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Saskatchewan Math Curriculum Patterns & Relations – Grade 7

3-Part Lesson Format

Part 1 – Minds On!

- Learning Goals
- Discussion Questions
- Quotes
- And More!

LEARNING GOAL

We are learning to analyze and interpret input-output tables using the four operations (+, -, ×, ÷) to explain how numbers change and to identify and represent the pattern rule that connects them.

Identifying Independent and Dependent Variables

Identify the independent and dependent variables in the situations below.

1) Priya earns \$80 for each day she babysits.	Independent		Dependent	
	Days	Earnings	Days	Earnings
2) Tavish cycles 12 km every hour.	Independent		Dependent	
	Hours	Distance	Hours	Distance
3) The temperature rises 2°C every hour after 9:00 a.m.	Independent		Dependent	
	Temperature	Time	Temperature	Time
4) Desmond reads 8 pages every 10 minutes.	Independent		Dependent	
	Time	Pages Read	Time	Pages Read
5) Nia's savings increase by \$15 every week.	Independent		Dependent	
	Savings	Weeks	Savings	Weeks

Part 2 – Action!

- Writing
- Matching
- Drag and Drop
- Drawing
- And More!

Part 3 – Consolidation!

- Exit Cards
- Quizzes
- Reflection
- And More!

Pattern Rule – Input/Output Tables

Fill in the input/output tables below by using the expression provided.

In a	Out $4a + 6$	In b	Out $6b \div 2$	In c	Out $10c - 7$	In d	Out $9 + 2d$
1		2		1		1	
2		4		2		2	
3		6		3		3	
4		8		4		4	
5		10		5		5	



Saskatchewan Math Curriculum

Patterns & Relations – Grade 7

Increasing Patterns

How many blocks are in each term? Sketch the next 3 terms.

--	--	--	--	--	--

1) Describe the pattern rule in your own words.

2) Represent the pattern using an algebraic expression:

Graphing Increasing Patterns

Translate the increasing patterns into a table of values and a line graph.

A classroom collects charity coins. On Day 1, there are 10 coins in the jar. Each day after that, 4 more coins are added.

Term Number (Day)	1	2	3	4	5	10	15
Term Value (Coins)							

Coins

Day

Circle if the pattern displayed on the graph is linear.

1) ☐ Linear ☐ Non-Linear

2) ☐ Linear ☐ Non-Linear



Saskatchewan Math Curriculum Patterns & Relations – Grade 7

Writing Algebraic Expressions – Increasing Pattern

Draw the 4th and 5th term, then answer the questions.

Term 1	Term 2	Term 3	Term 4	Term 5

Questions

Questions	Expression
a) Write an expression that represents how many shapes are in the pattern.	
b) How many shapes will be in the 15 th term?	
c) How many shapes will be in the 30 th term?	
d) How many rectangles will be in the 50 th term?	
e) How many smiley faces will be in the 500 th term?	

Pattern Rule – Input/Output Tables – Integers

Fill in the input/output tables below.

In	Out
n	$n + (-5)$
1	
2	
3	
4	
5	

In	Out
n	$3n + (-2)$
1	
2	
3	
4	
5	

In	Out
n	$n + 8$
-1	
-2	
-3	
-4	
-5	

In	Out
x	$2x + (-9)$
2	
4	
6	
8	
10	

In	Out
p	$p + (-14)$
-3	
-6	
-9	
-12	
-15	

Supply Shop

Use the expressions to quickly calculate the total for students buying gear for their classes. Use the price list below to help Leo find the totals.

Item	Variable	Price
Pen	(p)	\$1.25
Notebook	(n)	\$3.50
Eraser	(e)	\$0.75
Folder	(f)	\$1.50

Order	Expression & Substitution	Answer
1) 4 pens, 2 notebooks	$4 \times p + 2 \times n$	
2) 3 erasers, 5 folders	$4 \times 1.25 + 2 \times 3.50$	\$12.00
3) 2 notebooks, 1 pen, 3 folders		
4) 10 pens, 2 erasers		
5) 6 folders, 4 notebooks		
6) 2 of every item		
7) 5 pens, 5 erasers, 5 folders		
8) 2 notebooks, 10 erasers		

Grade 7

Patterns and Relationships



	Curriculum Expectations	Pages
P7.1	Demonstrate an understanding of the relationships between oral and written patterns, graphs and linear relations.	5 – 25, 30 – 58
Preview of 125 pages from this product that contains 306 pages total.		
P7.3	Demonstrate an understanding of one and two-step linear equations of the form $ax + b = c$ (where a , b , c , and d are whole numbers, $c < d$ and $b \neq 0$) by modelling the solution of the equations concretely, pictorially, physically, and symbolically - and explaining the solution in terms of the preservation of equality	133 – 137
P7.4	Demonstrate an understanding of linear equations of the form $x + a = b$ (where a and b are integers) by modelling problems as a linear equation and solving the problems concretely, pictorially, and symbolically	138 – 150

Pattern Rule – Input/Output Tables

Instructions

Fill in the input/output tables below.

