Grade 2 Mathematics
Key Concepts and Skills
A Parents' Guide

Below are the key mathematics concepts that we hope your child will master by the end of Grade 2.

Grade 2 is the year that we strengthen your child's number sense. We hope they:

- recognize and understand counting patterns,
- recognize quantities without counting,
- have strong visual images for quantities,
- understand place value and the relationships between the places, and
- can easily compare quantities.

Grade 2 is also the year that your child builds fluency with a variety of addition and subtraction strategies and representations. Your child should be very flexible in the strategies they use and she or he should be able to solve a problem in more than one way.

Number Concepts

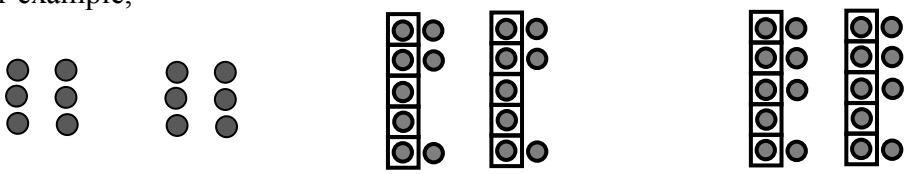
Skip Counting Sequences

1. Your child should understand that there is a pattern to counting by 5s, 10s, and 100s. He or she should know the forward and backward counting sequence when counting by:
    - 5s starting with any number that ends in 0 or 5 (e.g., He or she should be able to count forward or backwards by 5s starting at 5, 45, 230, 315, etc.).
    - 10s starting with any number that ends in a 0. (e.g., He or she should be able to count forward or backwards by 10s starting at 10, 50, 150, 230, 870, etc.)
    - 100s starting with any hundred (e.g., 100, 300, 700, etc.)
2. Your child should understand and be able to explain the patterns when counting by 5s, 10s, and 100s with an anywhere start. She or he should recognize and describe the pattern that occurs when counting by:
    - 5s no matter the starting number. For example, if we count by 5s starting at 23 we would say, 23, 28, 33, 38, 43, 48, 53, 58, and so on. If we count by 5s starting at 57 we would say, 57, 62, 67, 72, 77, 82, and so on. Your child should recognize and continue the pattern. He or she should also be able to state that the ending digits alternate between two numbers.
    - 10s no matter the starting number. For example, if we count by 10s starting at 36 we would say, 36, 46, 56, 66, 76, 86, 96, 106, etc. Your child should recognize and continue the pattern. He or she should also be able to state that the ending digit (ones place) stays the same and the tens place changes by one each time.
    - 100s no matter the starting number. For example, if we count by 100s starting at 268 we would say 268, 368, 468, 568, etc. Your child should recognize and continue the pattern. He or she should also be able to state that the "ending" 2-digit number stays the same and the hundreds place changes by one each time.

Subitize Numbers

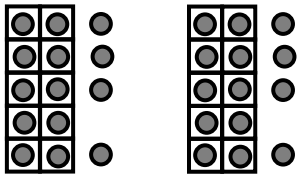
Subitize may be an unfamiliar term but many of us do this without knowing its name. For example, when you play a game involving dice, do you recognize a 6 without counting the pips? That is subitizing. Recognizing and naming a quantity without counting the individual objects.

3. Your child should be able to subitize double domino images and double 5-frame images. For example,

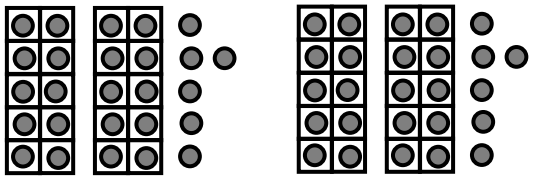


The double 5-frame images help children quickly find the total by doubling the fives to get 10 and then doubling the "extras". With the double 8 image above, double 5 is 10 and double 3 is 6, 10 and 6 is 16. In grade 1 we used these images to introduce the addition doubling strategy. In grade 2 we use these images to build fluency with the strategy and then extend to doubling 2-digit numbers. For example,

Double 14 is double 10 and double 4

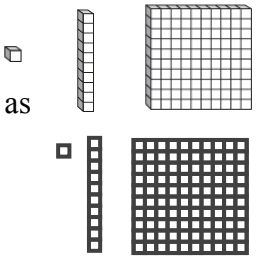


Double 26 is double 20 and double 6

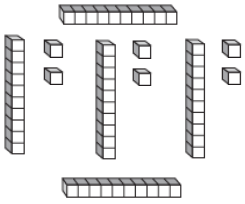


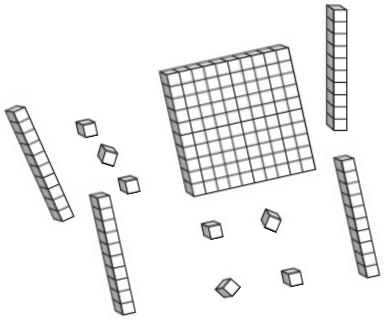
In grade 3 we use 5-frame images again to help children learn the Distributive Property for Multiplication.

