Lesson 19: Substituting to Evaluate Addition and Subtraction Expressions

Classwork

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:

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| --- | --- |
| **My Age (in years)** | **My Sister’s Age (in years)** |
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* 1. Looking at the table, what patterns do you see? Tell a partner.
  2. On the day I turned years old, how old was my sister?
  3. How do you know?
  4. On the day I turned years old, how old was my sister?
  5. How do you know?
  6. Do we need to extend the table to calculate these answers?

Example 1

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| **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?
  2. Please add that to the last row of the table.

**Example 2**

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| **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?
  2. How old was I when my sister was years old?
  3. How do you know?
  4. Look at the table in Example 2. If you know my sister’s age, can you determine my age?
  5. If we use the variable for my sister’s age in years, what expression would describe my age in years?
  6. Fill in the last row of the table with the expressions.
  7. With a partner, calculate how old I was when my sister was ,,and years old.

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.

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| **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?
  2. On day of school, how many box tops will Carter have brought to school?
  3. On day of school, how many box tops will Noah have brought to school?
  4. On day of school, how many box tops will Carter have brought to school?

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.

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| **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?

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

Problem Set

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.

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| **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?

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.

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

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

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

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| **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.

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| **Caitlin’s points** | **Michael’s points** |
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* 1. If this trend continues, how many points will Michael have when Caitlin has points?
  2. If this trend continues, how many points will Michael have when Caitlin has points?
  3. If this trend continues, how many points will Caitlin have when Michael has points?
  4. If this trend continues, how many points will Caitlin have when Michael has 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?
   2. Write an expression that describes the relationship of the number of trumpet players () and the number of drummers ().
   3. 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?