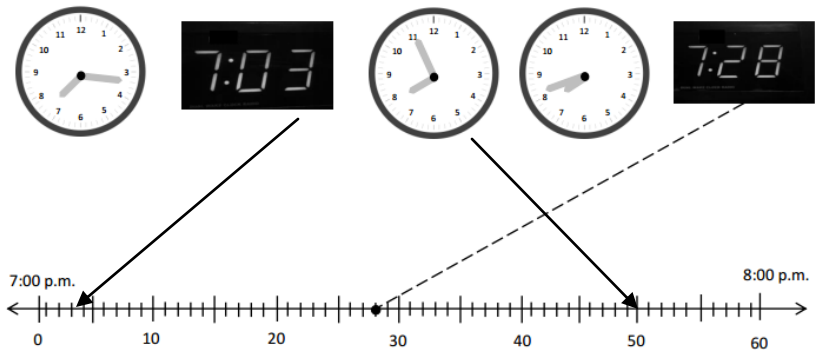


Lesson 3

Objective: Count by fives and ones on the number line as a strategy to tell time to the nearest minute on the clock.

You can add 4 smaller marks between each 5 minute marks to identify time to the minute.

1. Plot a point on the number line for the times shown on the clocks below. Then draw a line to match the clocks to the points.

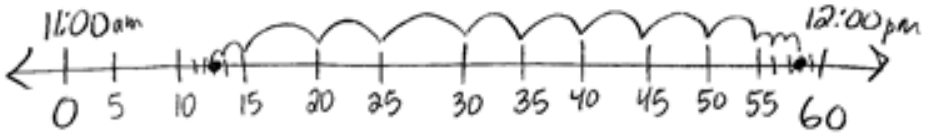


Lesson 4

Objective: Solve word problems involving time intervals within 1 hour by counting backward and forward using the number line and clock.

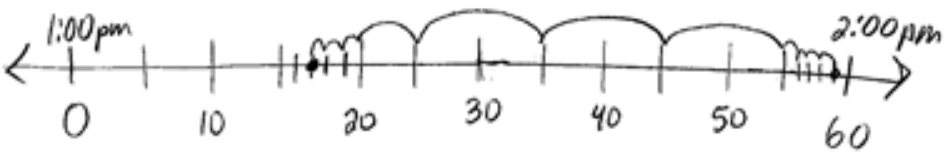
Remember to count up how many skip count by ones and fives to find the total elapsed time.

7. Sydney cleans her room for 45 minutes. She starts at 11:13am. What time does Sydney finish cleaning her room?



Sydney finishes at 11:58am.

8. The third grade chorus performs a musical for the school. The musical lasts 42 minutes. It ends at 1:59pm. What time does the musical start?

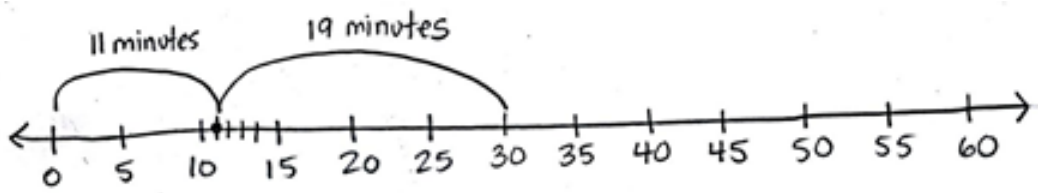


The musical starts at 1:17pm.

Lesson 5

Objective: Solve word problems involving time intervals within 1 hour by adding and subtracting on the number line.

Gia, Carlos's classmate, gets to class at 9:11. It takes her 19 minutes to write homework assignments and complete morning work. How can we figure out if Gia will be ready to start math at 9:30?



We can start at 9:11 and add 19 minutes. We can add 11 minutes and 19 minutes to find out how many minutes after 9:00 she finishes .

