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Lesson 19: Substituting to Evaluate Addition and Subtraction Expressions

Student Outcomes

* Students develop expressions involving addition and subtraction from real-world problems.
* Students evaluate these expressions for given values.

Lesson Notes

In this lesson, students begin by filling in data tables to help them organize data and see patterns; then, they move to drawing their own tables. Encourage students to label the columns completely.

Classwork

Fluency Exercise (5 minutes): Subtraction of Decimals

*Sprint*: Refer to the Sprints and Sprint Delivery Script sections in the Module Overview for directions on how to administer a Sprint.

Opening Exercise (3 minutes)

Opening Exercise

My older sister is exactly two years older than I am. Sharing a birthday is both fun and annoying. Every year on our birthday we have a party, which is fun, but she always brags that she is two years older than I am, which is annoying. Shown below is a table of our ages, starting when I was born:

*Scaffolding:*

Some students will benefit from having blank tables prepared ahead of time.

|  |  |
| --- | --- |
| My Age (in years) | My Sister’s Age (in years) |
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Make sure students understand the context of the story problem. It should be clear that the day I was born was my sister’s second birthday. My first birthday was her third birthday; my second birthday was her fourth birthday; etc.

**Discussion (5 minutes)**

* Today in class we will use data tables. They help us organize data and see patterns. We can use variables to make generalizations about the patterns we see.
  1. Looking at the table, what patterns do you see? Tell a partner.

My sister’s age is always two years more than my age.

* 1. On the day I turned years old, how old was my sister?

years old

* 1. How do you know?

Since my sister’s age is always two years more than my age, we just add to my age. .

* 1. On the day I turned years old, how old was my sister?

years old

* 1. How do you know?

Since my sister’s age is always two years more than my age, we just add to my age. .

* 1. Do we need to extend the table to calculate these answers?

No; the pattern is to add to your age to calculate your sister’s age.

Example 1 (5 minutes)

*Scaffolding:*

A number line in the classroom can provide an additional reference for students. A cardboard sheet with two windows cut to reveal and works with Examples 1 and 2.

**Example 1**

|  |  |
| --- | --- |
| My Age (in years) | My Sister’s Age (in years) |
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* 1. What if you don’t know how old I am? Let’s use a variable for my age. Let my age in years. Can you develop an expression to describe how old my sister is?

Your sister is years old.

MP.6

* 1. Please add that to the last row of the table.
* My age is years. My sister is years old. So, no matter what my age is (or was), my sister’s age in years will always be two years greater than mine.

Example 2 (5 minutes)

Example 2

|  |  |
| --- | --- |
| My Age (in years) | My Sister’s Age (in years) |
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* 1. How old was I when my sister was years old?

years old

* 1. How old was I when my sister was years old?

years old

* 1. How do you know?

My age is always years less than my sister’s age.

* 1. Look at the table in Example 2. If you know my sister’s age, can you determine my age?

We can subtract two from your sister’s age, and that will equal your age.

* 1. If we use the variable for my sister’s age in years, what expression would describe my age in years?
  2. Fill in the last row of the table with the expressions.

My age is years. My sister is years old.

* 1. With a partner, calculate how old I was when my sister was , , and years old.

You were ,, and years old, respectively.

Exercises (15 minutes)

Exercises

1. Noah and Carter are collecting box tops for their school. They each bring in box top per day starting on the first day of school. However, Carter had a head start because his aunt sent him box tops before school began. Noah’s grandma saved box tops, and Noah added those on his first day.
   1. Fill in the missing values that indicate the total number of box tops each boy brought to school.

|  |  |  |
| --- | --- | --- |
| School Day | Number of Box Tops Noah Has | Number of Box Tops Carter Has |
|  |  |  |
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* 1. If we let be the number of days since the new school year began, on day of school, how many box tops will Noah have brought to school?

box tops

* 1. On day of school, how many box tops will Carter have brought to school?

box tops

* 1. On day of school, how many box tops will Noah have brought to school?

box tops

* 1. On day of school, how many box tops will Carter have brought to school?

box tops

1. Each week the Primary School recycles pounds of paper. The Intermediate School also recycles the same amount but had another pounds left over from summer school. The Intermediate School custodian added this extra pounds to the first recycle week.
   1. Number the weeks and record the amount of paper recycled by both schools.

|  |  |  |
| --- | --- | --- |
| Week | Total Amount of Paper Recycled by the Primary School This School Year in Pounds | Total Amount of Paper Recycled by the Intermediate School This School Year in Pounds |
|  |  |  |
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* 1. If this trend continues, what will be the total amount collected for each school on Week?

The Primary School will have collected pounds. The Intermediate School will have collected pounds.

1. Shelly and Kristen share a birthday, but Shelly is years older.
   1. Make a table showing their ages every year, beginning when Kristen was born.

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| --- | --- |
| Kristen’s Age (in years) | Shelly’s Age (in years) |
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* 1. If Kristen is years old, how old is Shelly?

If Kristen is years old, Shelly is years old.

* 1. If Kristen is years old, how old is Shelly?

If Kristen is years old, Shelly is years old.

* 1. If Shelly is years old, how old is Kristen?

If Shelly is years old, Kristen is years old.

Closing (2 minutes)

* Why were we able to write these expressions?
  + *There was a relationship between the two quantities that we could identify.*
* What is important to remember about labeling columns in a table?
  + *The label should be complete, with units, so the reader understands precisely what is meant.*
* How are addition and subtraction expressions related to one another?
  + *They are inverse operations. One undoes the other.*

Exit Ticket (5 minutes)

Name Date

Lesson 19: Substituting to Evaluate Addition and Subtraction Expressions

Exit Ticket

Jenna and Allie work together at a piano factory. They both were hired on January , but Jenna was hired in , and Allie was hired in .

