

First Grade Nemeth Braille Code Curriculum
Module 1: Addition and Subtraction to 10, the English Letter Indicator for
Multiple Choice, and the Long Dash

It's almost time to board the airplane for a fun adventure! While we are waiting at the gate, let's review how to make 5 with a Five Frame.

Note: *Breaking numbers down into the addition of two numbers or pairs of addends is called decomposition in math. Learning how to decompose numbers allows students to think about numbers in flexible ways and helps students develop the understanding that smaller sets of objects exist within a larger set. This provides a foundation for learning basic math facts as well as regrouping (renaming) in subtraction in later grades.*

The Five Frame is available in braille within the curriculum. It may be helpful to place the Five Frame on a nonslip surface such as a rubber shelf liner for this activity. You may also place the Five Frame on a cookie sheet or magnetic board and use magnetic counters instead of pennies. It may be helpful to use a work tray to hold your counters/pennies.

Begin by placing 3 pennies on the Five Frame. How many more pennies are needed to make 5? That's right! We need 2 more pennies to make 5. How did you know that we need 2 more pennies to make 5?

Note: *There are several possible correct responses. The student may indicate that he/she counted the empty squares on the Five Frame or counted in his/her head. The student may also place 2 additional pennies on the Five Frame so that every square is filled.*

Remove the pennies from the Five Frame and place them back in the work tray. Now place 1 penny on the Five Frame. How many more pennies are needed to make 5? That's right! We need 4 more pennies to make 5.

Activity time: Let's play a review game called "Race to 5" with our Five Frame and pennies! We will also need a sorting tray and 3 flash cards for each number from 0-5.

Note: *You may also place the Five Frame on a cookie sheet or magnetic board and use magnetic counters instead of pennies.*

Shuffle your flash cards and then draw a flash card. Read the number on the flash card and then use your Five Frame and pennies to tell me how many more are needed to make 5. As you read each number card, use a sorting tray to separate which cards you have read and which cards you have not read.

Note: *If the student selects the number 5, then no additional pennies would be needed to make 5.*

You will win the game if you can tell me how many more are needed to make 5 for all of the numbers before the timer goes off.

Note: *The length of time should be based on the individual needs of the student. If desired, this game can be played more than once. The length of time can be decreased each time in order to promote fluency.*

Fun fact: Since the days of ancient Greece, people wanted to fly.

Welcome aboard the airplane! Let's begin the second part of the adventure by finding the first line of braille on the first braille page. Softly glide your fingers across the line. It says First Grade Nemeth. Now move your hands down to the second line of braille on the page. It says Curriculum Module 1. Now move your hands down to the third line of braille on the page.

There is just one symbol on the third line. It is on the left side of the page.



This is called an opening Nemeth Code indicator. It tells us that we are going to read math or science. Dots 4-5-6 are in the first cell, and dots 1-4-6 are in the second cell.

The fourth line of braille contains an equation about adding two groups together in braille.



The equation begins with the numeric indicator followed by dots 2-3. What number is this? That's right. It's the number 2. Afterwards, there is a plus sign. Which dots make the plus sign? You got it! Dots 3-4-6 make the plus sign. Notice that there is not a numeric indicator after the plus sign. Also notice that there is not a space before or after the plus sign.

After the plus sign, there are the dots 2-3 again. What number is made with dots 2-3? Yes, the number is 2.

So far our equation reads 2+2. What follows the number 2? Yes, there is a space followed by an equals sign after the number 2.

Did you remember that it takes 2 braille cells to write an equals sign? It is dots 4-6 in the first braille cell followed by dots 1-3 in the second braille cell.

What follows the equals sign? That's right. The equals sign is followed by another space. What is the last Nemeth symbol on the line? You got it! It is called a general omission symbol. We use this symbol when there is a missing number for you to write in math. Dots 1-2-3-4-5-6 make a general omission symbol.

What number is the general omission symbol standing for in the equation?
Let's use our Five Frame and pennies to find out.

Note: Encourage the student to verbalize the process they use to determine what the general omission symbol is standing for. Provide assistance as needed.

That's right! Two plus two equals four.

Try reading another equation. What does it begin with?

$\begin{array}{cccc} \times & \bullet & \times & \times \\ \times & \bullet & \bullet & \times \\ \bullet & \bullet & \times & \bullet \end{array}$

You got it! It begins with the number 1. What follows the number 1? Yes, there is a plus sign, followed by a 3. What dots make the plus sign? Yes, dots 3-4-6 make the plus sign. Did you remember that there is not a space before and after the plus sign?

Try reading the rest of the equation. You got it, Nemeth superstar! There is a space and then an equals sign. Afterwards, there is another space, followed by the general omission symbol.

What number is the general omission symbol standing for? Let's use our Five Frame and pennies to find out.

Note: Encourage the student to verbalize the process they use to determine what the general omission symbol is standing for. Provide assistance as needed.

That's right! One plus three equals four. Let's try reading another equation together.

$\begin{array}{cccc} \times & \bullet & \times & \bullet \\ \times & \bullet & \bullet & \times \\ \bullet & \bullet & \times & \bullet \end{array}$

Yes, we would read the equation as 5 plus 0 equals what number. Let's use our Five Frame and pennies to find out what the general omission symbol is standing for.

How should we begin? Yes, we should place 5 pennies on the Five Frame.
How many more pennies should we place on the Five Frame for the number

0? That is correct. We should not place any more pennies on the Five Frame because 0 means no objects.

So 5 plus 0 equals what number? Way to go! 5 plus 0 equals 5.

Note: *Encourage the student to verbalize the process they use to determine what the general omission symbol is standing for. Provide assistance as needed.*

Now read the equations below and tell me what number the general omission symbol stands for each time. Good luck, pilot!

