

identity (zero)  
associative  
commutative  
addends  
compensation  
decompose  
compatible  
friendly numbers  
reasonable

**addend**- numbers added together to give a sum.  
Example:  $2 + 7 = 9$ . 2 and 7 are addends.

**decomposing** - breaking down the numbers. The number will look like expanded from. Decomposing numbers helps students work with more complex numbers.  
ex.  $365 = 300 + 60 + 5$

**compensation**= Substitute a compatible number for one of the numbers so that you can more easily compute mentally. For example:  
 $47 + 29 = (47 + 30) - 1$   
I changed 29 to 30 because it was easier to add tens and then subtracted 1 from my total because I had added 1 to 29 to make 30.

**friendly Numbers/Compatible numbers**= number pairs that go together to make "friendly" numbers. That is, numbers that are easy to work with. To add  $78 + 25$  for example you might add  $75 + 25$  to make 100 and then add 3 to make 103.

**Inverse operations**- addition is the inverse of subtraction. Multiplication is the inverse of division.

Students learned multiple strategies for solving addition and subtraction problems in 2<sup>nd</sup> grade. This unit uses those strategies with more difficult numbers and requires students to explain their thinking.

# Estimating Sums

R 2-7

Suppose your class is saving 275 cereal box tops for a fundraising project. Your class has 138 Fruity Cereal box tops and 152 Bran Cereal box tops. Does your class have enough box tops for the project? Since you only need to know if you have enough, you can estimate.

Here are some ways you can estimate.

**Rounding:** Round each addend to the nearest hundred or to the nearest ten. Then add and compare.

Round to the nearest *hundred*.

$$\begin{array}{r} 152 \Rightarrow 200 \\ +138 \Rightarrow 100 \\ \hline = 300 \end{array}$$

Since  $300 > 275$ , you have enough.

Round to the nearest *ten*.

$$\begin{array}{r} 152 \Rightarrow 150 \\ +138 \Rightarrow 140 \\ \hline = 290 \end{array}$$

Since  $290 > 275$ , you have enough.

**Front-end estimation:** Use the front digit of each number and zeroes for the rest.

$$\begin{array}{r} 152 \Rightarrow 100 \\ +138 \Rightarrow 100 \\ \hline = 200 < 275 \end{array}$$

**Compatible numbers:** Use numbers that are close but easy to add.

$$\begin{array}{r} 152 \Rightarrow 150 \\ +138 \Rightarrow 140 \\ \hline = 290 > 275 \end{array}$$

# Estimating Differences

R 2-11

Members of the Biology Club caught 136 grasshoppers and 188 butterflies in nets. How many more butterflies than grasshoppers did the club catch?

Here are four different ways to estimate differences.

**Round to the nearest hundred:**

$$\begin{array}{r} 188 \text{ rounds to } 200 \\ - 136 \text{ rounds to } 100 \\ \hline \end{array}$$

About 100 more butterflies than grasshoppers

**Round to the nearest ten:**

$$\begin{array}{r} 188 \text{ rounds to } 190 \\ - 136 \text{ rounds to } 140 \\ \hline \end{array}$$

About 50 more butterflies than grasshoppers

**Use compatible numbers:**

$$\begin{array}{r} 188 \text{ is close to } 185 \\ - 136 \text{ is close to } 135 \\ \hline \end{array}$$

About 50 more butterflies than grasshoppers

**Use front-end estimation:**

$$\begin{array}{r} 188 \Rightarrow 100 \\ - 136 \Rightarrow 100 \\ \hline \end{array}$$

About the same number of butterflies and grasshoppers

You can use place value to add 3-digit numbers.

**Add.**  $268 + 195$       **Estimate.**  $300 + 200 = 500$

**Step 1** Add the ones. If there are 10 or more ones, regroup as tens and ones.

$$\begin{array}{r} 268 \\ + 195 \\ \hline 3 \end{array}$$

8 ones + 5 ones = 13 ones  
13 ones = 1 ten 3 ones

**Step 2** Add the tens. Regroup the tens as hundreds and tens.

$$\begin{array}{r} 11 \\ 268 \\ + 195 \\ \hline 63 \end{array}$$

1 ten + 6 tens + 9 tens = 16 tens  
16 tens = 1 hundred 6 tens

**Step 3** Add the hundreds.

$$\begin{array}{r} 11 \\ 268 \\ + 195 \\ \hline 463 \end{array}$$

1 hundred + 2 hundreds + 1 hundred = 4 hundreds

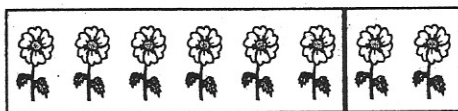
So,  $268 + 195 = 463$ .

