Minutes a Day-Mastery for a Lifetime!

Level 3

Problem Solving

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Vocabulary

arrange	put in a certain order
array	an arrangement of things in rows or columns
acute angle	an angle measuring less than 90° 
area	the size of a surface; area is always given in square units (ft^2, m^2,...)
calculate	figure out
classify	sort
congruent	figures with the same shape and the same size
data	information
decrease	get smaller
denominator	the bottom number of a fraction. Example: $\frac{1}{4}$, the denominator is 4.
diameter	the widest distance across a circle; the diameter always passes through the center
difference	the result or answer to a subtraction problem Example: The difference of 5 and 1 is 4.
double	add 2 of the same amount Example: 10 + 10 = 20
edge	where 2 faces meet on a 3-dimensional (solid) shape
equilateral	all sides have the same measurement
equivalent	different names for the same amount
estimate	a close guess
face	the flat part of a 3-dimensional (solid) shape
fraction	a part of a whole Example:  This box has 4 parts; 1 part is shaded. $\frac{1}{4}$
height	how high something is
increase	get larger

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Vocabulary (continued)

line of symmetry	a line along which a figure can be folded so that the two halves match exactly
length	how long something is
multiple	the product of a whole number and another whole number Example: The multiples of 3 are 3, 6, 9, 12, etc.
numerator	the top number of a fraction Example: In $\frac{1}{4}$, the numerator is 1.
obtuse angle	an angle measuring more than 90° 
pattern	an idea that repeats
perimeter	the distance around the outside of a polygon
probablility	the chance of something happening
product	the result or answer to a multiplication problem Example: The product of 5 and 3 is 15.
quotient	the result or answer to a division problem Example: The quotient of 8 and 2 is 4.
radius	the distance from any point on a circle to the center; the radius is half of the diameter
remainder	the part left over when one number can't be divided exactly by another Example: 5 ÷ 2 = 2 R1
right angle	an angle measuring exactly 90° 
similar	figures having the same shape, but different sizes
sum	the result or answer to an addition problem Example: The sum of 5 and 2 is 7.
symbols	signs **=** → equals **≠** → does not equal **>** → is greater than **<** → is less than
table	a chart with rows and columns
width	how wide something is

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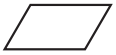
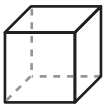
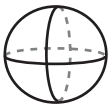
2-Dimensional Shapes			
circle 		ellipse 	(oval)
triangle 	any shape with 3 sides	quadrilateral 	any shape with 4 sides
parallelogram 		rectangle 	
square 		rhombus 	(diamond)
trapezoid 		pentagon 	any shape with 5 sides
hexagon 	any shape with 6 sides	octagon 	any shape with 8 sides
3-Dimensional Shapes			
pyramid 		cone 	
rectangular prism 		cube 	
sphere 		cylinder 	

Measurement — Relationships	
Volume	Distance
3 teaspoons = 1 tablespoon	36 inches = 1 yard
2 cups = 1 pint	1,760 yards = 1 mile
2 pints = 1 quart	5,280 feet = 1 mile
4 quarts = 1 gallon	100 centimeters = 1 meter
	1,000 millimeters = 1 meter

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Measurement — Relationships (continued)

Weight	Temperature
16 ounces = 1 pound	0° Celsius → freezing point of water
2,000 pounds = 1 ton	100° Celsius → boiling point of water
Time	32° Fahrenheit → freezing point of water
10 years = 1 decade	212° Fahrenheit → boiling point of water
100 years = 1 century	

Whole Numbers

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
2	7	1,	4	0	5

The number above is read: two hundred seventy-one thousand, four hundred five.