Note: In grades 2-5 we use Base 10 materials as models for 1s, 10s, and 100s. Your child may use these blocks in schools. The 1 is a cubic centimeter. The 10 looks as though 10 of the cubic centimeters have been stuck together. The 100 looks as though 100 of the cubic centimeters have been stuck together in a 10 by 10 "block." Your child may also use a paper version of these materials that have been cut from centimeter grid paper 10 by 10, 1 by 10, and 1 by 1.



4. Your child should be able to subitize Base 10 materials in any arrangement and turned in a variety of ways. For example,





Comparing Quantities

5. Given 2 numbers, your child should be able to tell which is larger, smaller, or the same. He or she should be able to correctly use the symbols >, <, =.

Place Value

6. Your child should be able to show that a 2-digit number has groups of 10s and some "extras." They need to understand that the way in which we write a 2-digit number (e.g., 36) shows the greatest number of tens we can make with a number. For example, we can make 36 with 3 tens and 6 ones. Your child should understand that 36 can also be made with 2 tens and 16 ones (think of dimes and pennies, 2 dimes and 16 pennies). We can make 36 with 36 ones (36 pennies). We can make 36 with 1 ten and 26 ones.
7. Your child should understand that 10 tens or 100 ones can be thought of as 100. That 200 refers to 2 hundreds, 300 refers to 3 hundreds, etc.
8. Your child should understand that a number such as 435 is made up of 4 hundreds, 3 tens, and 5 ones. Your child will begin to find many other ways to make numbers such as 435 using hundreds, tens, and ones. For example, 3 hundreds, 13 tens, and 5 ones; 435 ones; 43 tens and 5 ones, etc.
9. Given any number, your child should be able to name the number that is 1 more, 10 more, and 100 more.
10. Given any 2-digit number your child should be able to name the number that is 10 fewer, or 1 fewer.
11. Given any 3-digit number your child should be able to name the number that is 100 fewer, 10 fewer, or 1 fewer.
12. Your child should be able to correctly read and write numbers between 1 and 1000 using numerals (e.g., 235, 56, 999), number words (e.g., two hundred thirty-five, fifty-six, and nine hundred ninety-nine), and expanded form (e.g., 235 = 200 + 30 + 5, 56 = 50 + 6, 999 = 900 + 90 + 9).

Addition and Subtraction

Addition Concepts

1. Your child should be able to illustrate and solve math stories involving putting things together and adding to a starting quantity where the unknown is in different positions. Your child should be able to illustrate with simple drawings and objects and use a blank, box, or some other symbol for the unknown number. He or she should also be able to act out the stories. For example,
    - Result is unknown: *Adara is collecting can goods for a school food drive. She has 48 cans. Her neighbors give her 23 more cans. How many cans does Adara have now?* In this problem your child is determining the result of putting the two groups together. 48 + 23 = ___
    - Start unknown: *Adara is collecting can goods for a school food drive. She just got 23 more cans from her neighbors. Now she has 71 cans. How many did she have before her neighbors gave her more cans?* In this problem we know how Adara's number of cans changed (She got 23 cans from her neighbors). We know how many she now has (71). Your child is to determine how many cans Adara started with. ___ + 23 = 71
    - Change unknown: *Adara is collecting can goods for a school food drive. She has 48 cans. She got some more from her neighbors. Now she has 71 cans. How many did she get from her neighbors?* In this problem we know how many can goods

Adara started with. We know how many can goods she has after her neighbors' donations. Your child is to determine how the number of can goods changed (how many she got from her neighbors). 48 + ___ = 71

2. Your child should be able to tell a putting together or adding to story when given a problem such as 64 + 25 or when given an illustration.
3. Your child should understand that when combining two numbers, you combine like places (hundreds with hundreds, tens with tens, and ones with ones).
4. Your child should be able to represent the combining of two numbers using objects (such as base 10 materials), drawings, and a variety of strategies.

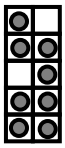
Note: Notice that learning mathematics is not the memorization of facts, rules, and tricks. It is having strong visual images (such as 5-frame, 10-frame, domino, Base 10 models, etc.) of number and then looking for patterns when combining and separating these quantities.

Addition Strategies

Your child should know and use a variety of addition strategies.

Combinations for 10

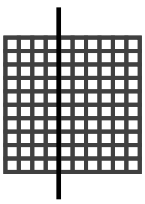
1. In grade 1 your child learned about the numbers that go together to make 10. We used a 10-frame to help with this. For example, if shown



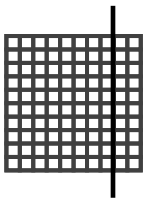
your child understood that 2 more are needed to make 10, so 8 and 2 is 10 (8 + 2 = 10). In grade 2 your child should be fluent with these combinations.