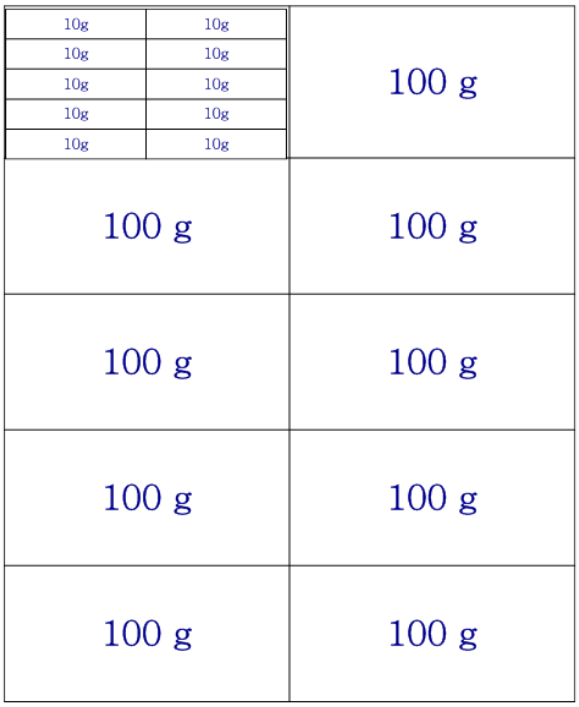
11 minutes + 19 minutes = 30 minutes

Gina will be ready to start math at 9:30

Lesson 6

Objective: Build and decompose a kilogram to reason about the size and weight of 1 kilogram, 100 grams, 10 grams, and 1 gram.

1 kg=



Lesson 7

Objective: Develop estimation strategies by reasoning about the weight in kilograms of a series of familiar objects to establish mental benchmark measures.

A.

Objects that Weigh About 1 kilogram	Actual Weight
a dictionary	1,240 g
my shoe	920 g
the globe	1,180 g

B.

Objects that Weigh About 100 grams	Actual Weight
my apple	90 g
a calculator	80 g
my notebook	120 g

C.

Objects that Weigh About 10 grams	Actual Weight
a blue pattern block	7 g
a dry erase marker	9 g
my bracelet	8 g

D.

Objects that Weigh About 1 gram	Actual Weight
a penny	3 g
my pencil	6 g
an index card	2 g

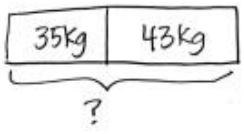
Lesson 8

Objective: Solve one-step word problems involving metric weights within 100 and estimate to reason about solutions.

Use a tape diagram, count on, decompose, or other methods to solve problems. Remember to write an equation to match your models.

2. Use tape diagrams to model the following problems. Keiko and her brother Jiro get weighed at the doctor's office. Keiko weighs 35 kilograms and Jiro weighs 43 kilograms.

a. What is Keiko and Jiro's total weight?



35 + 43

35 + 3 = 38

38 + 40 = 78

Keiko and Jiro's total weight is 78kg.

Keiko and Jiro weigh 78 kilograms.

28 g + 36 g =

2 34

30 g + 34 g = 64 g

30 4

Lesson 9

Objective: Decompose a liter to reason about the size of 1 liter, 100 milliliters, 10 milliliters, and 1 milliliter.

One mL is can be measured with an eye dropper

One liter and be thought of as a bottle of water

Lesson 10

Objective: Estimate and measure liquid volume in liters and milliliters using the vertical number line.

When estimating think about what number it is closest too.

4. The chart below shows the capacity of 4 barrels.

Barrel A	75 liters
Barrel B	68 liters
Barrel C	96 liters
Barrel D	52 liters

a. Label the number line to show the capacity of each barrel. Barrel A has been done for you.

b. Which barrel has the greatest capacity?

Barrel C.

c. Which barrel has the smallest capacity?

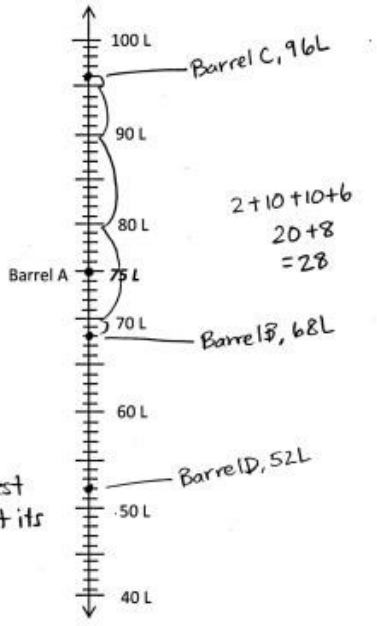
Barrel D.

d. Ben buys a barrel that holds about 70 liters. Which barrel did he most likely buy? Explain why.

He might buy barrel B because its closest to 70L. It won't exactly hold 70L, but its closest.

e. Use the number line to find how many more liters Barrel C can hold than Barrel B.

96-68. It can hold 28L more.



Lesson 11

Objective: Solve mixed word problems involving all four operations with grams, kilograms, liters, and milliliters given in the same units.