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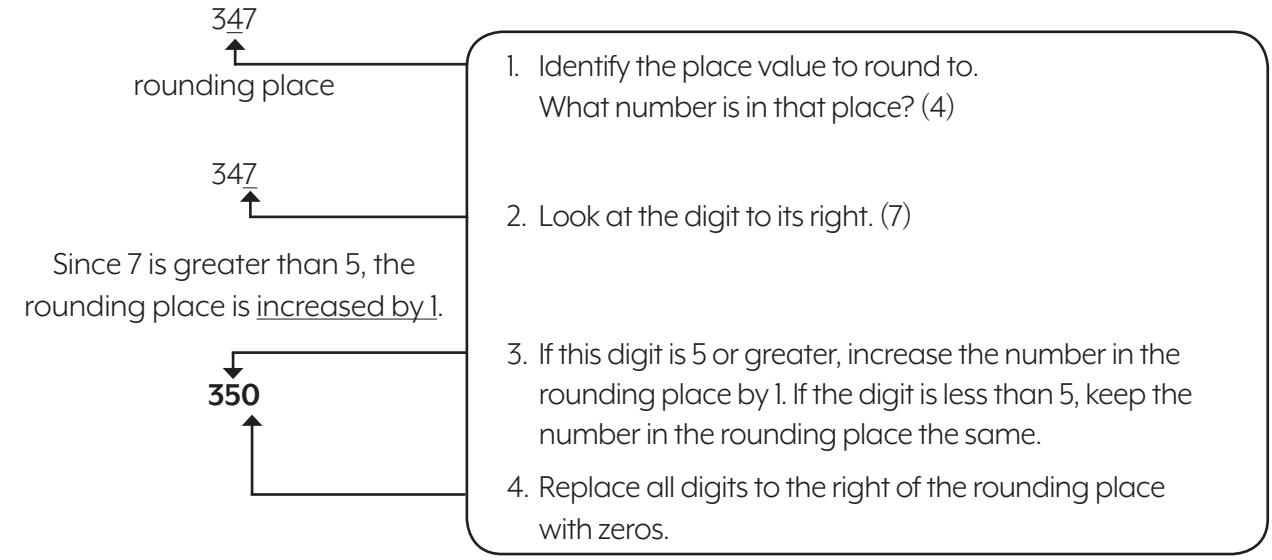
Whole Numbers

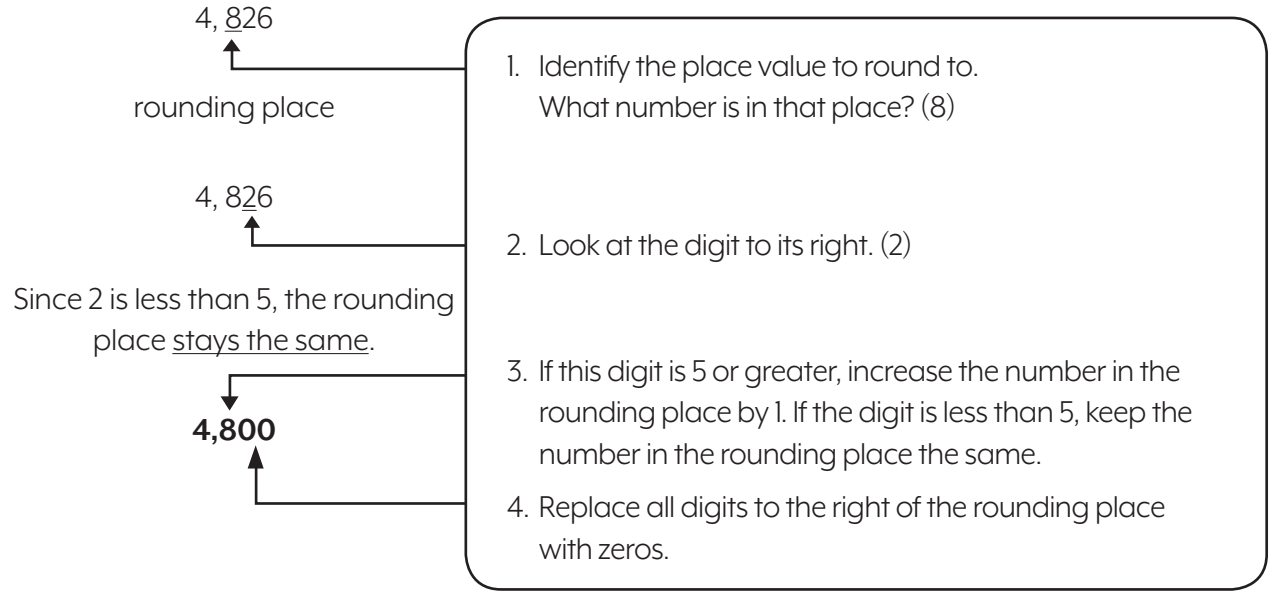
Think of **rounding numbers** as an easier way to work with numbers. Rounding is a way of estimating. The rounded number (or estimate) is close to the actual value, but has zeros at the end. Use a place value chart if needed.

Examples:

Round 347 to the tens place.



Round 4,826 to the hundreds place.



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Whole Numbers (continued)

When **adding or subtracting whole numbers,** first the numbers must be lined-up from the right. Starting with the ones place, add (or subtract) the numbers. When adding, if the answer has two digits, write the ones digit and regroup the tens digit. For subtraction, it may also be necessary to regroup first. Then, add (or subtract) the numbers in the tens place. Continue with the hundreds, etc.