Combinations for 100

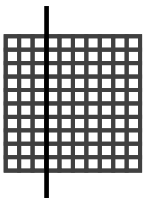
2. Your child should know the numbers that go together to make 100. We use a 10 by 10 grid or Base 10 hundred block to help with this. For example, students can "cut" a 10 by 10 grid in a number of ways to show ways to make 100.



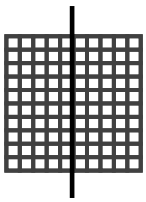
40 and 60 is 100



80 and 20 is 100

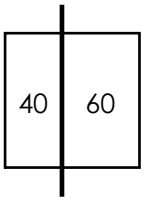


30 and 70 is 100

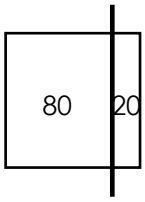


50 and 50 is 100

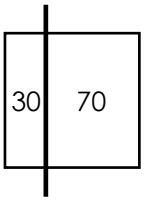
The paper versions of these materials allow us to turn the 10 by 10 over and show the same information without the individual squares. For example,



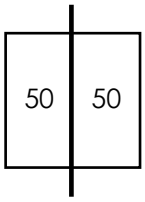
40 and 60 is 100



80 and 20 is 100



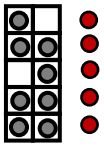
30 and 70 is 100



50 and 50 is 100

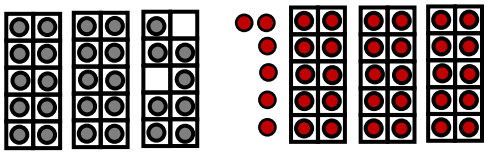
Bridge to 10

3. The bridge to 10 strategy is a powerful addition strategy for your child to know. In grade 1 your child learned that another way to think of 9 + 4 is as 10 + 3 or 8 + 6 as 10 + 4. We used a 10-frame to help with this. For example, if shown

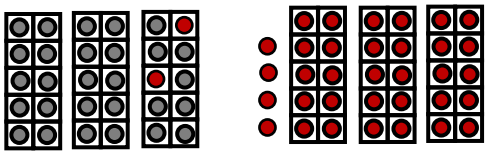


your child understands that he or she can fill the empty sections within the 10-frame by sliding 2 of the red "chips" over. So, 8 and 5 is the same as 10 and 3, 8 + 5 = 10 + 3.

In grade 2 we extend this strategy to 2-digit numbers. For example, 28 + 36 shown on the right.



Your child can "fill" the 2 empty spots in the 10-frame with 2 red dots from 36 making an equivalent problem, 30 + 34.



This strategy is important because it introduces your child to prealgebra techniques for computing. Although we hope that your child is fluent with the addition facts (1-digit + 1-digit numbers), we also need her or him to know this strategy and use with simple computations so that she or he can later use it with much larger numbers. In grade 2, we use this strategy with 2-digit numbers and 3-digit numbers. When they reach grade 5 they will use the strategy to solve problems such as 3.8 + 1.6 linking the problem to 4.0 + 1.4. We call it the Bridge to 10 strategy in grades 1 & 2. In later grades your child will learn it is the Associative Property. For our example above, we thought of 36 as the same as 2 and 34. Instead of associating the 2 with the 34, we moved 2 of the dots to associate with the 28.
28 + 36 = 28 + (2 + 34) = (28 + 2) + 34.

Doubles and Near Doubles

4. Doubles and near doubles (doubles plus 1, doubles minus 1, doubles plus 2, doubles minus 2) are also important addition strategies for your child to know. In grade 1 your child learned to double the numbers 1 to 9 (e.g., double 8 is 16, double 6 is 12). He or she may have doubled multiples of 10 (e.g., double 40 is 80, double 30 is 60). It is important for your child to name the double (For example, when shown 7 + 7 your child can name it as double 7). A near double is a problem such as 7 + 8. It is important for your child to know that this is double 7 and 1 more or 1 fewer than double 8.

   In grade 2 we use these strategies for doubling 2-digit and 3-digit numbers. To double 34 we double 30 and we double 4 to get 68. To solve 199 + 199 we can double 200 and remove 2. As your child moves up through the grades they learn that 199 + 199 can be written as 2 x 199 and will again use the doubling strategy to solve.