## Addition Properties

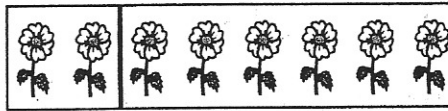
R 2-1

### The Commutative (order) Property

You can add numbers in any order, and the sum will be the same.



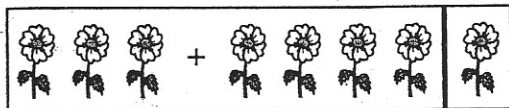
$6 + 2 = 8$



$2 + 6 = 8$

### The Associative (grouping) Property

You can group addends in any way, and the sum will be the same.



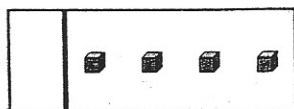
$(3 + 4) + 1 = 8$



$3 + (4 + 1) = 8$

### The Identity (zero) Property

The sum of any number and zero equals that same number.



$0 + 4 = 4$

## Mental Math Strategies for Addition

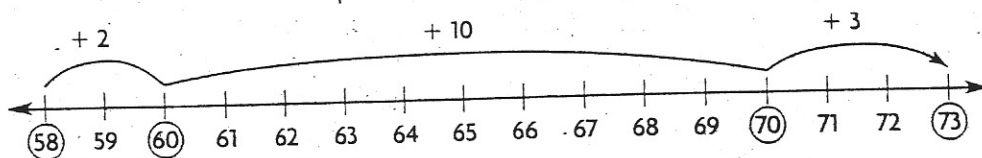
You can count by tens and ones to find a sum.

Find  $58 + 15$ .

**Step 1** Count on to the nearest ten. Start at 58. Count to 60.

**Step 2** Count by tens. Start at 60. Count to 70.

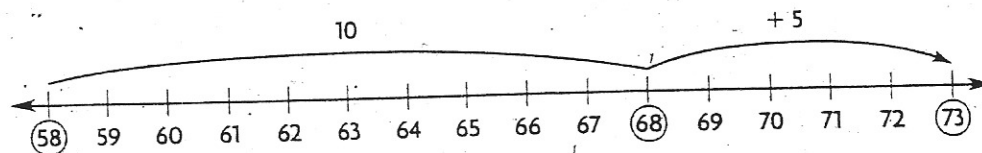
**Step 3** Then count by ones. Start at 70. Count to 73.



**Think:**  $58 + 2 + 10 + 3 = 73$

So,  $58 + 15 = 73$ .

You can also count on by tens first and then by ones.



**Think:**  $58 + 10 + 5 = 73$

So,  $58 + 15 = 73$ .

## Use the Break Apart Strategy to Add

You can use the break apart strategy to add.

Add.  $263 + 215$

### Think and Record

**Step 1** Estimate. Round to the nearest hundred.

$$300 + 200 = 500$$

**Step 2** Start with the hundreds. Break apart the addends. Then add each place value.

$$263 = 200 + 60 + 3$$

$$215 = 200 + 10 + 5$$

$$400 + 70 + 8$$

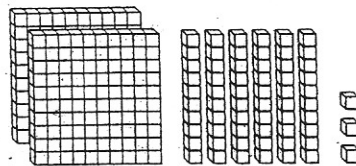
**Step 3** Add the sums.

$$400 + 70 + 8 = 478$$

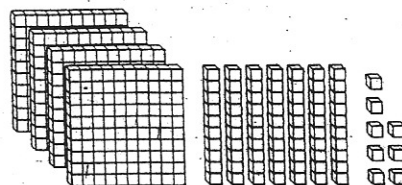
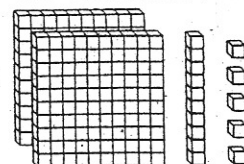
So,  $263 + 215 = 478$ .