$5 + 0 = ?$

$5 + 0 = ?$

$5 + 0 = ?$

$5 + 0 = ?$

$5 + 0 = ?$

$5 + 0 = ?$

Fun fact: Approximately 700 years ago, Leonardo da Vinci studied how birds flew and then drew pictures of flapping-wing machines that might help people fly.

Activity time: Let's use flash cards to practice reading equations. Afterwards, tell me what number the general omission symbol stands for. Once you finish, go back and time how quickly you can read the equations! Do you think you can read the equations even quicker? If so, try one more time!

Note: *Flash cards are available in braille within the curriculum. It may be helpful to place the flash cards on a nonslip surface such as a rubber shelf liner for this activity.*

Way to go, math superstar! For the third part of the adventure, let's review how to write equations in braille. Place your fingers on the correct keys on either the Accessible Equation Editor or your braillewriter.

Begin by writing $2 + 1 = ?$

Note: *An answer key in braille is provided on page 1 of the document entitled "B3 Module 1_Answer Key for Writing Activities_1".*

What should we braille first? Yes, we will begin by brailleing the number 2, followed by the plus sign.

How do we write a plus sign in braille? Yes, a plus sign is made with the dots 3-4-6. Remember that there will not be a space before or after the plus sign.

Next we will write the number 1. We will not need another numeric indicator. So we will press only the dot 2 after the plus sign to write the number 1.

We will need a space after the number 1 so we will press the space bar one time. How do we write the equals sign in braille? Yes, the equals sign begins with the dots 4-6, followed by the dots 1-3.

We will need another space after the equals sign. Then we will need to braille the general omission symbol. Dots 1-2-3-4-5-6 are used to write the general omission symbol.

Super work, Nemeth superstar! Move to the next line by pressing the line spacing key twice. Practice writing $2+1 = ?$ several times. You will need to press your line spacing key twice to move to the next line before brailleing the equation each time.

Note: *Repeat saying the equation $2+1 = ?$ as many times as needed. Also remind the student to move his/her fingers across the braille and check his/her work if needed.*

Let's practice brailleing another equation.

$3+0 = ?$

Note: *An answer key in braille is provided on page 1 of the document entitled "B3 Module 1_Answer Key for Writing Activities_1".*

What should we braille first? Yes, we will begin by brailleing the number 3, followed by the plus sign. How do we write a plus sign in braille? Yes, a plus sign is made with the dots 3-4-6. Will we need a space before or after the plus sign? That's right. We will not need a space.

Next we will write the number 0. We do not need another numeric indicator because the number is coming after the plus sign. So we would press dots 3-5-6 after the plus sign to write the number 0.

What should we braille next? Yes, we need a space and then an equals sign. How do we write the equals sign in braille? Yes, the equals sign begins with the dots 4-6, followed by the dots 1-3.

Will we need another space after the equals sign? Yes, we will need a space before and after an equals sign in braille. Then we will end the equation with a general omission symbol. What dots are used to write a general omission symbol? Yes, dots 1-2-3-4-5-6 are used to write the general omission symbol in braille.

Move to the next line by pressing the line spacing key twice. Practice writing $3+0 = ?$ several times. You will need to press your line spacing key twice to move to the next line before brailleing the equation each time.

Fun fact: In the mid-1800s, George Cayley studied how a wing works and then built a glider that carried a person a short distance.

Activity time: You will need the Accessible Equation Editor and/or your braillewriter and braille paper for this activity. Listen and then braille what you hear.

Note: Repeat saying each equation as many times as needed. Also remind the student to move his/her fingers across the braille and check his/her work if needed. An answer key in braille is provided on page 1 of the document entitled "B3 Module 1_Answer Key for Writing Activities_1".

$$1+1 = ?$$

$$5+0 = ?$$

$$? = 3+1$$

$$? = 2+3$$

$$0+4 = ?$$

Let's try a few more. This time number the equations.

Note: If needed, remind the student how to number the equations, including the dot configuration for the punctuation indicator. Continue to repeat saying each equation as many times as needed. An answer key in braille is provided on page 2 of the document entitled "B3 Module 1_Answer Key for Writing Activities_1".

1. $1+2 = ?$

2. $4+1 = ?$

3. $? = 0+5$

4. $3+2 = ?$

5. $3+0 = ?$

Now go back to the equations that you wrote and tell me what number the general omission symbol is standing for each time.

The passengers are on the plane, and the suitcases have been loaded in the cargo bins. It is time for the airplane to leave the gate! For the fourth part of the adventure, let's review how to use a Ten Frame to help us make 10.

Note: *The Ten Frame is available in uncontracted and contracted braille within the curriculum. It may help to place the Ten Frame on a nonslip surface such as a rubber shelf liner. You may also place the Ten Frame on a cookie sheet or magnetic board and use magnetic counters instead of pennies. The Tactile Tokens from APH fit perfectly into the Ten Frame and the two textures can represent the two addends. You can also use the shapes and line segments from the Picture Maker Wheatley Tactile Diagramming Kit to create the Ten Frame. It may be helpful to use a bowl to hold your counters/pennies.*

Where will you find the title? Yes, it is at the top of the page. The title is Ten Frame. Now use your hands to locate the top row. How many squares are in the top row of squares?

Note: *Offer the following hint if needed: Move your hands across the top row of squares from left to right to count.*

That is correct. There are five squares.

Next find the bottom row. How many squares are in the bottom row of squares? Yes, there are five squares.

When we use the Ten Frame, fill the top row up first, before moving to the bottom row. Begin by placing 3 pennies on the Ten Frame. Good job! You remembered to begin by placing pennies on the top row, beginning on the far left. Remove the pennies from the Ten Frame and place them in a bowl. Now place 8 pennies on the Ten Frame.

Note: Encourage the student to verbalize the process they use for placing the pennies on the Ten Frame. Provide assistance as needed. It may be helpful to point out that 8 is three more than 5.