Subtraction Strategies

1. Your child should be able to separate up to 100 objects into 2 groups in more than one way. For example, if given 86 objects, your child can separate them into 75 and 11, 66 and 20, 50 and 36. He or she can draw pictures to match.
2. Your child should understand that there are many ways to subtract. Your child should be able to use a variety of strategies and represent these strategies with concrete objects (e.g., Base 10 materials) and drawings. Strategies include round and adjust, use place value, decompose 10s and 100s, find the missing part (missing addend), count on. Your child should be able to represent these strategies using models such as Base 10 materials and number lines.

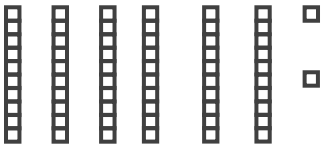
Round and Adjust

This strategy is one of the most efficient strategies for solving problems such as 62–29, 33–18, 184–57.

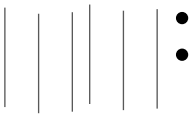
Example: 62 – 29

Begin with showing 62 using Base 10 materials (with materials and as a drawing).

Materials

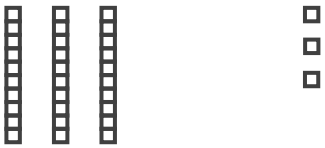


Drawings

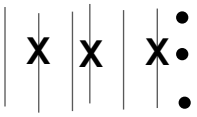


To remove 29, we remove 30 and then give back 1. We rounded the 29 to 30 and then needed to adjust (give 1 back) because we took away one too many. Another way to think about this is with money. Suppose you have 6 dimes and 2 pennies. You buy something that costs 29¢. You don't trade a dime for 10 pennies. You give the cashier 3 dimes. They give you back 1 penny. That is what we just did with the tens and ones. This strategy models what we do when we pay for items with cash. The illustrations below show the changes in our materials and drawing after using this strategy.

Materials



Drawings



I removed 3 tens, or 30, and gave back 1. (Note: It doesn't matter which of the 10s are removed or crossed out.)

$$62 - 29 = 62 - 30 + 1 \text{ or } 33$$

Use Place Value and Decompose a 10

This strategy uses 2 different understandings.

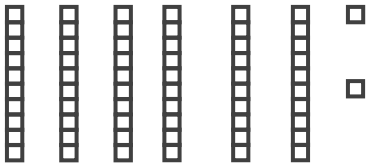
- One understanding is that we can represent numbers using place value. For example, 29 is 20 and 9, 18 is 10 and 8, 57 is 50 and 7. When written as 29 = 20 + 9, 18 = 10 + 8, 57 = 50 + 7 it is called expanded form of a number.
- The other is that we can split a 10 into 2 parts in many different ways.

Let's use this strategy for 62 – 29. This strategy can also be used for 184 – 57.

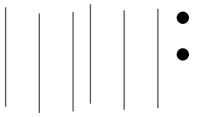
Example: 62 – 29

Begin with showing 62 using Base 10 materials (with materials and as a drawing).

Materials

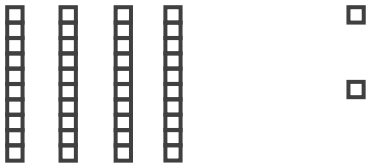


Drawings

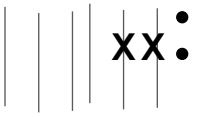


We think of 29 as 20 and 9. First remove 20.

Materials

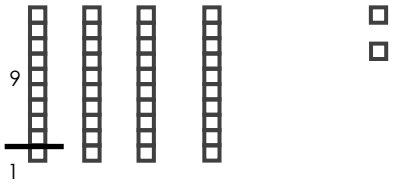


Drawings

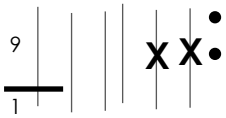


We don't have 9 ones to remove so we "cut" a 10 into 9 and 1 (Note: It doesn't matter which 10 we cut into 2 pieces).

Materials

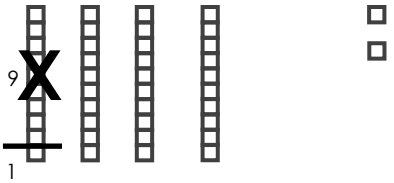


Drawings

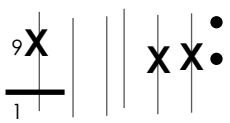


We "remove" the 9 and we are left with the answer.

Materials



Drawings



62 – 29 = 62 – 20 – 9 or 33

Use Place Value, Part-Part-Total, and Decompose a 10

This strategy uses 3 different understandings.

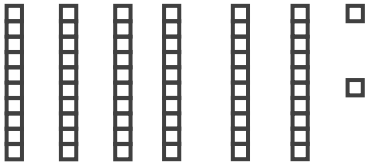
- One understanding is that we can represent numbers using place value. For example, 29 is 20 and 9, 18 is 10 and 8, 57 is 50 and 7. When written as 29 = 20 + 9, 18 = 10 + 8, 57 = 50 + 7 it is called expanded form of a number.
- Some children like to first remove the ones that they have. For 62 – 29, they understand that 62 is made up of 6 tens and 2 ones. They understand that 9 is the same as 2 and 7, 9 = 2 + 7. They first remove the 2 from the 62.
- They also understand that a 10 can be split into 2 parts. For our example, 62 – 29, they still need to remove 7 ones. They split a10 into 7 and 3 to get the rest of the ones that still need to be removed.