Rule: add 3	
In	Out
105	
113	
134	

Rule: add 6	
In	Out
215	
233	
268	
291	

Rule: add 5	
In	Out
295	
303	
321	
347	

Rule: subtract 7	
In	Out
308	
335	
367	
402	

Rule: subtract 10	
In	Out
508	
529	
543	
588	

Rule: Subtract 8	
In	Out
605	
617	
632	
648	

Rule: multiply by 2	
In	Out
5	
10	
20	
50	

Rule: multiply by 12	
In	Out
6	
8	
10	
12	

Rule: multiply by 7	
In	Out
8	
12	
20	

Rule: divide by 3	
In	Out
12	
24	
39	
45	

Rule: divide by 4	
In	Out
16	
36	
48	
64	

Rule: divide by 6	
In	Out
18	
30	
54	
78	

Exit Cards

Cut Out

Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Fill in the input/output tables below:

Rule: multiply by 2	
In	Out
287	

Rule: divide by 10	
In	Out
70	
150	

Rule: subtract 5	
In	Out
217	
	356

Name: _____

Fill in the input/output tables below:

Rule: add 7	
In	Out
287	
	309

Rule: multiply by 2	
In	Out
12	
	36

Rule: divide by 10	
In	Out
217	
	356

Rule: subtract 5	
In	Out
217	
	356

Name: _____

Fill in the input/output tables below:

Rule: add 7	
In	Out
287	
	309

Rule: multiply by 2	
In	Out
12	
	36

Rule: divide by 10	
In	Out
70	
150	

Rule: subtract 5	
In	Out
217	
	356

Name: _____

Fill in the input/output tables below:

Rule: add 7	
In	Out
287	
	309

Rule: multiply by 2	
In	Out
12	
	36

Rule: divide by 10	
In	Out
70	
150	

Rule: subtract 5	
In	Out
217	
	356

Recursive vs. Functional Relationships

A **recursive relationship** describes the pattern between successive numbers in one of the rows/columns of a table of values. A **functional relationship** is a general rule to describe the relationship between two columns/rows of numbers in a table of values. We look across the table, instead of beside it. If there is a functional relationship, then we have a **linear pattern**, which we will learn more about later.

Part 1 Is Jeffrey describing the recursive or functional relationship?

	Pattern					Jeffrey's Description	Recursive or Functional
1)	x	1	4			The pattern goes up by 3 each time.	
	y	5	8	11			
2)	x	10	20	30		Each term number is multiplied by 10.	
	y	100	200	300			
3)	x	1	2	3	4	Each term number is multiplied by 4 and then 1 is added.	
	y	5	9	13	17		
4)	x	1	2	3	4	The pattern goes up by 4 each time.	
	y	8	12	16	20		
5)	x	1	2	3	4	$7x + 11 = y$	
	y	18	25	32	39		

Part 2 Provide a recursive and functional description of the patterns.

	Pattern					Recursive	
1)	x	1	2	3	4	Functional	
	y	3	9	15	21		
	Pattern					Recursive	
2)	x	1	2	3	4	Functional	
	y	12	20	28	36		

Table of Values – Finding Term N

When finding a random term in a pattern, we can use a variable. Often n is used to take the place of the term number. When we use n , we can change the value to find the term value for any term number.

We can find the value for n by looking at the pattern between the term number and term value (functional relationship). To do this, we look across the table from the term number to the term value.

Practice: Find the pattern rule when you look across the table of values

Term Number	Term Value
1	5
2	10
3	15
4	20
5	25
8	

$5n$

Term Number	Term Value
1	1
2	5
3	7
4	9
5	11
9	

$3n - 2$

Term Number	Term Value
1	6
2	12
3	18
4	24
5	30
10	

Term Number	Term Value
1	4
2	6
3	8
4	10
5	12
9	

Term Number	Term Value
1	5
2	15
3	25
4	35
5	45
10	

Term Number	Term Value
1	6
2	9
3	12
4	15
5	18
11	

Using Algebraic Expressions

In the expression $6y + 5$, the 6 is the **numerical coefficient** of the variable and the 5 is the **constant term**. The **variable** is the y , which can represent any number.

Part 1

Use the algebraic expression to fill in the tables.