Remove the pennies from the Ten Frame and place them in a bowl. Now as I call a number, place that many pennies on the Ten Frame.

2

9

5

6

10

Fun fact: Orville and Wilbur Wright built a plane with a gas-engine, and in December 1903, they flew it 120 feet and safely landed in Kitty Hawk, North Carolina.

Now remove the pennies from the Ten Frame and let's work together to determine how many more pennies are needed to make 10.

Begin by placing 9 pennies on the Ten Frame. How can we find out how many more pennies are needed to make 10?

Note: Encourage the student to verbalize the process they use to determine how many more pennies are needed to make 10. There are several possible correct responses. The student may indicate that he/she counted the empty squares on the Ten Frame or counted the number of full braille cells in his/her head. The student may also place 1 additional object or penny on the Ten Frame so that each square is filled. Provide assistance if needed.

That's right! We need 1 more penny to make 10. Remove the pennies from the Ten Frame and place them in a bowl.

Nice work, math superstar! Now place 5 pennies on the Ten Frame. How can we find out how many more pennies are needed to make 10?

Note: Encourage the student to verbalize the process they use to determine how many more pennies are needed to make 10. Continue to provide assistance if needed.

You got it! We need 5 more pennies to make 10. Remove the pennies from the Ten Frame and place them in a bowl.

Activity time: Let's play a game called "Zoom to 10" with our Ten Frame and pennies! We will also need a sorting tray and 2 flash cards for each number from 0-10.

Shuffle your flash cards and then draw a flash card. Read the number on the flash card and then use your Ten Frame and pennies to tell me how many more are needed to make 10. As you read each number card, use a sorting tray to separate which cards you have read and which cards you have not read.

Note: The length of time should be based on the individual needs of the student. If desired, this game can be played more than once. The length of time can be decreased each time in order to promote fluency.

It is time for take-off! Make sure that your seat belt is fastened securely! For the fifth part of the adventure, let's work together to solve addition problems to 10 with our Ten Frame and pennies.

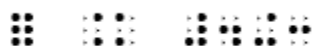
Note: *It may be helpful to point out that braille page numbers are placed at the right margin on the last line. Also point out that braille page numbers are transcribed in Unified English Braille, not the Nemeth braille code.*

Yes, we would read the equation as 6 plus 1 equals what number. Let's use our Ten Frame and pennies to find out what the general omission symbol is standing for.

How should we begin? Yes, we should place 6 pennies on the Ten Frame. How many more pennies should we place on the Ten Frame for the number 1? That is correct. We should place one more penny on the Ten Frame.

So 6 plus 1 equals what number? Way to go! 6 plus 1 equals 7. Let's try another one together.

$$? = 4 + 3$$



How should we begin? You got it! We would begin by reading the equation.

You try it. Yes, it would be read as what number equals 4 plus 3. Let's use our Ten Frame and pennies to find out what the general omission symbol is standing for.

What should we do first? Yes, we should place 4 pennies on the Ten Frame. How many more pennies should we place on the Ten Frame for the number 3? That is correct. We should place three more pennies on the Ten Frame.

So what number equals 4 plus 3? Way to go! 7 equals 4 plus 3. Let's try one more together.

$$8 + 2 = ?$$



How should we begin? You got it! We would begin by reading the equation.

You try it now. Yes, we would read the equation as 8 plus 2 equals what number.

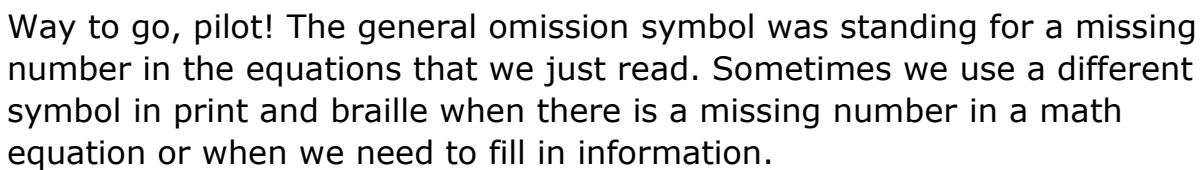
What should we do next? Yes, we should place 8 pennies on the Ten Frame. How many more pennies should we place on the Ten Frame for the number 2? That is correct. We should place two more pennies on the Ten Frame.

So 8 plus 2 equals what number? Way to go! 8 plus 2 equals 10.

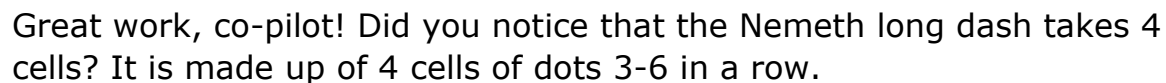
Fun fact: The first planes were built of wood.

Now read the equations below and tell me what number the general omission symbol stands for each time. Good luck!





Note: Encourage the student to verbalize the process they use to determine what the general omission symbol is standing for. Provide assistance as needed.













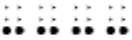


Softly guide your fingers across the line of braille at the top of page 3. In the middle of the line, you will find a long dash. There is a full braille cell before and after the long dash.
















Revised 12/26/18

In the following equation, there is a long dash standing for a missing number. Let's read the equation together.







What does the equation begin with? Yes, it begins with the number 4. What follows the number 4? Yes, there is a plus sign, followed by a 2. Try reading the rest of the equation. You got it, Nemeth superstar! There is a space and then an equals sign. Afterwards, there is another space, followed by the long dash.

When reading an equation with a long dash, you may read the long dash as "blank" or "what number". So we could read the equation as 4 plus 2 equals blank. Another way of reading the equation is 4 plus 2 equals what number.

What is the missing number in the equation? Yes, the missing number is 6 since $4+2 = 6$.

Note: Encourage the student to verbalize the process they use to determine the missing number. If needed, a Ten Frame and pennies may be used.

Try reading another equation with a long dash.