Let's use this strategy for 62 – 29. This strategy can also be used for 184 – 57.

Example: 62 – 29

Begin with showing 62 using Base 10 materials (with materials and as a drawing).

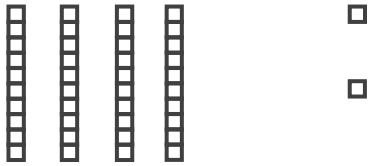
Materials



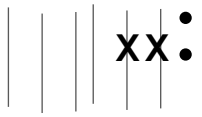
Drawings

We think of 29 as 20 and 9. First remove 20.

Materials

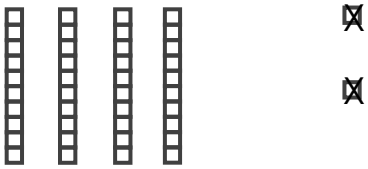


Drawings

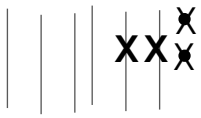


We don't have 9 ones to remove but we do have 2 ones. Remove the 2 ones.

Materials

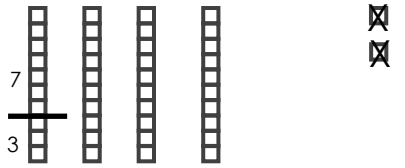


Drawings

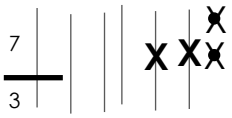


We still need to remove 7. At this point we've thought of 9 as 2 + 7 (Part-part-total; part 1 is 2, part 2 is 7, total is 9). So we "cut" a 10 into 7 and 3 (Note: It doesn't matter which 10 we cut into 2 pieces).

Materials

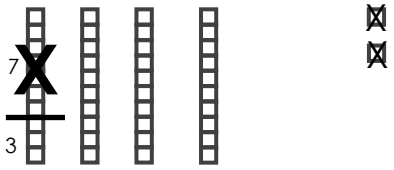


Drawings

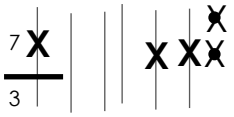


We "remove" 7 more and we are left with the answer.

Materials



Drawings



62 – 29 = 62 – 20 – 2 – 7 or 33

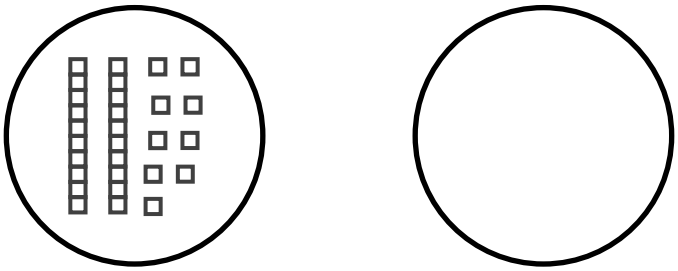
Think of Subtraction as How Many More—Missing Addend

This strategy is very important for solving fraction subtraction problems in later grades. Using this strategy, we think of problems such as 62 – 29 as how many more than 29 is 62 or how many do we need to add to 29 to get to 62.

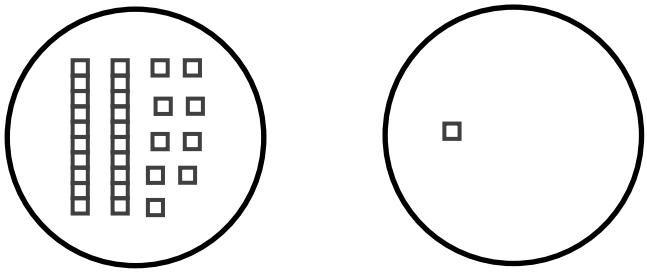
29 + ___ = 62.

Finding the Missing Part

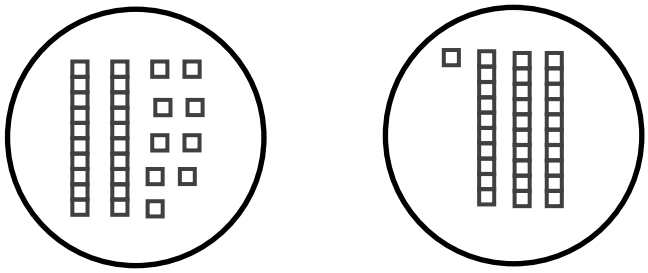
To solve 29 + ___ = 62 (or 62 – 29) using a missing part strategy, use 2 plates or sheets of paper and the Base 10 materials. Begin with representing the part you know (29) in one part. The illustrations below show the changes that take place as "pieces" are added to the missing part.