Look at these **addition** examples.

Examples:

Find the sum of 314 and 12.

$$\begin{array}{r} 314 \\ +\ 12 \\ \hline 326 \end{array}$$

1. Line up the numbers on the right.
2. Beginning with the ones place, add. Regroup if necessary.
3. Repeat with the tens place.
4. Continue this process with the hundreds place, etc.

Add 6,478 and 1,843.

$$\begin{array}{r} {\scriptstyle 1\ 1\ 1} \\ 6{,}478 \\ +\ 1{,}843 \\ \hline 8{,}321 \end{array}$$

Look at these **subtraction** examples.

Example: Subtract 37 from 93.

$$\begin{array}{r} {\scriptstyle 8\ 13} \\ 9\not{3} \\ -\ 37 \\ \hline 56 \end{array}$$

1. Begin with the ones place. Since 7 is larger than 3, regroup to 8 tens and 13 ones.
2. Now look at the tens place. Since 3 is less than 8, the regrouping is complete.
3. Subtract each place value beginning with the ones.

Example: Find the difference of 425 and 233.

$$\begin{array}{r} {\scriptstyle 3\ 12} \\ 4\not{2}5 \\ -\ 233 \\ \hline 192 \end{array}$$

1. Begin with the ones place. Since 3 is less than 5, do not regroup.
2. Now look at the tens place. Since 3 is larger than 2, regroup to 3 hundreds and 12 tens.
3. Now look at the hundreds place. Notice, 2 is less than 3; the regrouping is complete.
4. Subtract each place value beginning with the ones.

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Whole Numbers (continued)

When **subtracting from zero**, always regroup.

Example: Subtract 261 from 500.

$$\begin{array}{r} {\scriptstyle 4\ 10\ 10}\ {\scriptstyle 9} \\ 5\not{0}\not{0} \\ -\ 261 \\ \hline 239 \end{array}$$

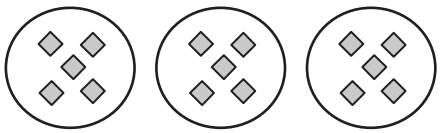
1. Begin with the ones place. Since 8 is less than 0, regroup.
2. Regroup to 5 tens and 10 ones.
3. Then, subtract each place value beginning with the ones.

Example: Find the difference between 600 and 238.

$$\begin{array}{r} {\scriptstyle 5\ 10\ 10}\ {\scriptstyle 9} \\ 6\not{0}\not{0} \\ -\ 238 \\ \hline 362 \end{array}$$

Multiplication is a quick way to add groups of numbers. The sign (×) for multiplication is read "times." The answer to a multiplication problem is called the product. Use the pictures below to understand multiplication.

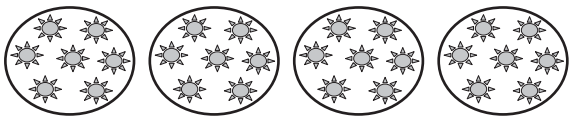
Example: 3 × 5 is read "three times five." It means 3 groups of 5, or 5 + 5 + 5.



3 × 5 = 5 + 5 + 5 = 15

The product of 3 × 5 = 15.

Example: 4 × 7 is read "four times seven." It means 4 groups of 7, or 7 + 7 + 7 + 7.



4 × 7 = 7 + 7 + 7 + 7 = 28

The product of 4 × 7 = 28.

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Whole Numbers (continued)

It is very important to memorize **multiplication facts**. This table will help.

To use this table, choose a number in the top gray box and multiply it by a number in the left gray box. Follow both arrows with your fingers (down and across) until they meet. The number in that box is the product.

An example is shown: 2 × 3 = 6.

×	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30	36	42	48	54	60
7	0	7	14	21	28	35	42	49	56	63	70
8	0	8	16	24	32	40	48	56	64	72	80
9	0	9	18	27	36	45	54	63	72	81	90
10	0	10	20	30	40	50	60	70	80	90	100

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Whole Numbers (continued)

When **multiplying multi-digit whole numbers**, it is important to know the multiplication facts. Follow the steps and the examples below.

Example: Multiply 23 by 5.