Yes, we would read the equation as 5 plus 5 equals blank. Another way of reading the equation is 5 plus 5 equals what number.

What is the missing number in the equation? Yes, the missing number is 10 since $5+5 = 10$.

Fun fact: The Wright brothers became interested in flight as children after their father gave them a rubber band powered toy helicopter. The brothers were amazed that the toy helicopter would fly across a room.

Activity time: You will need the Accessible Equation Editor and/or your braillewriter and braille paper for the activity. Read the equations at the top of page 4 and find the long dash. Sometimes the long dash will be at the beginning of the equation, and sometimes it will be at the end of the equation.

After you find the long dash in the equations, write the missing number. Don't forget to number your problems. Good luck, math superstar!

Note: *Encourage the student to verbalize the process they use to determine the missing number. Provide assistance as needed. An answer key in braille is provided on page 2 of the document entitled "B3 Module 1_Answer Key for Writing Activities_1".*

3 + 4 = 7 5 + 6 = 11 2 + 3 = 5 8 + 9 = 17
 1 + 2 = 3 4 + 5 = 9 7 + 8 = 15 6 + 7 = 13
 9 + 1 = 10 3 + 4 = 7 5 + 6 = 11 2 + 3 = 5
 8 + 9 = 17 1 + 2 = 3 4 + 5 = 9 7 + 8 = 15
 6 + 7 = 13 9 + 1 = 10 3 + 4 = 7 5 + 6 = 11
 2 + 3 = 5 8 + 9 = 17 1 + 2 = 3 4 + 5 = 9

The long dash is sometimes next to the addition sign when one of the numbers being added together is missing. A number being added to another number to make a new total is called an addend.

Let's read an equation together for an example.

3 + 4 = 7

The equation begins with the numeric indicator followed by dots 2-5. What number is this? That's right. It's the number 3. What comes after the number 3? Yes, there is a plus sign after the number 3.

What comes after the space in the equation? Yes, there is a space after the plus sign. What comes next? You got it! It is a long dash. Notice that there is a space before and after the long dash. When reading an equation with a long dash, you may read the long dash as "blank" or "what number".

What follows the long dash? Yes, there is a space, followed by an equals sign, another space, and then the number 4.

Read along with me as I read the equation once more. 3 plus blank equals 4. Now you try reading. Yes, 3 plus blank equals 4.

To figure out the missing addend, we can ask ourselves 3 plus what number equals 4. Way to go, math superstar! 3 plus 1 equals 4.

Note: *Encourage the student to verbalize the process they use to determine the missing number. If needed, a Five/Ten Frame and pennies may be used.*

Let's try another one. Begin by reading the equation and finding the long dash.

.....

Way to go! You found the long dash.

The equation begins with a long dash, so we would read it as blank or what number. We would read the equation as blank plus 5 equals 6.

How can we figure out the missing addend? That's right. We can ask ourselves blank plus 5 equals 6

What is the missing addend?

Note: *Encourage the student to verbalize the process they use to determine the missing number. If needed, a Five/Ten Frame and pennies may be used.*

Yes, the missing addend is 1 because 1 plus 5 equals 6.

Fun fact: After their toy helicopter broke, Wilbur and Orville Wright made several copies of the toy together.

Activity time: You will need the Accessible Equation Editor and/or your braillewriter and braille paper for the next activity. Read the equations at the top of page 5 and find the long dash.

After you find the long dash, write the missing addend. Don't forget to number your problems. You can do it!

Note: *Encourage the student to verbalize the process they use to determine the missing number. Provide assistance as needed. An answer key in braille is provided on page 3 of the document entitled "B3 Module 1_Answer Key for Writing Activities_1".*

$$\begin{array}{r}
 23 + 12 = 35 \\
 15 + 20 = 35 \\
 10 + 25 = 35 \\
 18 + 17 = 35 \\
 22 + 13 = 35
 \end{array}$$

Let's try some more problems. This time you may find the long dash at the beginning, middle, or end of the equation. The long dash may be standing for a missing addend or a missing sum. Good luck, pilot!

$$\begin{array}{r}
 23 + ______ = 35 \\
 15 + ______ = 35 \\
 10 + ______ = 35 \\
 18 + ______ = 35 \\
 22 + ______ = 35 \\
 ______ + 12 = 35 \\
 ______ + 20 = 35 \\
 ______ + 25 = 35
 \end{array}$$

Fun fact: The Wright brothers owned a bicycle business. They sold, repaired, and later built bicycles. They also built many parts of their plane in the backroom of their bicycle shop.

Activity time: Let's use flash cards to practice reading addition problems that have a long dash. Afterwards, tell me what the missing number is. Once you can read all of the equations correctly, go back and time how quickly you can read the equations and answer the problems! Do you think you can read the equations and answer the problems even quicker? If so, try one more time!

Note: *Flash cards are available in braille within the curriculum. It may be helpful to place the flash cards on a nonslip surface such as a rubber shelf liner for this activity. Building fluency in reading and answering addition and subtraction problems to 10 is a key skill in first grade. This will require*

practice across time. Activities such as this one will help the child develop grade-level fluency.

For the seventh part of the adventure, let's learn how to write a long dash in braille. Place your fingers on the correct keys on either the Accessible Equation Editor or your braillewriter. Then press the ring finger on your left hand and the ring finger on your right hand four times to write the long dash. Now use your line spacing key twice and move to the next line. Then practice writing the long dash again.

Activity time: You will need the Accessible Equation Editor and/or your braillewriter and braille paper for this activity. Listen and then braille what you hear. Use your line spacing key twice and move to the next line each time.

Note: *An answer key in braille is provided on page 4 of the document entitled "B3 Module 1_Answer Key for Writing Activities_1".*

1. long dash
2. plus sign
3. equals sign
4. minus sign
5. long dash
6. general omission symbol
7. tally mark
8. ellipsis
9. long dash
10. plus sign

Now move your fingers across your braille and check your work as I say the Nemeth symbols again. Nice writing, co-pilot!

