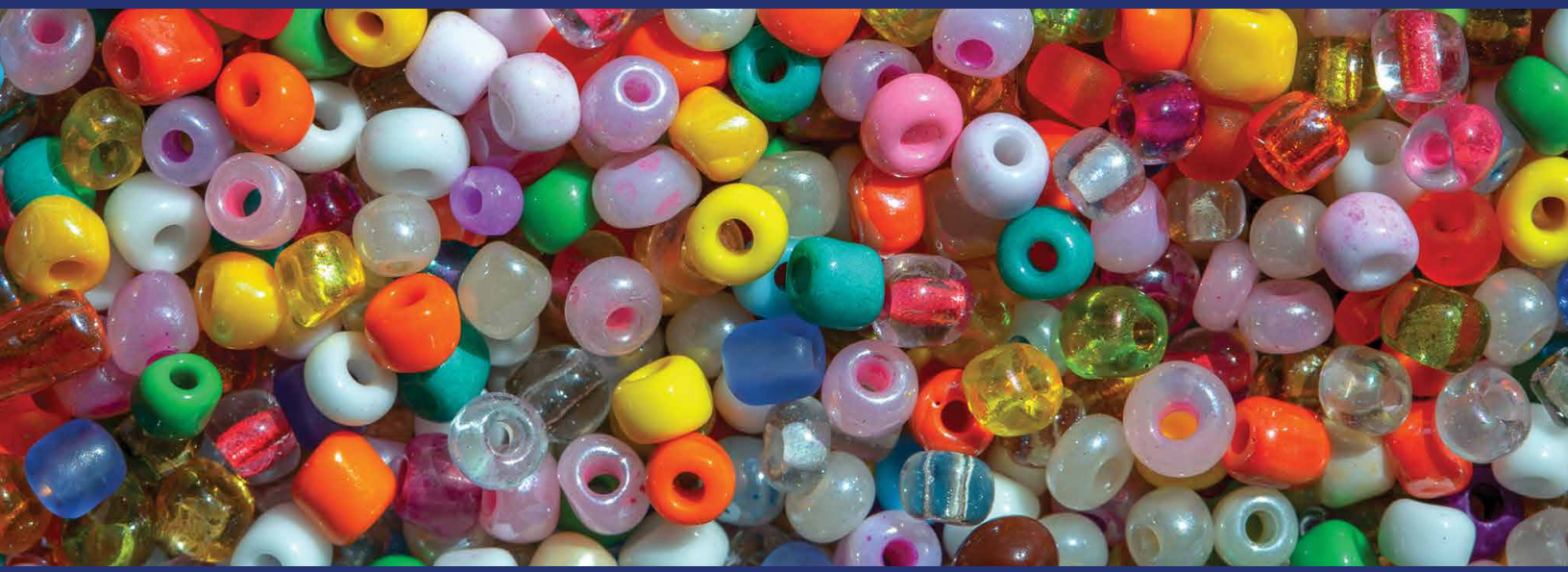
ABC Everyday Numbers

Workbook 3

Estimating



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Welcome to *ABC Everyday Numbers*!

We designed *ABC Everyday Numbers* to help you think about math in new ways.

Be patient with yourself as you get started. As you learn more, you'll get better and better at working with numbers. Then you may even begin to feel more comfortable.

When you feel good about your math skills, you're less stressed. You may even find that you start to enjoy doing math.

In today's workshop you will learn:

- What estimating is
- Why estimating is important
- Some strategies for making good estimates

What is estimating?

We **estimate** almost every day. It's a helpful skill that can make our lives easier.

Math words

Estimating means making a guess to get an answer that is almost correct.

Here are some things we can estimate:

- **Time:** How long does it take me to finish a task at work?
- **Money:** How much money do I need for weekly groceries?
- **Size:** What size pants do I need to buy for my child?
- **Amounts:** How much milk should I add to my coffee?

Why do we estimate?

Estimating is a quick way for us to get a pretty good answer without spending a lot of time figuring out the exact answer. Imagine you're grocery shopping for a family dinner. It would be hard to figure out exactly how much food you need, but you can make a good guess.

Estimation language

Here are some words and phrases we use when we estimate:

- about
- around
- approximately
- a little more than
- a little less than
- at least
- at most
- between _____ and _____
- close to

Let's practice using the language of estimation

Use one of the words or phrases from above to answer the following questions:

1. How much sleep did you get yesterday?
2. How many people were at the last event you attended?
3. How much do you spend a month on groceries?
4. How tall is the closest building?
5. How far away from home are you right now?

Meet Ratana

Ratana works as a host at a restaurant. Part of their job is telling people about how long they will have to wait for a table. Ratana estimates the wait times. They can't know exactly how long it will be before a table is available. They can make a good guess based on how busy the restaurant is and how many other people are already waiting.