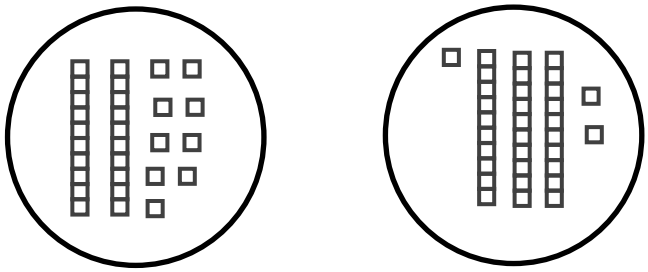
In the second part, we add 10s and 1s until the total is reached (62). For example, if we add a 1, we have a total of 30. (**Note:** I don't have to begin by adding ones. I could begin with tens, adding tens until I get close to the goal number.)



We add 10s until we reach a total of 60.



We then add 1s until we reach a total of 62.



The missing part is 33.

29 + **33** = 62 so 62 – 29 = **33**

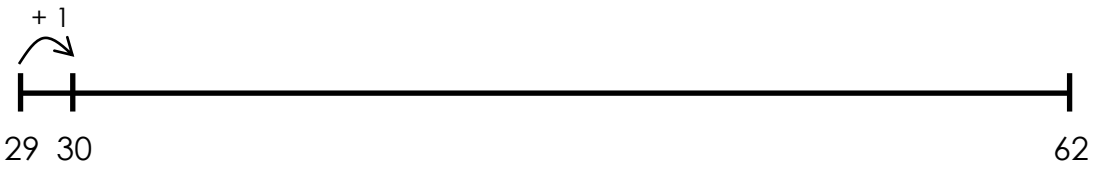
Missing Addend—Counting Up

An open number line can also be used to show a counting up strategy for finding the missing addend (missing part). To solve 29 + ___ = 62 (or 62 – 29) using a counting on strategy, we begin with a number line with the start number on the left and the goal number on the right.

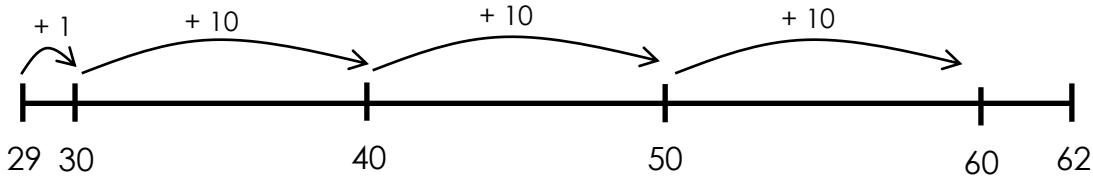
The goal is to find the distance between 29 and 62 by making jumps. Note: There are many different ways to "jump" from 29 to 62.

Example 1

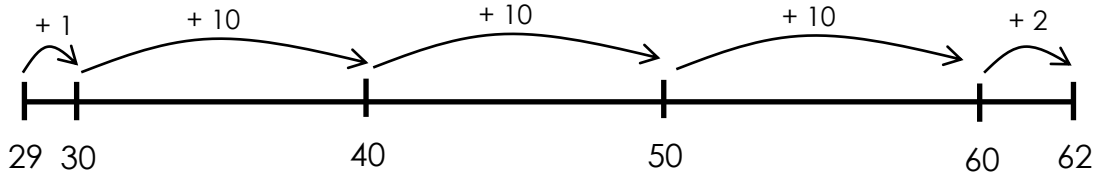
We can make a jump of 1 to get to 30 (Count up 1).



We can make jumps of 10 to get to 60 (Count up 10, 20, 30).



We make a jump of 2 to get to 62 (Count up 2).



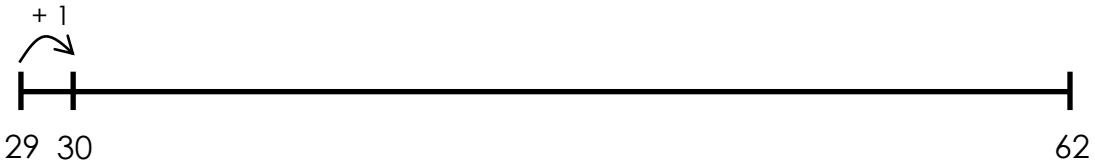
We combine the jumps to get the missing addend.