Fun fact: Before building a plane, Orville and Wilbur Wright built a glider and flew it more than 1,000 times in 4 years to learn more about flying.

Let's practice writing the following equation:

_____ = 2+2

Note: When voicing the equation, say "Blank equals 2 plus 2." An answer key in braille is provided on page 5 of the document entitled "B3 Module 1_Answer Key for Writing Activities_1".

What should we braille first? Yes, we will begin by brailleing the Nemeth long dash. Press the ring finger on your left hand and the ring finger on your right hand four times to write the long dash.

What should we braille next? Yes, we need a space and then an equals sign. How do we write the equals sign in braille? Yes, the equals sign begins with the dots 4-6, followed by the dots 1-3.

Will we need another space after the equals sign? Yes, we will need a space before and after an equals sign in braille. What should we write next? You got it! We will need a numeric indicator followed by the dots 2-3. This will be followed by the plus sign. How do we write a plus sign in braille? Yes, a plus sign is made with the dots 3-4-6. Will we need a space before or after the plus sign? That's right. We will not need a space.

Next we will write the number 2. We do not need another numeric indicator because the number is coming after the plus sign. So we would press dots 2-3 after the plus sign to write the number 2.

Move to the next line by pressing the line spacing key twice. Practice writing _____ = 2+2 several times. You will need to press your line spacing key twice to move to the next line before brailleing the equation each time.

Co-pilot, let's practice writing an equation where an addend is missing.

5+ _____ = 8

Note: When voicing the equation, say "5 plus blank equals 8." An answer key in braille is provided on page 5 of the document entitled "B3 Module 1_Answer Key for Writing Activities_1".

What should we braille first? Yes, we will begin by brailleing a numeric indicator followed by the dots 2-6. This will be followed by the plus sign. How do we write a plus sign in braille? Yes, a plus sign is made with the dots 3-4-6.

Will we need a space before the plus sign? That's right. We will not need a space before the plus sign.

Will we need a space between the plus sign and the long dash? Yes, we will need a space because of the long dash.

18

Note: A numeric indicator is not used when a number follows a sign of operation without a space.

It begins with the numeric indicator followed by dots 2-5-6. What number is this? That's right. It's the number 4. Afterwards, there is a minus sign.

Which dots make the minus sign? You got it! Dots 3-6 make the minus sign. Notice that there is not a numeric indicator after the minus sign. Also notice that there is not a space before or after the minus sign.

After the minus sign, there is a single dot 2. What number is made with the dot 2? Yes, the number is 1.

So far our equation reads 4-1. What follows the number 1? Yes, there is a space followed by an equals sign.

What follows the equals sign? That's right. The equals sign is followed by a space and then a long dash. Four cells of dots 3-6 make a long dash. So we would read the equation as 4 minus 1 equals blank.

In subtraction, we find the difference between two numbers. In the equation "four minus one equals blank", we are trying to find the difference between 4 and 1.

Let's use our Five Frame and pennies to figure out the answer to the problem.

Note: Encourage the student to verbalize the process they use to determine what number is missing. Provide assistance as needed.

That's right! Four minus one equals three. In this problem, the difference is three.

Try reading another equation.



Yes, we would read the equation as 5 minus 0 equals blank. Let's use our Five Frame and pennies to find the difference.

How should we begin? Yes, we should place 5 pennies on the Five Frame. How many pennies should we remove from the Five Frame for the number 0? That is correct. We should not remove any pennies from the Five Frame because 0 means no objects.

So 5 minus 0 equals what number? Way to go! 5 minus 0 equals 5.

Now read the equations below. Then find the difference. Good luck, co-pilot!

Note: *If needed, remind the student that the long dash will be voiced as "blank" in these equations.*











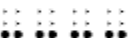






















Fun fact: The Wright brothers continued to fly planes, and together they helped found the aviation industry. Aviation means air travel or flight.

Now let's work together to solve subtraction problems with our Ten Frame and pennies. Begin by reading the equation at the top of page 7.





Yes, we would read the equation as 10 minus 5 equals blank. Let's use our Ten Frame and pennies to find the difference.

How should we begin? Yes, we should place 10 pennies on the Ten Frame. Did you remember to place pennies on the top row first, beginning on the far left?

How many pennies should we remove from the Ten Frame for the number 5? That is correct. We should remove 5 pennies from the Ten Frame.

So 10 minus 5 equals what number? Way to go! 10 minus 5 equals 5.

Try another problem. Begin by reading the equation.





Yes, we would read the equation as 6 minus 3 equals blank. Let's use our Ten Frame and pennies to find the difference.

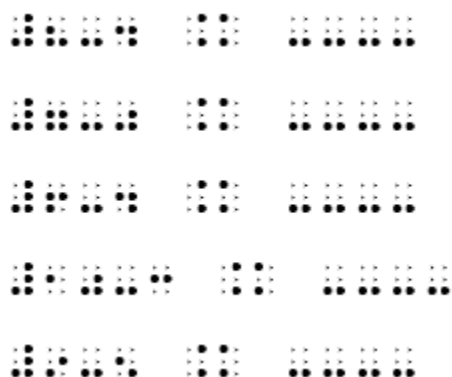
How should we begin? Yes, we should place 6 pennies on the Ten Frame.

Note: *If needed, remind the student to place pennies on the top row first, beginning on the far left.*

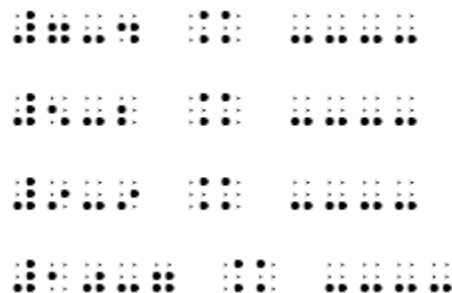
How many pennies should we remove from the Ten Frame? That is correct. We should remove 3 pennies from the Ten Frame.