Let's talk about it

- What information do you think Ratana uses to estimate how long customers will need to wait for a table?
- What do you think happens when Ratana's estimates are wrong?
- What are some other jobs where you would use estimation?

Being precise

When we work with numbers, sometimes we need to know exact numbers and sometimes it's okay to be close enough. How close we need to be to the exact numbers is called **precision**. When we decide how exact we need to be, we are deciding how **precise** we need to be.

Math words

We use **precision** when we need to know exactly how much or how many.

A **precise** measurement is one that is as accurate and exact as possible.

How can we know when we should use estimation, and when it would be better to figure out the actual amount?

Sometimes it is important to be very precise.

For example, a truck driver needs to know exactly how high their truck is so that they will know when it is safe to go under bridges and overpasses. A nurse who is measuring medication for a patient has to pay attention so that they get the dose exactly right. A carpenter who is cutting wood has to get her measurements exact.

Sometimes it is okay to be less precise.

When you are shopping you might use **friendly numbers** to keep track of about how much your groceries will cost.

Sometimes we can't know the exact numbers so we have to be less precise.

You often can't know exactly how long it will take you to get to work or to the doctor's office. But you probably have an idea of about how long it will take.

Math words

A **friendly number** is any number you find easy to work with.

Let's talk about it

- What are some situations in your life where it is important to be precise?
- Have you ever seen something go wrong because you or someone else didn't measure precisely enough?
- What are some situations in your life where it's ok to estimate?

How precise do we need to be?

Read the following situations. For each situation decide how precise you need to be or if it's ok to just make a guess. Make a mark on the line to show how exact you need to be for the situation.

Deciding if a sofa can fit in the living room

Need to be precise **OK to just guess**

Baking a cake

Need to be precise **OK to just guess**

Finding new boots for a growing child

Need to be precise **OK to just guess**

Feeding a pet

Need to be precise **OK to just guess**

When you're the one estimating, you get to decide how precise to be.

Estimating how many

Here is a picture of some stacked firewood. How many logs do you think are in the picture? Take 5 seconds to look at the picture and make a quick estimate.

My estimate: _____

How confident are you in your estimate?

A strategy called **partitioning** can help us make a better estimate.

Math words

Partitioning means to break things into pieces.

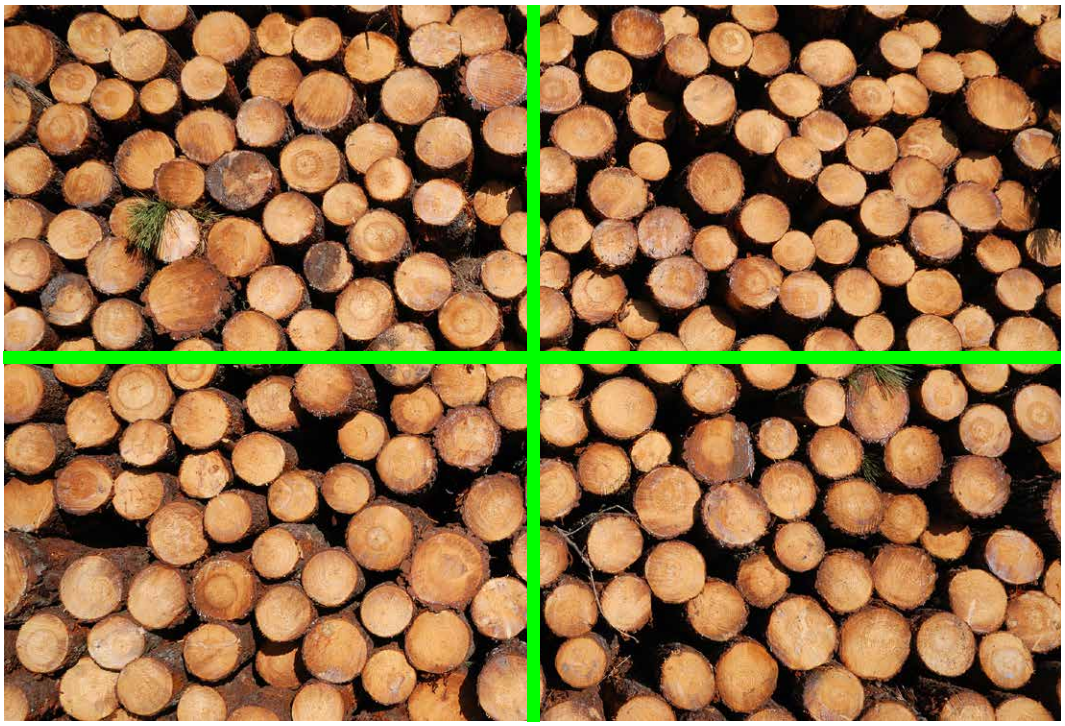
Let's divide the picture in half.