Decompose to add and subtract

$34g + 126g = ?$

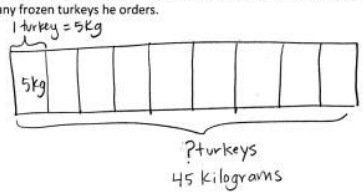
30 4

$30 + 4 + 126 =$

$30 + 130 =$

Use tape diagrams to multiply or divide

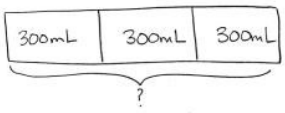
4. A frozen turkey weighs about 5 kilograms. The chef orders 45 kilograms of turkey. Use a tape diagram to find about how many frozen turkeys he orders.



$45 \div 5 = 9$

The chef ordered 9 turkeys.

5. A recipe requires 300 milliliters of milk. Sara decides to triple the recipe for dinner. How many milliliters of milk does she need to cook dinner?



300mL + 300mL + 300mL = 900ml

Sara needs 900mL of milk.

Lesson 12

Objective: Round two-digit measurements to the nearest ten on the vertical number line.

Think about the vertical number line when rounding. If you are halfway to the next unit or more, round up to the next unit. If it is less than halfway to the next unit, round down to the lesser unit.

Container	Measurement (in mL)	The container measures between (which two tens)	Liquid volume rounded to the nearest ten mL
Example: Container A	33 mL	30 and 40 mL	30 mL
Container B	67mL	60 and 70 mL	70 mL
Container C	12mL	10 and 20 mL	10 mL
Container D	45 mL	40 and 50 mL	50mL
Container E	94mL	90 and 100 mL	90 mL

4. Work with a partner. Use a clock to complete the chart below.

Activity	Actual time	The activity measures between (which two tens)	Time rounded to the nearest ten minutes
Example: Time we started math	10:03	10:00 and 10:10	10:00
Time I started the Application Problems	10:34	10:30 and 10:40	10:30
Time I finished station 1	10:41	10:40 and 10:50	10:40
Time I finished station 2	10:48	10:40 and 10:50	10:50
Time I finished station 3	10:56	10:50 and 11:00	11:00

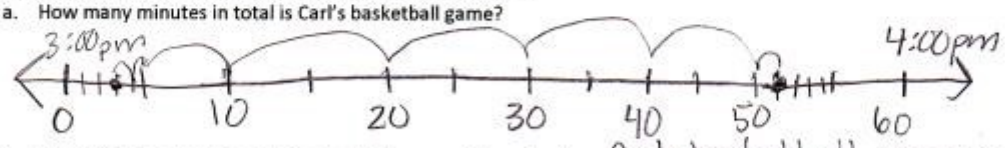
Lesson 13

Objective: Round two- and three-digit numbers to the nearest ten on the vertical number line.

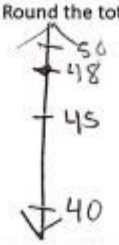
	Number line	Round to the nearest ten grams
 36 grams		36g ≈ 40g

3. Carl's basketball game begins at 3:03pm and ends at 3:51pm.

a. How many minutes in total is Carl's basketball game?



b. Round the total number of minutes to the nearest ten minutes.

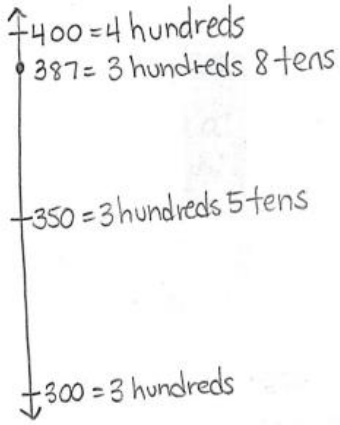


48 min ≈ 50 min

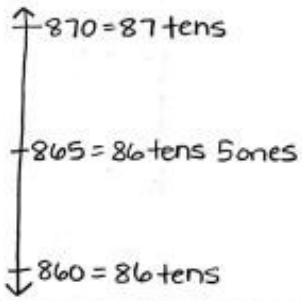
Carl's basketball game is 48 minutes in total.

Lesson 14

Objective: Round to the nearest hundred on the vertical number line.



4. The teacher asks students to round 865 to the nearest ten. Christian says that it is eight hundred seventy. Alexis disagrees and says it is 87 tens. Who is correct? Explain your thinking.



They are both correct because 870 in unit form is 87 tens.

870 = 87 tens.

870 has 80 tens + 7 tens, 87 tens.

Lesson 15

Objective: Add measurements using the standard algorithm to compose larger units once.