So 6 minus 3 equals what number? Way to go! 6 minus 3 equals 3.

Now read the equations below. Then use your Ten Frame and pennies to find the difference.



Let's try some more subtraction problems. For a challenge, try to find the difference without using your Ten Frame and pennies.



Activity time: Let's use flash cards to practice reading subtraction problems that have a long dash. Afterwards, tell me the answer to the problem. Once you can read all of the equations correctly, go back and time how quickly you can read the equations and answer the problems! Do you think you can read the equations and answer the problems even quicker? If so, try one more time!

Note: *Flash cards are available in braille within the curriculum. It may be helpful to place the flash cards on a nonslip surface such as a rubber shelf liner for this activity. Building fluency in reading and answering addition and subtraction problems to 10 is a key skill in first grade. This will require*

practice across time. Activities such as this one will help the child develop grade-level fluency.

Fun fact: The original 1903 Wright airplane is now displayed in the National Air and Space Museum in Washington D.C.

Way to go, math superstar! For the ninth part of the adventure, let's review how to write equations with a minus sign in braille. Place your fingers on the correct keys on either the Accessible Equation Editor or your braillewriter.

Begin by writing $4-3 = \underline{\hspace{1cm}}$

Note: *When voicing the equation, say "4 minus 3 equals blank." An answer key in braille is provided on page 6 of the document entitled "B3 Module 1_Answer Key for Writing Activities_1".*

What should we braille first? Yes, we will begin by brailing the number 4, followed by the minus sign.

How do we write a minus sign in braille? Yes, a minus sign is made with the dots 3-6. Remember that there will not be a space before or after the minus sign.

Next we will write the number 3. We will not need another numeric indicator. So we would press only the dots 2-5 after the minus sign to write the number 3.

We will need a space after the number 3 so we will press the space bar one time. How do we write the equals sign in braille? Yes, the equals sign begins with the dots 4-6, followed by the dots 1-3.

We will need another space after the equals sign. Then we will need to braille the long dash. Four cells of dots 3-6 are used to write the long dash.

Super work, Nemeth superstar! Move to the next line by pressing the line spacing key twice. Practice writing $4-3 = \underline{\hspace{1cm}}$ several times. You will need to press your line spacing key twice to move to the next line before brailing the equation each time.

Note: *Repeat saying the equation $4-3 = \underline{\hspace{1cm}}$ as many times as needed. Also remind the student to move his/her fingers across the braille and check his/her work if needed.*

Let's practice brailing another equation.

$5-1 = \underline{\hspace{1cm}}$

Note: When voicing the equation, say "5 minus 1 equals blank." An answer key in braille is provided on page 6 of the document entitled "B3 Module 1_Answer Key for Writing Activities_1".

What should we braille first? Yes, we will begin by brailleing the number 5, followed by the minus sign. How do we write a minus sign in braille? Yes, a minus sign is made with the dots 3-6. Will we need a space before or after the minus sign? That's right. We will not need a space.

Next we will write the number 1. We do not need another numeric indicator because the number is coming after the minus sign. So we would press dot 2 after the minus sign to write the number 1.

What should we braille next? Yes, we need a space and then an equals sign. How do we write the equals sign in braille? Yes, the equals sign begins with the dots 4-6, followed by the dots 1-3.

Will we need another space after the equals sign? Yes, we will need a space before and after an equals sign in braille. Then we will end the equation with a long dash. What dots are used to write a long dash in Nemeth? Yes, dots 3-6 are used to write the long dash in Nemeth. How many times will you press dots 3-6 to make a long dash? That's correct. You will press dots 3-6 four times.

Move to the next line by pressing the line spacing key twice. Practice writing $5-1 = \underline{\hspace{1cm}}$ several times. You will need to press your line spacing key twice to move to the next line before brailleing the equation each time.

Fun fact: Today, airplanes are used for transportation, recreation, and military purposes.

Activity time: You will need the Accessible Equation Editor and/or your braillewriter and braille paper for this activity. Listen and then braille what you hear.

Note: Repeat saying each equation as many times as needed. Also remind the student to move his/her fingers across the braille and check his/her work if needed. An answer key in braille is provided on page 6 of the document entitled "B3 Module 1_Answer Key for Writing Activities_1".

$$2-0 = \underline{\hspace{1cm}}$$

$$5-5 = \underline{\hspace{1cm}}$$

$$3-2 = \underline{\hspace{1cm}}$$

$$4-1 = \underline{\hspace{1cm}}$$

Note: If needed, remind the student how to number the equations, including the dot configuration for the punctuation indicator. Continue to repeat saying each equation as many times as needed.

- Fun fact:** Today some planes are flown remotely or by computers. These are called drones.

Let's read another subtraction problem together.

What comes after the minus sign in the equation? Yes, there is a space after the minus sign. What comes next? You got it! It is a long dash. Notice that there is a space before and after the long dash, even when it follows a minus sign. When reading an equation with a long dash, you may read the long dash as “blank” or “what number”.

Read along with me as I read the equation once more. 3 minus blank equals 2. Now you try reading it. Yes, 3 minus blank equals 2.

To figure out the missing number, we can ask ourselves 3 minus what number equals 2. Way to go, math superstar! 3 minus 1 equals 2.

Note: *Encourage the student to verbalize the process they use to determine the missing number. If needed, a Five/Ten Frame and pennies may be used.*

Let's try two more subtraction problems. This time read the problems by yourself.

$$\begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} - \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} = \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array}$$

That's right! 8 minus what number equals 4! Now use your Ten Frame and pennies to figure out the missing number.