Is it easier to estimate how many logs are in half of the picture?

Maybe, maybe not. That's still a lot of logs.

If there are still too many logs in each part, we can partition the picture again.

Let's divide it in half again.



Use 1 of the 4 sections to estimate the number of logs.

1. Decide about how many logs are in 1 section of the picture. You could count the logs or just make a good guess.
2. Assume that all 4 sections of the picture have about the same number of logs.
3. Once you know how many logs are in 1 section you can use addition or multiplication to find the total number of logs.

Let's say we think there are 60 logs in 1 section of the picture.
To find out how many total logs we can add:

60 + 60 + 60 + 60

Or we can multiply:

60 x 4

Estimating based on how many logs you think are in one fourth of the picture, may be good enough. If you want a more precise answer, you can partition even more. Here is one more copy of the picture.

Draw lines on the picture to divide it into sections.

Let's talk about it

- What way of partitioning the picture feels best to you?
- The more you break up the picture, the more precise your estimate will be. How precise do you want to be?

Let's practice

Estimate how many runners are in this picture. You can try using the partitioning strategy. Or you can estimate another way.

Take a handful or 2 of coins, beans, beads or other small objects. How many do you think there are? You can try using the partitioning strategy. Or you can estimate another way.

If you don't have any items nearby to estimate with, you can use this picture:

Estimating with groups of numbers

Here's a list of numbers:

$13.49
$17.99
$21.07
$14.15
$6.89

About how much do you think these numbers add up to? What is your estimate? How did you think about it?

Math tip

There are lots of ways you can estimate the total of a group of numbers. People use different estimation strategies based on what numbers they are working with, what feels easiest to them, and how precise they need to be. There's no right or wrong way to estimate.

Meet August and Elodie

August and Elodie like to work together on gardening projects. They took the shopping list for their next project to the garden supply store. August and Elodie both want to estimate how much the items on their list will cost so they can make a budget for their project.

Here are the prices for the items they need to buy:

$13.49 $17.99 $21.07 $14.15 $6.89

August and Elodie estimate in different ways.

Here's August's thinking:

I didn't pay much attention to the cents.

I started by adding $13 and $17 to get $30
(because I knew that 3 + 7 = 10).

Then I added $20 because the next number was only a little bigger than $20.

So far that makes $50.

Then I added $15 because it's an easier number to work with than $14.15.

So that's $65.

Finally, I added $7 more because $6.89 is almost $7.
That gave me $72.

I think it's probably a little more than that because I left off about $2.50 in the first three numbers, and I only made the last two bigger by less than a dollar all together.

Final estimate: more than $72

Let's talk about it

- How did August get $50 from $13.49, $17.99, and $21.07?
- Why was $15 easier for August to work with than $14.15?
- How does August know his estimate is a little less than the precise answer?
- Where do you see August making choices about how precise he wants to be?

Here's Elodie's thinking:

I started looking at the dollars.

First I noticed that the $3 and the $7 in $13 and $17 add up to $10.

7 + 3 = 10, plus the $10 in $17 and the $10 in $13 = $30.

Then I saw I could make another $30 with the $20 in $21 and $10 in $14.

That got me to $60.

I added $4 and $6 for another $10.

I put that all together for $30+30+10 = $70.

Then added the $1 from $21, to get $71.

Looking at the change, I estimated that 0.89+0.15 is about $1.

$0.99 is about $1, so my total is up to $73.

I estimated 0.49 and 0.07 to be a little more than 0.50.

Final estimate: a little more than $73.50.

Let's talk about it

- Why did it help Elodie to find numbers that added up to 10?
- Where did the $4 Elodie added come from?
- Why does Elodie think the exact total is a little bit more than $73.50?
- Where do you see Elodie making choices about how precise she wants to be?
- How is Elodie's thinking similar to August's?
- How is her thinking different?

Strategies for estimating with numbers

The table below lists some things we can do when we estimate. For each strategy, put an x in the second column if it's something August did. Put an x in the third column if it's something Elodie did. Put an x in the last column if it's a strategy you use when you estimate.

Strategy	August did this	Elodie did this	I do this
Focus on bigger chunks			
Break numbers into friendly pieces			
Focus on the beginnings of numbers			
Combine to make friendly numbers			
Round numbers up or down			
Keep track of the total as you go			
Think about whether you are over or under			
Make adjustments			

What other ideas do you have about helpful things to do when you are estimating?

Meet Zlata

Zlata is part of August and Elodie's gardening group. She has her own way of estimating groups of numbers. She made an estimate of the same list of prices that August and Elodie used.

Here's Zlata's thinking:

The biggest place is the tens place.