1. Line up the numbers on the right.
2. Multiply the digits in the ones place. Regroup if necessary.
3. Multiply the digits in the tens place. Add any regrouped tens.
4. Repeat step 3 for the hundreds place, etc.

$$\begin{array}{r} {\scriptstyle 1}\,2\,3 \\ \times\quad 5 \\ \hline 1\,1\,5 \end{array}$$

3 × 5 = 15 ones or 1 ten and 5 ones

2 × 5 = 10 tens + 1 ten (regrouped) or 11 tens

Example: Find the product of 314 and 3.

$$\begin{array}{r} 3\,{\scriptstyle 1}\,1\,4 \\ \times\quad 3 \\ \hline 9\,4\,2 \end{array}$$

4 × 3 = 12 ones or 1 ten and 2 ones

1 × 3 = 3 tens + 1 ten (regrouped) or 4 tens.

3 × 3 = 9 hundreds

Division is the opposite of multiplication. The symbols for division are ÷ and $\overline{)}$ and are read "divided by." The answer to a division problem is called the quotient.

Remember that multiplication is a way of adding groups to get their total. Think of division as the opposite of this. In division, the total and the number in each group are given. Find the number of groups. Study the examples below.

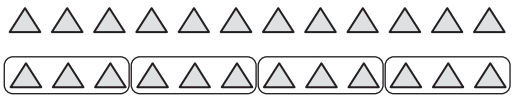
Example: What is 12 ÷ 3?

The total number is 12.

Each group contains 3.

How many groups are there?

(12 items divided into groups of 3)



There are 4 groups.

12 ÷ 3 = 4

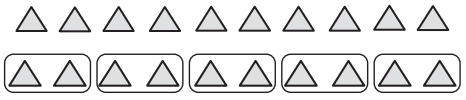
Example: Divide 10 by 2.

The total number is 10.

Each group contains 2.

How many groups are there?

(10 items divided into groups of 2)



There are 5 groups.

10 ÷ 2 = 5

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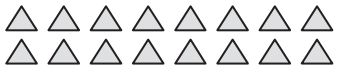
Whole Numbers (continued)

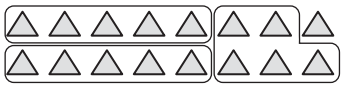
Sometimes in division, there are items left over that do not make a whole group. These left-over items are called the **remainder**. When this happens, we say that "the whole cannot be divided evenly by that number."

Example: What is 16 ÷ 5? (16 items divided into groups of 5)

The total number is 16.



Each group contains 5.

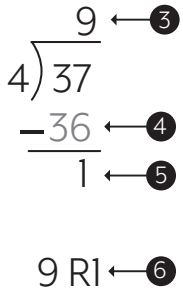


How many groups are there?

There are 3 groups, but there is 1 left over.
The remainder is 1.

16 ÷ 5 = 3 **R1**
This is read "3 remainder 1."

The next group of examples involves **long division using one-digit divisors with remainders**. This is the process for dividing numbers with multiple digits.



1. In this problem, 37 is the dividend, and 4 is the divisor. Look at each digit in the dividend, starting on the left.
2. Ask if the divisor (4) goes into the left-most digit in the dividend (3). It doesn't, so keep going to the right.
3. Does the divisor (4) go into the two left-most digits (37)? It does. How many times does 4 go into 37? (9 times)
4. Multiply 4 x 9. (36)
5. Subtract 36 from 37. (1) There's nothing left to bring down from above. Once this number is smaller than the divisor, it is called the remainder, and the problem is finished.
   The remainder is 1.
6. Write the answer with the remainder. (9 R1)

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Whole Numbers (continued)

Example: What is 556 divided by 6?

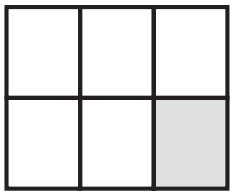
```
   9      ← 2
6)556
 −54↓     ← 3
  16      ← 4

   92     ← 5
6)556
 −54↓
  16
 − 12     ← 6
   4      ← 7

92 R41    ← 8
```

1. Ask if the divisor (6) goes into the left-most digit in the dividend (5). It doesn't, so keep going to the right.
2. Does the divisor (6) go into the two left-most digits (55)? It does. How many times does 6 go into 55? (9 times)
3. Multiply 6 × 9. (54)
4. Subtract 54 from 55. (1) Bring down the 6 ones from the first line. This leaves 16 left from the original 556.
5. Does the divisor (6) go into 16? It does. How many times does 6 go into 16? (2)
6. Multiply 6 × 2. (12)
7. Subtract 12 from 16. (4) There's nothing left to bring down from above. Once this number is smaller than the divisor, it is called the remainder, and the problem is finished. The remainder is 4.
8. Write the answer with the remainder. (92 R4)

Remember: The remainder can NEVER be larger than the divisor!