You got it! The missing number is 4 because 8 minus 4 equals 4. In this problem, the missing number comes first in the equation.

$$\begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} - \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} = \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array}$$

Good reading! Blank (or what number) minus 5 equals 1. What is the missing number?

Note: *Encourage the student to verbalize the process they use to determine the missing number.*

Way to go! 6 is the missing number since 6 minus 5 equals 1.

Now read the equations below. Then use your Ten Frame and pennies to find the missing number.

$$\begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} - \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} = \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array}$$

$$\begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} - \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} = \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array}$$

$$\begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} - \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} = \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array}$$

$$\begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} - \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} = \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array}$$

$$\begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} - \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} = \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array}$$

$$\begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} - \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array} = \begin{array}{|c|c|} \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \bullet & \bullet \\ \hline \end{array}$$

It is time to begin our initial descent by learning how to write equations when the subtraction problem begins with a missing number. Place your fingers on the correct keys on either the Accessible Equation Editor or your braillewriter.

Begin by writing ____ -2 = 3

Note: When voicing the equation, say "blank minus 2 equals 3." An answer key in braille is provided on page 7 of the document entitled "B3 Module 1_Answer Key for Writing Activities_1".

What should we braille first? Yes, we will begin by brailleing a long dash. How do we write a long dash in braille? That's right. Four cells of dots 3-6 are used to write the long dash.

What do we need after the long dash? Yes, we need a space after the long dash.

What will come next? You got it! We will write a minus sign. How do we write a minus sign in braille? Yes, a minus sign is made with the dots 3-6. Remember that there will not be a space after the minus sign.

Next we will write the number 2. We will not need a numeric indicator. So we will press only the dots 2-3 after the minus sign to write the number 2.

We will need a space after the number 2 so we will press the space bar one time. How do we write the equals sign in braille? Yes, the equals sign begins with the dots 4-6, followed by the dots 1-3.

What do we need after the equals sign? Yes, we will need a space after the equals sign. What should you braille next? That's correct. You should braille the number 3.

Super work, Nemeth superstar! Move to the next line by pressing the line spacing key twice. Practice writing ____ -2 = 3 several times. You will need to press your line spacing key twice to move to the next line before brailleing the equation each time.

Note: Repeat saying the equation ____ -2 = 3 as many times as needed. Also remind the student to move his/her fingers across the braille and check his/her work if needed.

Let's practice brailleing another equation.

8- ____ = 4

Note: When voicing the equation, say "8 minus blank equals 4." An answer key in braille is provided on page 7 of the document entitled "B3 Module 1_Answer Key for Writing Activities_1".

What should we braille first? Yes, we will begin by brailleing the number 8, followed by the minus sign. How do we write a minus sign in braille? Yes, a minus sign is made with the dots 3-6.

What comes next in the equation? Yes, a space and then a long dash comes next. Why do we need a space after the minus sign? That's right. We need a space because a space comes before and after a long dash.

What dots are used to write a long dash in Nemeth? Yes, dots 3-6 are used to write the long dash in Nemeth. How many times will you press dots 3-6 to make a long dash? That's correct. You will press dots 3-6 four times.

What should we braille next? Yes, we need a space and then an equals sign. How do we write the equals sign in braille? You got it! The equals sign begins with the dots 4-6, followed by the dots 1-3.

Will we need another space after the equals sign? Yes, we will need a space before and after an equals sign in braille. Then we will end the equation with a number 4.

Move to the next line by pressing the line spacing key twice. Practice writing 8- ____ = 4 several times. You will need to press your line spacing key twice to move to the next line before brailleing the equation each time.

Fun fact: Some airplanes can travel faster than sound.

Activity time: You will need the Accessible Equation Editor and/or your braillewriter and braille paper for this activity. Listen and then braille what you hear.

Note: Repeat saying each equation as many times as needed. Also remind the student to move his/her fingers across the braille and check his/her work if needed. An answer key in braille is provided on pages 7-8 of the document entitled "B3 Module 1_Answer Key for Writing Activities_1".

$$\text{____} - 5 = 3$$

$$2 - \text{____} = 0$$

$$10 - \text{____} = 1$$

$$\text{____} - 2 = 4$$

$$9 - \text{____} = 5$$

Now go back and tell me the missing number in each equation.

Let's try a few more. This time number the equations.

Note: *If needed, remind the student how to number the equations, including the dot configuration for the punctuation indicator. Continue to repeat saying each equation as many times as needed.*

1. $8-0 = \underline{\hspace{1cm}}$

2. $5- \underline{\hspace{1cm}} = 4$

3. $\underline{\hspace{1cm}} -1 = 7$

4. $3-0 = \underline{\hspace{1cm}}$

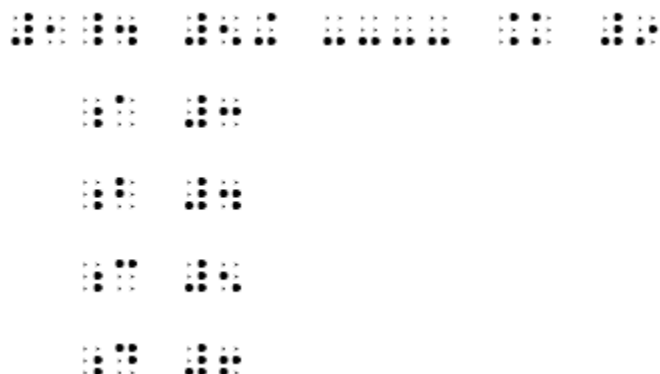
5. $9- \underline{\hspace{1cm}} = 6$

6. $2-1 = \underline{\hspace{1cm}}$

Now go back and tell me the missing number in each equation.

Fun fact: Pilots usually fly airplanes from a cockpit located toward the front of the plane.