$13.49 So the first thing I did was to add up all the 10s.
$17.99
$21.07
$14.15
$ 6.89 **10 + 10 + 20 + 10 = 50**

I noticed I could add some numbers in the ones' places to make more 10s.

$13.49 I added the 6 and the 4 from the bottom two numbers - that makes 10.
$17.99
$21.07 Then I added the 3 and the 7 from the top two numbers - that makes another 10.
$14.15
$ 6.89 All together that's 7 tens, so that makes 70.

I left off the cents and in one case I left off more than a dollar, so it's about a few dollars more than $70.

Final estimate: a few dollars more than $70.

Let's talk about it

- How is Zlata's strategy different from August and Elodie's?
- Why does Zlata think the exact total is a few dollars more than $70?
- Do you like Zlata's strategy?

Let's practice

Can you use the strategy that Zlata used to estimate the sum of these numbers?

$213

$165

$68

$39

Estimating measurements

We use **measurement** every day. Weighing tomatoes in a grocery store, measuring the length of a fence, and checking the temperature outside are all examples of measurement.

Math words

Measurement is the process of checking the size or amount of something. We can measure many things, including size, weight, distance, time, temperature, and speed.

Why do we measure?

Measurement helps us answer questions like:

- How big?
- How heavy?
- How hot?
- How far?
- How much?
- How fast?

What tools do you know for measuring how big something is?

Make a list of tools you can use to help you measure. Here are some ideas to get started:

- Ruler
- Bathroom scale
- Measuring cups
- _____
- _____
- _____

Measuring tools are helpful when you need an exact measurement. There are other ways of measuring that are good for when you only need to have an estimate of how big something is.

Using your body as a benchmark

Benchmarks help us estimate measurements.

Math words

A **benchmark** is something that you know well and know how big it is. For example, you may know how tall you are or how much your bag weighs.

When we have benchmarks we can compare them to other things to measure through estimation. Let's get to know the measurements of your own body, so that you can be a measurement tool in the world!

The table below lists measurements on your body that can help you estimate length.

You can use these benchmarks to help you think about the sizes of things when you can't use measuring tools or when you don't need to be precise. You can use a measuring tool to help with the ones you don't know.

Write in the measurements you know. Or choose different lengths to measure and add them to the empty rows at the bottom of the table. Use the benchmarks that work best for you.

Benchmark measurements

Length to measure	How to measure	Your measurement
Your height	Write down your height if you know it. It's ok to use an easier number if that's better for you. For example, if your height is 5 feet, 2 inches, you could write down 5 feet.	
Your wingspan	Spread your arms out from your sides. Your wingspan is the distance from the fingertip of one hand to the fingertip of the other hand. This is often about the same as your height	
Your handspan	The distance from the tip of your thumb to the tip of your little finger when you spread out your hand.	
Your step length	Take one normal step. Measure the distance from where your foot started to where it ended.	

Let's practice

Use the benchmarks from your table to estimate the lengths of things around you.

Find something that is:

- about **5** wingspans long _____
- about **20** wingspans long _____
- about _____ wingspans long _____
- about **5** step lengths long _____
- about **20** step lengths long _____
- about _____ step lengths long _____

Find some other things to estimate and choose a benchmark that works for measuring.

- I estimate that _____ is about _____ long. I used _____ as a benchmark.
- I estimate that _____ is about _____ long. I used _____ as a benchmark.
- I estimate that _____ is about _____ long. I used _____ as a benchmark.

Let's talk about it

When we estimate we can use our own ideas and strategies.

- What have you learned about yourself as a math person who makes estimates?
- What are three things you've learned about estimation?
- How have you improved your ability to estimate?

Using estimation in your life

The ability to estimate is like a muscle. The more we use it, the stronger it gets. Estimation is something we can improve with practice.

Here are ideas for when you can practice estimation strategies:

- If you have been to the supermarket, you have probably done some estimating to figure out which check-out line to get in. The next time you are in line, try to estimate. How long before I reach the front of the line?
- Estimate how many pages are in a book. Check. How close were you?
- When you are shopping, estimate the total cost of your items. Then at the checkout, see how close you were.
- Estimate the distance between two places. Walk the distance. Use your stride length to come up with a more precise estimate.
- Put coins or dried beans on the table. Quickly estimate how many there are. Count some and revise your estimate.

What are some other opportunities from your daily life for you to practice your estimation skills?

Math tip

One key to improving your ability to estimate is to estimate and then check in on how close you were when you can. Everytime we make an estimate is an opportunity to learn something for the next time we make an estimate.

Congratulations!

You've completed the *ABC Everyday Numbers Estimating* workbook. You've taken a step to build your math skills.

Think about what you did and what you learned.

- What are you proud of?

_____

- What surprised you?

_____

- What did you do when the problems were challenging?

_____

- What did you learn about yourself?

_____

- What's one thing you do to help you do an even better job next time?

_____