Fractions

A **fraction** is used to represent part of a whole. The top number in a fraction is the part. The bottom number in a fraction is the whole.



The whole rectangle has 6 sections.

Only 1 section is shaded.

This can be shown as the fraction $\frac{1}{6}$.

$\frac{1}{6}$ $\frac{\text{shaded part}}{\text{total part}}$

To **add (or subtract) fractions with the same denominator**, simply add (or subtract) the numerators, keeping the same denominator.

Examples: $\frac{3}{5} + \frac{1}{5} = \frac{4}{5}$ $\frac{8}{9} - \frac{1}{9} = \frac{7}{9}$

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Decimals

Adding and subtracting decimals is similar to adding and subtracting whole numbers. Lining up the decimal points of the number values is always the first step. Add zeros if necessary, so that all of the numbers have the same number of digits after the decimal point. The zeros don't change the value. Before subtracting, remember to regroup also. After adding or subtracting the number values, bring the decimal point straight down into the answer.

Example: Find the sum of 4.25 and 2.31.

$$\begin{array}{r} 4.25 \\ +2.31 \\ \hline 6.56 \end{array}$$

1. Line up the decimal points. Add zeros as needed.
2. Add (or subtract) the decimals.
3. Add (or subtract) the whole numbers.
4. Bring the decimal point straight down.

Example: Subtract 4.8 from 7.4.

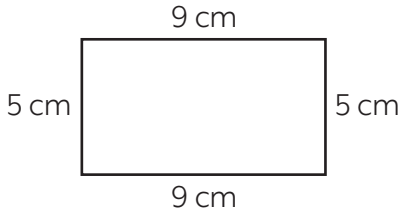
$$\begin{array}{r} {\scriptstyle 6\ 14} \\ 7.\cancel{4} \\ -4.8 \\ \hline 2.6 \end{array}$$

Geometry

The **perimeter of a polygon** is the distance around the outside of the figure. To find the perimeter, add the lengths of the sides of the figure. Be sure to label the answer.

Perimeter = sum of the sides

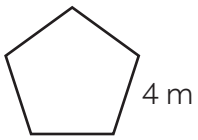
Example: Find the perimeter of the rectangle below.



Perimeter = 5 cm + 9 cm + 5 cm + 9 cm

Perimeter = 28 cm

Example: Find the perimeter of the regular pentagon below.



A pentagon has 5 sides. Each of the sides is 4 m long.

P = 4 m + 4 m + 4 m + 4 m + 4 m

P = 5 × 4 m

P = 20 m

Help Pages

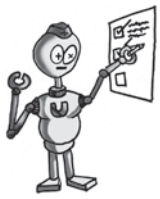
Problem-Solving Strategies

Make an Organized List

Some math problems ask for a list of all possible correct answers. This strategy helps you organize all your ideas without repeating any answers.

Guess and Check

Some math problems ask you to think like a detective. Detectives follow clues to solve a "case." Guess and check as you work with one clue at a time. When the final answer fits every clue, you have solved the case!



Look for a Pattern

Some math problems ask you to write what comes next. In a pattern, numbers go in order according to a rule. The numbers in a pattern may be getting larger or smaller. This strategy helps you think about what rule a pattern is following.

Draw a Picture

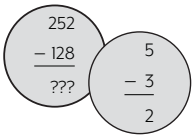
Some math problems are easier to understand through pictures. Draw a picture to act out the problem on paper.

Work Backward

Some math problems tell you the end of a story. Your task is to discover the beginning of the story. To use this strategy, start with the answer and do the math steps in reverse.

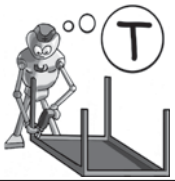
Solve a Simpler Problem

Some math problems have numbers that seem too big. This strategy helps you find a basic fact you already know. You can use what you know to tackle the bigger numbers.



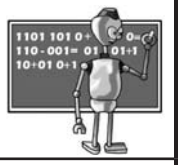
Make a Table

Some math problems give lots of information. Tables have rows and columns. Labels are helpful, too. A table helps you organize the information and see patterns.



Write a Number Sentence

Word problems can become numbers and math symbols (+ – ÷ × = < >). These numbers and math signs help you solve the problem.



Use Logical Reasoning

Some math problems are like puzzles. If this piece goes here, then this other piece must go there. Use logic to work in little bits until you see the whole answer.