### Model

$$263 = 2 \text{ hundreds} + 6 \text{ tens} + 3 \text{ ones}$$



$$215 = 2 \text{ hundreds} + 1 \text{ ten} + 5 \text{ ones}$$



$$4 \text{ hundreds} + 7 \text{ tens} + 8 \text{ ones} = 478$$

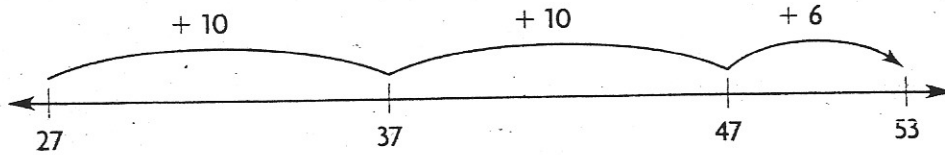
# Mental Math Strategies for Subtraction

You can count up on a number line to find a difference.

Find  $53 - 27$ .

**Step 1** Count up by tens.  
Start at 27. Count up to 47.

**Step 2** Count up by ones.  
Start at 47. Count up to 53.



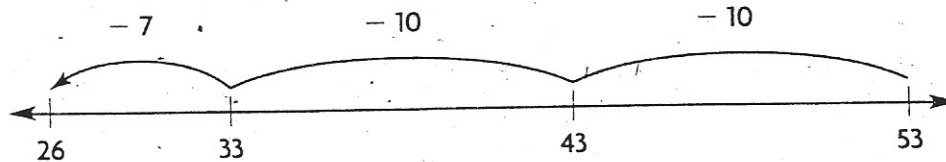
**Think:**  $10 + 10 + 6 = 26$ .

So,  $53 - 27 = 26$ .

You can take away tens and ones to find a difference.

**Step 1** Take away tens.  
Start at 53.

**Step 2** Take away ones.  
Start at 33.



**Think:**  $53 - 10 - 10 - 7 = 26$ .

So,  $53 - 27 = 26$ .

## Combine Place Values to Subtract

You can combine place values to subtract. Think of two digits next to each other as one number.

**Subtract.**  $354 - 248$

**Estimate.**  $350 - 250 = 100$

**Step 1** Look at the digits in the ones place.

**Think:**  $8 > 4$ , so combine place values.

$$\begin{array}{r} 354 \\ - 248 \\ \hline \end{array}$$

**Step 2** Combine the tens and ones places.

**Think:** There are 54 ones and 48 ones.

Subtract the ones. Write 0 for the tens.

$$\begin{array}{r} 354 \\ - 248 \\ \hline 106 \end{array}$$

**Step 3** Subtract the hundreds.

$$\begin{array}{r} 354 \\ - 248 \\ \hline 106 \end{array}$$

So,  $354 - 248 = 106$ .

**Remember:** You can also combine hundreds and tens to subtract.

# Adding and Subtracting Money

R 3-12

Find  $\$12.50 + \$9.25$ .

Estimate:  $\$13 + \$9 = \$22$ .

## Step 1

Add as you would with whole numbers. Make sure to line up the decimal points before adding.

$$\begin{array}{r} 1 \\ \$12.50 \\ + 9.25 \\ \hline 21.75 \end{array}$$

## Step 2

Write the answer in dollars and cents. Be sure to include the decimal point.

$$\begin{array}{r} 1 \\ \$12.50 \\ + 9.25 \\ \hline \$21.75 \end{array}$$

$$\$12.50 + \$9.25 = \$21.75$$

## Use Place Value to Subtract

You can use place value to subtract 3-digit numbers.

**Subtract.**  $352 - 167$       **Estimate.**  $400 - 200 = 200$

**Step 1** Subtract the ones.

$$\begin{array}{r} 4 \text{ 12} \\ 3\cancel{5}2 \\ - 167 \\ \hline 5 \end{array}$$

Are there enough ones to subtract 7?

There are not enough ones.

Regroup 5 tens 2 ones as 4 tens 12 ones.

12 ones - 7 ones = 5 ones

**Step 2** Subtract the tens.

$$\begin{array}{r} 14 \\ 2\cancel{4}12 \\ \cancel{3}52 \\ - 167 \\ \hline 85 \end{array}$$

Are there enough tens to subtract 6?

There are not enough tens.

Regroup 3 hundreds 4 tens as 2 hundreds 14 tens.

14 tens - 6 tens = 8 tens

**Step 3** Subtract the hundreds.

$$\begin{array}{r} 14 \\ 2\cancel{4}12 \\ \cancel{3}52 \\ - 167 \\ \hline 185 \end{array}$$

2 hundreds - 1 hundred = 1 hundred

So,  $352 - 167 = 185$ .