29 + **1 + 10 + 10 + 10 + 2** = 62
29 + **33** = 62 so 62 – 29 = **33**

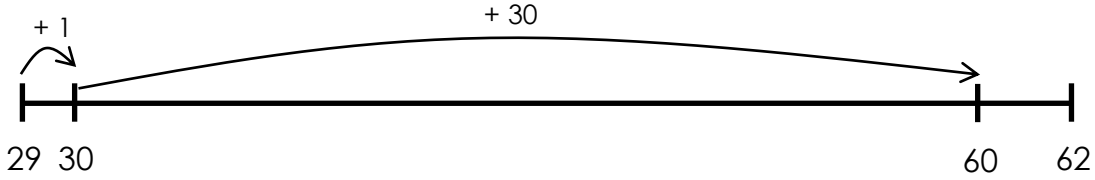
Example 2

There are many ways that we can jump from 1 to 62. Your child should find more efficient ways to jump than by 1s.

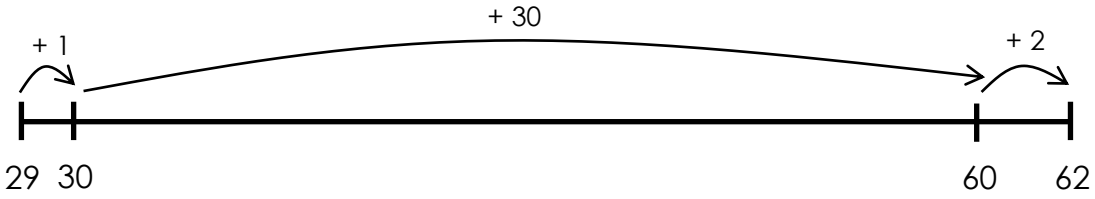
We can make a jump of 1 to get to 30 (Count up 1).



We can make a jump of 30 to get to 60 (Count up 30).



We make a jump of 2 to get to 62 (Count up 2).



We combine the jumps to get the missing addend.

$$29 + \underline{\mathbf{1 + 30 + 2}} = 62$$
$$29 + \underline{\mathbf{33}} = 62 \quad \text{so} \quad 62 - 29 = \underline{\mathbf{33}}$$

Subtraction Concepts

1. Your child should understand that subtraction can be used for comparisons. Suppose your child is asked to solve the following problem.

   Payton collected 57 cans for the food drive. Liam collected 42 cans. How many more cans than Liam did Payton collect?

   He or she can represent this comparison as 57 – 42 or as 57 = 42 + ___.
2. Your child should understand that he or she can use what they know about addition to find the answer to a subtraction problem (think addition).
3. Your child should be able to illustrate math stories involving taking from or taking apart a starting quantity where the unknown is in different positions. Your child should be able to illustrate with simple drawings, using objects, and use a blank, box, or some other symbol for the unknown number. He or she should also be able to act out the stories. For example,
   - Result unknown: *Adriana's Bakery has 34 Snicker Doodle cookies. They sell 28 cookies before noon. How many do they still have to sell?* In this problem your child is to determine the result of taking from the starting quantity. 34 – 28 = ___
   - Start unknown: *Adriana's Bakery sells Snicker Doodle cookies. They sell 28 cookies before noon. They still have 6 Snicker Doodle cookies. How many Snicker Doodles did they start the day with?* In this problem we know how the number of

cookies changed (they sold 28 cookies). We know the number of cookies (the result) that they had selling the cookies. Your child is to determine the number of cookies Adriana's Bakery started with. ___ – 28 = 6

- Change unknown: *Adriana's Bakery has 34 Snicker Doodle cookies. They sell a lot of cookies before noon. They now have 6 Snicker Doodles left. How many did they sell?* In this problem we know how many Snicker Doodle cookies Adriana's Bakery started with. We know how many they ended with. Your child is to determine how the number of cookies changed (how many they sell before noon). 34 – ___ = 6

4. Your child should be able to illustrate math stories involving comparisons where the unknown is in different positions. Your child should be able to illustrate with simple drawings, using objects, and use a blank, box, or some other symbol for the unknown number. These problems are often represented as missing addends. He or she should also be able to act out the stories. For example,
    - Result unknown: *Jayden and Paisley are having a book reading contest. So far Jayden has read 47 books. Paisley has read 38 books. How many more books has Jayden read?* In this problem your child is to determine the result of comparing two quantities. 47 – 38 = ___ or 47 = 38 + ___
    - Part unknown: *Jayden and Paisley are having a book reading contest. So far, Jayden read 9 more books than Paisley. If Paisley read 38 books, how many books has Jayden read?* In this problem your child is to determine one of the missing parts of the comparison. ___ = 38 + 9
    - Other part unknown: *Jayden and Paisley are having a book reading contest. So far, Jayden read 47 books. Paisley has read 9 fewer books. How many books has Paisley read?* In this problem your child is to determine the other missing parts of the comparison. ___ = 47 – 9
5. Your child should be able to tell a taking from, taking apart or comparison story problem when given a problem such as 75 – 29 or when given an illustration.