* 1. Fill in the table below to summarize the two workers’ experience totals.

|  |  |  |
| --- | --- | --- |
| **Year** | **Allie’s Years of Experience** | **Jenna’s Years of Experience** |
| 2010 |  |  |
| 2011 |  |  |
| 2012 |  |  |
| 2013 |  |  |
| 2014 |  |  |

* 1. If both workers continue working at the piano factory, when Allie has years of experience on the job, how many years of experience will Jenna have on the job?
  2. If both workers continue working at the piano factory, when Allie has years of experience on the job, how many years of experience will Jenna have on the job?

Exit Ticket Sample Solutions

Jenna and Allie work together at a piano factory. They both were hired on January , but Jenna was hired in , and Allie was hired in .

* 1. Fill in the table below to summarize the two workers’ experience totals.

|  |  |  |
| --- | --- | --- |
| Year | Allie’s Years of Experience | Jenna’s Years of Experience |
| 2010 |  |  |
| 2011 |  |  |
| 2012 |  |  |
| 2013 |  |  |
| 2014 |  |  |

* 1. If both workers continue working at the piano factory, when Allie has years of experience on the job, how many years of experience will Jenna have on the job?

Jenna will have been on the job for years.

* 1. If both workers continue working at the piano factory, when Allie has years of experience on the job, how many years of experience will Jenna have on the job?

Jenna will have been on the job for years.

Problem Set Sample Solutions

1. Suellen and Tara are in sixth grade, and both take dance lessons at Twinkle Toes Dance Studio. This is Suellen’s first year, while this is Tara’s fifth year of dance lessons. Both girls plan to continue taking lessons throughout high school.
   1. Complete the table showing the number of years the girls will have danced at the studio.

|  |  |  |
| --- | --- | --- |
| Grade | Suellen’s Years of Experience Dancing | Tara’s Years of Experience Dancing |
| Sixth |  |  |
| Seventh |  |  |
| Eighth |  |  |
| Ninth |  |  |
| Tenth |  |  |
| Eleventh |  |  |
| Twelfth |  |  |

* 1. If Suellen has been taking dance lessons for years, how many years has Tara been taking lessons?

Tara has been taking dance lessons for years.

1. Daejoy and Damian collect fossils. Before they went on a fossil-hunting trip, Daejoy had fossils in her collection, and Damian had fossils in his collection. On a -day fossil hunting trip, they each collected new fossils each day.
   1. Make a table showing how many fossils each person had in their collection at the end of each day.

|  |  |  |
| --- | --- | --- |
| Day | Number of Fossils in Daejoy’s Collection | Number of Fossils in Damian’s Collection |
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* 1. If this pattern of fossil-finding continues, how many fossils does Damian have when Daejoy has fossils?

When Daejoy has fossils, Damian has fossils.

* 1. If this pattern of fossil-finding continues, how many fossils does Damian have when Daejoy has fossils?

When Daejoy has fossils, Damian has fossils.

1. A train consists of three types of cars: box cars, an engine, and a caboose. The relationship between the types of cars is demonstrated in the table below.

|  |  |
| --- | --- |
| Number of Box Cars | Number of Cars in the Train |
|  |  |
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* 1. Tom wrote an expression for the relationship depicted in the table as. Theresa wrote an expression for the same relationship as. Is it possible to have two different expressions to represent one relationship? Explain.

Both expressions can represent the same relationship, depending on the point of view. The expression   
represents the number of box cars plus an engine and a caboose. The expression represents the whole car length of the train, less the engine and caboose.

* 1. What do you think the variable in each student’s expression represents? How would you define them?

The variable would represent the total cars in the train. The variable would represent the number of box cars.

1. David was when Marieka was born. Complete the table.

|  |  |
| --- | --- |
| Marieka’s Age in Years | David’s Age in Years |
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1. Caitlin and Michael are playing a card game. In the first round, Caitlin scored points, and Michael scored points. In each of the next few rounds, they each scored points. Their score sheet is below.

|  |  |
| --- | --- |
| Caitlin’s points | Michael’s points |
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|  |  |
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* 1. If this trend continues, how many points will Michael have when Caitlin has points?

Michael will have points.

* 1. If this trend continues, how many points will Michael have when Caitlin has points?

Michael will have points.

* 1. If this trend continues, how many points will Caitlin have when Michael has points?

Caitlin will have points.

* 1. If this trend continues, how many points will Caitlin have when Michael has points?

Caitlin will have points.

1. The high school marching band has drummers this year. The band director insists that there are to be more trumpet players than drummers at all times.
   1. How many trumpet players are in the marching band this year?

. There are trumpet players this year.

* 1. Write an expression that describes the relationship of the number of trumpet players () and the number of drummers ().

or

* 1. If there are only trumpet players interested in joining the marching band next year, how many drummers will the band director want in the band?

The band director will want drummers.

Subtraction of Decimals–Round 1

Number Correct: \_\_\_\_\_\_

**Directions:**  Subtract the decimals to determine the difference.

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Subtraction of Decimals–Round 1 [KEY]

**Directions:** Subtract the decimals to determine the difference.

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Subtraction of Decimals–Round 2

Number Correct: \_\_\_\_\_\_

Improvement: \_\_\_\_\_\_

**Directions:** Subtract the decimals to determine the difference.

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Subtraction of Decimals–Round 2 [KEY]

**Directions:**  Subtract the decimals to determine the difference.

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