2. Nadine and Jen buy a small bag of popcorn and a pretzel at the movie theater. The pretzel weighs 63 grams more than the popcorn. What is the weight of the pretzel?

$$\begin{array}{r} 44 \\ +\ 63 \\ \hline 107 \end{array}$$

The pretzel weighs 107 grams.

3. In math class, Jason and Andrea find the total liquid volume of water in their beakers. Jason says the total is 782mL, but Andrea says it is 792mL. The amount of water in each beaker can be found in the table to the right. Show whose calculation is correct. Explain the mistake of the other student.

Student	Liquid Volume
Jason	475mL
Andrea	317mL

$$\begin{array}{r} 475\text{ mL} \\ +317\text{ mL} \\ \hline 792\text{ mL} \end{array}$$

Andrea is correct. Jason forgot to rename some ones as tens. Or else he just forgot to add the ten he renamed to the 7 tens and 1 ten that were already there.

4. It takes Greg 15 minutes to mow the front lawn. It takes him 17 more minutes to mow the back lawn than the front lawn. What is the total amount of time Greg spends mowing the lawns?

15 min + 17 min = 32 min

32 + 15 = 47 minutes

40 7

Greg spends 47 minutes mowing lawns.

Lesson 16

Objective: Add measurements using the standard algorithm to compose larger units twice.

Some problems may require us to add more then once.

Always ask yourself "is my answer reasonable?"

4. The milk carton to the right holds 183 milliliters more liquid than the juice box. What is the total capacity of the juice box and milk carton?

$$\begin{array}{r} 279\text{ mL} \\ +\ 183\text{ mL} \\ \hline 462\text{ mL of milk} \end{array}$$

$$\begin{array}{r} 462\text{ mL} \\ +\ 279\text{ mL} \\ \hline 741\text{ mL} \end{array}$$

The total capacity is 741 mL.

Sometimes you can distribute to make benchmark numbers.

a. 52 mL + 68 mL

50 mL + 70 mL

120 mL

Lesson 17

Objective: Estimate sums by rounding and apply to solve measurement word problems.

356 + 161 = 517
400 + 200 = 600

356 + 148 = 504
400 + 100 = (500)

347 + 149 = 496
300 + 100 = 400

Circle the estimated sum that is the closest to its real sum.

3. Sadie, the bear at the zoo, weighs 182 kilograms. Her cub weighs 74 kilograms.

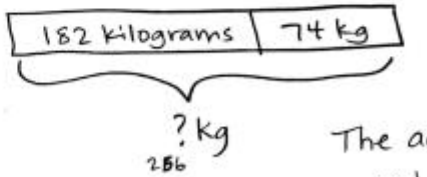
   a. Estimate the total weight of Sadie and her cub using whatever method you think best.

   182 ≈ 180
   74 ≈ 70
   180 + 70 = 250

   The total weight of Sadie and her cub is about 250 kilograms.

   b. What is the actual weight of Sadie and her cub? Model the problem with a tape diagram.

   182
   + 74
   256



The actual weight of Sadie and her cub is 256 kilograms.

Lesson 18

Objective: Decompose once to subtract measurements including three-digit minuends with zeros in the tens or ones place.

There are different approaches to subtraction problems. Students are encouraged to use the one they feel suits them best.

c. 360 mL − 224 mL

5 10
3 6 0 mL
− 2 2 4 mL
1 3 6 mL

a. 60 mL − 24 mL

30 30 6

30 + 6 = 36 mL

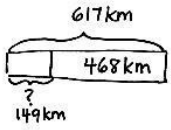
k. 3 kg 924 g − 1 kg 893 g

2 kg 8 9 12 4 g
− 8 9 3 g
2 kg 31 g

Lesson 19

Objective: Decompose twice to subtract measurements including three-digit minuends with zeros in the tens and ones places.

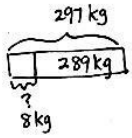
2. David drives from Los Angeles to San Francisco. The total distance is 617 kilometers. He has 468 kilometers left to drive. How many kilometers has he driven so far?



$$\begin{array}{r} 5\,10\,17 \\ 6\,\not{1}\,\not{7} \\ -\,4\,6\,8 \\ \hline 1\,4\,9 \end{array}$$

David has driven 149 km so far.

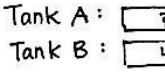
3. The piano weighs 289 kilograms more than the piano bench. How much does the bench weigh?



297 − 289 = 8 kg

The bench weighs 8 kg.

