

Name _____

Date _____

Substituting to Evaluate Addition and Subtraction Expressions

Jenna and Allie work together at a piano factory. They both were hired on January 3, but Jenna was hired in 2005, and Allie was hired in 2009.

- a. 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		

- b. If both workers continue working at the piano factory, when Allie has A years of experience on the job, how many years of experience will Jenna have on the job?
- c. If both workers continue working at the piano factory, when Allie has 20 years of experience on the job, how many years of experience will Jenna have on the job?

- 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.

- 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		

- If Suellen has been taking dance lessons for Y years, how many years has Tara been taking lessons?

- Daejoy and Damian collect fossils. Before they went on a fossil-hunting trip, Daejoy had 25 fossils in her collection, and Damian had 16 fossils in his collection. On a 10-day fossil hunting trip, they each collected 2 new fossils each day.

- Make a table showing how many fossils each person had in their collection at the end of each day.

- If this pattern of fossil finding continues, how many fossils does Damian have when Daejoy has F fossils?
- If this pattern of fossil finding continues, how many fossils does Damian have when Daejoy has 55 fossils?

3. 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
0	2
1	3
2	4
10	12
100	102

- a. Tom wrote an expression for the relationship depicted in the table as $B + 2$. Theresa wrote an expression for the same relationship as $C - 2$. Is it possible to have two different expressions to represent one relationship? Explain.
- b. What do you think the variable in each student's expression represents? How would you define them?
4. David was 3 when Marieka was born. Complete the table.

Marieka's Age in Years	David's Age in Years
5	8
6	9
7	10
8	11
10	
	20
32	
M	
	D

5. Caitlin and Michael are playing a card game. In the first round, Caitlin scored 200 points and Michael scored 175 points. In each of the next few rounds, they each scored 50 points. Their score sheet is below.

Caitlin's points	Michael's points
200	175
250	225
300	275
350	325

- a. If this trend continues, how many points will Michael have when Caitlin has 600 points?
- b. If this trend continues, how many points will Michael have when Caitlin has C points?
- c. If this trend continues, how many points will Caitlin have when Michael has 975 points?
- d. If this trend continues, how many points will Caitlin have when Michael has M points?

6. The high school marching band has 15 drummers this year. The band director insists that there are to be 5 more trumpet players than drummers at all times.
- How many trumpet players are in the marching band this year?
 - Write an expression that describes the relationship of the number of trumpet players (T) and the number of drummers (D).
 - If there are only 14 trumpet players interested in joining the marching band next year, how many drummers will the band director want in the band?

Jenna and Allie work together at a piano factory. They both were hired on January 3, but Jenna was hired in 2005, and Allie was hired in 2009.

- a. Fill in the table below to summarize the two workers' experience totals.

Year	Allie's Years of Experience	Jenna's Years of Experience
2010	1	5
2011	2	6
2012	3	7
2013	4	8
2014	5	9

- b. If both workers continue working at the piano factory, when Allie has A 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 $A + 4$ years.

- c. If both workers continue working at the piano factory, when Allie has 20 years of experience on the job, how many years of experience will Jenna have on the job?

$$20 + 4 = 24$$

Jenna will have been on the job for 24 years.

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.

- a. 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	1	5
Seventh	2	6
Eighth	3	7
Ninth	4	8
Tenth	5	9
Eleventh	6	10
Twelfth	7	11

- b. If Suellen has been taking dance lessons for Y years, how many years has Tara been taking lessons?

Tara has been taking dance lessons for $Y + 4$ years.

2. Daejoy and Damian collect fossils. Before they went on a fossil-hunting trip, Daejoy had 25 fossils in her collection, and Damian had 16 fossils in his collection. On a 10-day fossil hunting trip, they each collected 2 new fossils each day.

- a. 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
1	27	18
2	29	20
3	31	22
4	33	24
5	35	26
6	37	28
7	39	30
8	41	32
9	43	34
10	45	36

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

When Daejoy has F fossils, Damian has $F - 9$ fossils.

- c. If this pattern of fossil-finding continues, how many fossils does Damian have when Daejoy has 55 fossils?

$$55 - 9 = 46$$

When Daejoy has 55 fossils, Damian has 46 fossils.

3. 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
0	2
1	3
2	4
10	12
100	102

- a. Tom wrote an expression for the relationship depicted in the table as $B + 2$. Theresa wrote an expression for the same relationship as $C - 2$. 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 $B + 2$ represents the number of box cars plus an engine and a caboose. The expression $C - 2$ represents the whole car length of the train, less the engine and caboose.

- b. What do you think the variable in each student's expression represents? How would you define them?

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

4. David was 3 when Marieka was born. Complete the table.

Marieka's Age in Years	David's Age in Years
5	8
6	9
7	10
8	11
10	13
17	20
32	35
M	$M + 3$
$D - 3$	D

5. Caitlin and Michael are playing a card game. In the first round, Caitlin scored 200 points, and Michael scored 175 points. In each of the next few rounds, they each scored 50 points. Their score sheet is below.

Caitlin's points	Michael's points
200	175
250	225
300	275
350	325

- a. If this trend continues, how many points will Michael have when Caitlin has 600 points?
 $600 - 25 = 575$
Michael will have 575 points.
- b. If this trend continues, how many points will Michael have when Caitlin has C points?
Michael will have $C - 25$ points.
- c. If this trend continues, how many points will Caitlin have when Michael has 975 points?
 $975 + 25 = 1,000$
Caitlin will have 1,000 points.
- d. If this trend continues, how many points will Caitlin have when Michael has M points?
Caitlin will have $M + 25$ points.
6. The high school marching band has 15 drummers this year. The band director insists that there are to be 5 more trumpet players than drummers at all times.
- a. How many trumpet players are in the marching band this year?
 $15 + 5 = 20$. *There are 20 trumpet players this year.*
- b. Write an expression that describes the relationship of the number of trumpet players (T) and the number of drummers (D).
 $T = D + 5$ or $D = T - 5$

- c. If there are only 14 trumpet players interested in joining the marching band next year, how many drummers will the band director want in the band?

$$14 - 5 = 9$$

The band director will want 9 drummers.