Measurement

Time

1. It is still important for your child to accurately tell time to 5 minutes on an analog clock. An analog clock is the clock that is divided into 12 equal sections. Sometimes the sections are numbered 1 to 12, with 12 at the top of the clock. Sometimes only some of the sections are labeled (e.g., 3, 6, 9, and 12). The numbers on the clock represent 2 different time measures. First, the numbers represent the number of hours that have passed since midnight or since noon. It takes 1 hour for the hour hand to move from one number to the next. The numbers also represent multiples of 5 minutes.

    Some important things for your child to notice.
    - We use "o'clock" to name on the hour time. On the hour, the minute hand is pointed to the 12.
    - At half past the hour, the hour hand is halfway between 2 numbers on the clock.
    - At a quarter past the hour, the hour hand is a quarter of the way between 2 numbers on the clock.

    Your child should also be able to draw an analog clock with the numbers in the correct position.

2. The more your child practices telling time, the better they will get. Your child should be able to identify the times at which he or she does certain activities during the day, correctly using a.m. and p.m.

Money

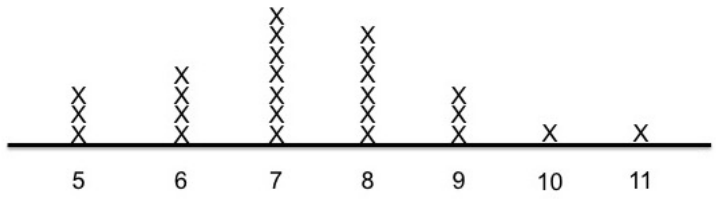
1. In grade 2 your child is expected to be able to:
    - name each of the coins regardless of the image on the head or tail,
    - name the value of each coin,
    - find and name other information available on the coins (date, United States of American, In God We Trust, value, etc.),
    - name the total when given a collection of mixed coins,
    - show multiple ways to make the same value using coins, and
    - solve money story problems.

Measuring Length

1. It is important for your child to recognize an inch, a foot, a yard, a centimeter, and a meter. In Grade 2 we use very simple measurement devices that help your child get a sense of those unit sizes before giving them a typical ruler, yard stick, meter stick, etc. However, the more your child measures items (helping you cook, sew, build things), the more proficient they become.
2. It is important for children to understand that you do not need to line up an object at zero to be able to measure the object. The object can be placed anywhere on the ruler. We can measure the object by counting the units (inches). A favorite test question is for children to state the measurement of an object using a "broken" ruler (The ruler is broken off at each end).

Graphing—Represent and Interpret Data

1. Your child should be able to draw a picture graph with up to four categories.
2. Your child should be able to draw a bar graph with up to four categories.
3. Your child should be able to make a line plot. For example,



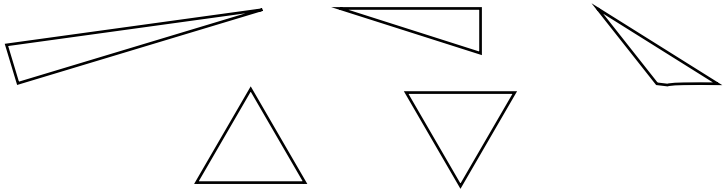
4. Your child should be able to solve simple put together, take apart, and compare word problems about data represented in graphs.

Geometry

3D & 2D Shapes

1. It is important for your child to understand:
    - that the objects we encounter in our world are 3D objects.
    - that 2D objects have no thickness.
    - that squares are special rectangles. They are rectangles with equal sides.
2. It is important for your child to understand attributes that are defining attributes of shapes and those that aren't. For example, we can turn a square in any orientation and it is still called a square. The way in which the shape is turned is not a defining attribute. The fact that it is a rectangle with equal sides is a defining attribute.

Triangles can be turned in any orientation and can have sides with different lengths. They do not have to sit on a side. Orientation and lengths of sides are non-defining attributes. Having 3 sides that meet and don't overlap (closed) is a defining attribute.



3. Your child should be able to name and draw shapes with given attributes. For example, a certain number of sides, angles, faces, etc.

Fractions

4. In grade 2 we have children work with fractions by having them cut a shape into 2 equal pieces, 4 equal pieces, or 3 equal pieces (**Note**: We typically work with 4 parts prior to 3 parts to build the idea of repeated halving. This idea is important for division in Grade 3). It is important for your child to be able cut a shape into two (or 4, or 3) equal pieces in more than one way as well as draw pictures to match the way that he or she cut the shape.
5. It is important for your child to correctly use terms such as halves, fourths, quarters, thirds, half of, fourth of, quarter of, third of.
6. It is important for your child to understand that two halves, three thirds, and four fourths all make a whole.