For the last part of our journey, let's learn about multiple choice questions with answer choices. Sometimes in math, you will be given a problem with answer choices to select from. The answer choices are often labeled a, b, c, and d. Sometimes there is a period after each letter, and sometimes there is not a period after each letter. Let's read an example together at the top of page 9.



Begin by reading the problem first. That's correct! 5 plus blank equals 9. Notice how the problem begins in cell 1 of the braille line.

Now move to the next line. You will notice that the answer choices begin in cell 3 with dots 5-6 each time. This is called an English letter indicator in Nemeth. The indicator helps us know that a letter and not a word is coming next.

3. 6 minus blank (or what number) equals 3
 a. 3
 b. 4
 c. 5

Good reading, pilot! The problem would be read as:

3. 6 minus blank (or what number) equals 3

The answer choices are:

- a. 3
- b. 4
- c. 5

What is the correct answer? Yes, the correct answer would be the first answer choice, letter a.

Before beginning our last activity, let's learn how to write the English letter indicator. You will need the Accessible Equation Editor and/or your braillewriter and braille paper.

Dots 5-6 are used to write the English letter indicator. Braille the dots 5-6 with your right hand. Then press your line spacing key twice to move to the next line. Now braille the answer choice b. You will begin with dots 5-6 and then the letter b. You got it! Let's braille another one. This time braille the answer choice c.

What will you begin with? Yes, begin with the dots 5-6. What should you braille next? That's right. You will braille the letter "c" next.



Activity time: You will need the Accessible Equation Editor and/or your braillewriter and braille paper for this activity. Begin by reading each problem and answer choices. Then use your Ten Frame and pennies to find the missing number. Afterwards, write the problem number and letter of the correct answer choice. Then press your line spacing key twice to move to the next line of braille before beginning the next problem.

Note: Encourage the student to pay close attention to the sign of operation and verbalize the process they use to determine the missing number. If needed, a Five/Ten Frame and pennies may be used. Also remind the

Figure 6

The figure consists of two separate 3x3 grids. The left grid has black squares at positions (1,3), (2,2), (2,3), and (3,2) assuming top-left is (0,0). The right grid has black squares at positions (0,1), (0,2), (1,1), (1,2), (2,1), and (2,2).

☐ ☐ ☒ ☒ ☐ ☒ ☐ ☐

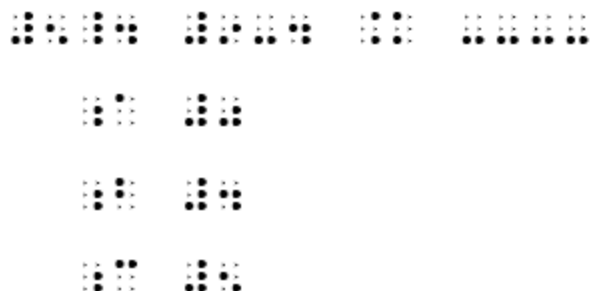



[illegible]

Figure 1 displays five 3x3 grids, each representing a different combination of the three variables (A, B, and C). The grids are arranged horizontally. Each grid contains black squares in various positions, representing the presence of a variable in a specific context. The patterns are as follows:

- Grid 1:** Black squares at (1,1), (1,2), (1,3), (2,1), (2,2), (2,3), (3,1), (3,2), (3,3).
- Grid 2:** Black squares at (1,1), (1,2), (1,3), (2,1), (2,2), (2,3), (3,1), (3,2), (3,3).
- Grid 3:** Black squares at (1,1), (1,2), (1,3), (2,1), (2,2), (2,3), (3,1), (3,2), (3,3).
- Grid 4:** Black squares at (1,1), (1,2), (1,3), (2,1), (2,2), (2,3), (3,1), (3,2), (3,3).
- Grid 5:** Black squares at (1,1), (1,2), (1,3), (2,1), (2,2), (2,3), (3,1), (3,2), (3,3).

Figure 1 shows two 3x3 dot patterns. Pattern (a) has dots at positions (1,1), (1,2), (2,1), (2,2), (3,1), and (3,2). Pattern (b) has dots at positions (1,1), (1,2), (1,3), (2,1), (2,2), (2,3), (3,1), and (3,2). The dots are represented by small black circles.



At the end of the last answer choice, there is a Nemeth Code terminator.



This symbol tells us that we are almost finished with our adventure today. Sometimes this symbol comes at the end of a document, just like it is this time. This symbol can also be used in other places within a document to tell us that we are finishing the math section and are moving to literary material.

Since we have completed our final descent and arrived at the airport, let's taxi to the gate with a follow-up activity.

Follow-up activity: We are going to play a new game called Connect Four. We will need Connect Four game cards, the problem set with subtraction and addition problems to 10 in braille, and markers. Small stickers or pieces of Wikki Stix® can be used for markers.

Note: *The problem set and game cards are included in separate documents. You will need 2 or more players for this game. If you use Wikki Stix® pieces, roll them into a ball with your hand so that they will stick to the paper more easily. Another option is using pushpins on a cork board or magnets on a cookie sheet.*

The first player to get 4 markers in a row wins the game! Each time you find a missing number in an equation, you will earn the right to place a marker on the number somewhere on the Connect Four game board. Once you have 4 markers horizontally in a row, vertically in a column, or going diagonally, call out Connect Four.

Let's get started by using your hands to explore the Connect Four game card. You will find the title centered on the first line. Afterwards there will be 6 rows with six numbers on each row. We will play until a winner calls out "Connect Four".

Next take turns reading an equation on the problem set. Then figure out the missing number in the equation. Then find the missing number on the Connect Four game board and place a marker on top of it. There are more than 1 of each number on the game board, so you get to decide where to place your sticker or Wikki Stix® each time. Think about which one will help you get 4 markers in a row horizontally, vertically, or diagonally.

Note: *This activity can easily be completed with several students who read print or braille. If some of the players read print, add print to each of the flash cards and Connect Four cards.*