4. Tank A holds 165 fewer liters of water than Tank B. Tank B holds 400 liters of water. How much water does Tank A hold?



$$\begin{array}{r} 3\,\overset{9}{\not{4}}\,\overset{10}{\not{0}} \\ 4\,\not{0}\,\not{0} \\ -\,1\,6\,5 \\ \hline 2\,3\,5 \end{array}$$

Tank A holds 235 liters.

Lesson 20

Objective: Estimate differences by rounding and apply to solve measurement word problems.

Before we round we look at the numbers to see what type of rounding will get me a reasonable answer. Should I round to the tens or hundreds?

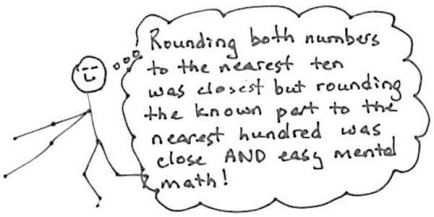
362 − 189

↓

400 − 200 = 200

360 − 190 = 170

362 − 200 = 162



362 − 189 = 173

349 − 154

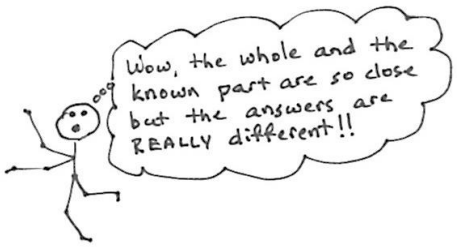
300 − 200 = 100

349 − 149

300 − 100 = 200

351 − 149

400 − 100 = 300

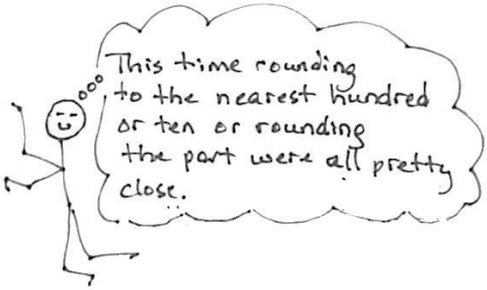


496 − 209 = 287

500 − 200 = 300

500 − 210 = 290

496 − 200 = 296



Lesson 21

Objective: Estimate sums and differences of measurements by rounding, and then solve mixed word problems.

a. Estimate, then find the total amount of liquid in the 3 containers.

Estimate: 210 + 240 + 200 = 650 mL

212
238
195
645 mL

The total amount of liquid is 645 mL.

b. Estimate, then find the difference between the amount of water in Container D and Container E. Model the problem with a tape diagram.

Estimate: 240 − 210 = 230 mL

Container E: 238 mL
Container D: 212 mL ?

238
−212
26 mL

The difference is 26 mL

4. Shane watches a movie in the theater that is 115 minutes long, including the trailers. The chart to the right shows the length in minutes of each trailer.

	Length in minutes
Trailer 1	5 minutes
Trailer 2	4 minutes
Trailer 3	3 minutes
Trailer 4	5 minutes
Trailer 5	4 minutes
Total:	21 minutes

10
3
8

a. Find the total number of minutes for all 5 trailers.

The total minutes is 21 minutes.

b. Estimate to find the length of the movie without trailers. Then find the actual length of the movie by calculating the difference between 115 minutes and the total minutes of trailers.

115 − 21 ≈ 120 − 20 = 100 min.
115 − 21 = 94 min.
The length of the movie is 94 minutes.

c. Is your answer reasonable? Explain why.

Yes, it is reasonable because 94 min. is close to 100 min.

2. Measure the lengths of the 3 pieces of yarn.

a. Estimate, then find the total length of Yarn A and Yarn C.

Yarn A	64	cm ≈	60	cm
Yarn B	88	cm ≈	90	cm
Yarn C	38	cm ≈	40	cm

Estimate: 60 cm + 40 cm = 100 cm

64 + 38 = 102 cm
62, 2, 40

The total length is 102 cm.

b. Estimate, then subtract the length of Yarn B from the total length of Yarn A and Yarn C. Model the problem with a tape diagram.

Estimate: 100 cm − 90 cm = 10 cm

Yarn A + Yarn C: 102 cm
Yarn B: 88 cm ? cm

9 12
102
− 88
14 cm

The difference is 14 cm.

3. Plot the capacity of the 3 containers on the number lines below. Then round to the nearest ten milliliters.

Container D: 220 mL, 215 mL, 212 mL, 210 mL
212 mL ≈ 210 mL

Container E: 240 mL, 238 mL, 235 mL, 230 mL
238 mL ≈ 240 mL

Container F: 200 mL, 195 mL, 190 mL
195 mL ≈ 200 mL