Term Number	Term Value
1	5
2	9
3	
4	
5	
8	

$$4x + 1$$

Term Number	Term Value
1	
2	
3	
9	

Term Number	Term Value
1	
2	
3	
4	
5	
11	

$$t + 8$$

Term Number	Term Value
1	
2	
3	
4	
5	
11	

$$6n - 7$$

Term Number	Term Value
1	
2	
4	
5	
10	
20	

$$20 \div x + 5$$

Term Number	Term Value
1	
2	
4	
5	
11	

$$8x - 6$$

Part 2

Write 4 algebraic expressions using:

Variable = n Constant term = 6 Numerical coefficient = 3

1	
2	

3	
4	

Pattern Rule – Input/Output Tables

Instructions Fill in the input/output tables below by using the expression provided.

In n	Out $2n$
1	
2	
3	
4	
5	

In n	Out $2n + 3$
1	
2	
3	
4	
5	

In n	Out $5n - 5$
1	
2	
3	
4	
5	

In x	Out $3x - 3$
10	
20	
30	
40	
50	

In x	Out $2x + 1$
2	
4	
6	
8	
10	

In x	Out $20 + x$
1	
2	
3	
4	
5	

In p	Out $3p + 10$
20	
40	
60	
80	
100	

In p	Out $10p - 12$
3	
6	
9	
12	
15	

In p	Out $7p + 20$
5	
10	
15	
20	
25	

Activity Title: Algebraic Adventure Hunt

Objective

What are we learning about?

To help students understand and practice filling in input/output tables using given expressions involving all four operations through a fun and engaging treasure hunt.

Materials

What you will need for the activity.

- Stopwatch or timer (or use a smartphone)
- Index cards
- Markers
- Small prizes or rewards (optional)
- Tape



Instructions

How you will complete the activity.

- 1) Cut out the input/output tables provided. They will be the treasure hunt challenge questions.
- 2) Hide these cards around the classroom or in a designated area of the school. You are taping them under chairs, desks, or tucked into non-obvious spots.
- 3) Divide the class into small teams and give each team a stopwatch or timer.
- 4) Explain the game: each team will hunt for a card, solve the problem on it as quickly as they can, and return to you for verification.
- 5) Start the timer when you say "Go!" Each team rushes to find their first card.
- 6) When a team thinks they have the correct answer, they come back to you for verification. If they get it right, the teacher keeps the card. If the answer is wrong, they can try again or hide the card back in its original spot and find a new card.
- 7) The game continues until all cards are found or you call time. The team with the most correct answers wins.
- 8) Discuss the game, focusing on the concepts taught on the cards.

Name: _____

14

Instructions

Cut out the cards below.

In	Out	In	Out	In	Out	In	Out	In	Out
j	$34j \div 2$	f	$f \div 2 + 17$	c	$14c \div 2$	p	$10p - 12$		
3		12		3					
	102		29				8		
9		36		7		3			
12			41			4			
15		60					38		
In	Out	In	Out	In	Out	In	Out		
k	$k + 20$	i	$22i$		$52e - 3$	x	$12x$		
100		1		10		2			
150		2			777		48		
200		3		20		6			
250		4		25			96		
300		5			1557	10			

Instructions

Cut out the cards below.

In	Out	In	Out	In	Out	In	Out	In	Out
x	$r \div 5$	p	$p \div 3 + 30$	n	$9n - 7$	l	$l \div 5 + 2$		
25		9		9		105			
50		18		18		115			
75		27		27		125			
100		36				135			
125		45				145			
In	Out	In	Out	In	Out	In	Out	In	Out
x	$4s \div 2 + 1$	x	$2q$	m	$5o + 10$	m	$13m + 4$		
10		2		8					
20		4		10			212		
30		6		15		24			
40		8		20		32			
50		10		25		40			

Instructions

Cut out the cards below.

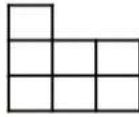
In	Out	In	Out	In	Out	In	Out	In	Out
h	$h \div 4 + 3$	f	$3f - 45$	e	$15e + 3$	b	$b \div 2 - 1$		
8		15		2		20			
16		20		4		30			
24		25		6		40			
32		30				50			
40		35							
In	Out	In	Out	In	Out	In	Out	In	Out
k	$k \div 5 - 3$	g	$2g + 1$	c	$d \div 3 - 2$	c	$4c + 25$		
	0	1		3		3			
20		2		6		5			
25		3		9		7			
30		4		12		9			
35		5				11			

Growing Patterns

Instructions

How many blocks are in each term? Sketch the next 3 terms.

A)

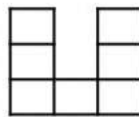
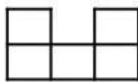
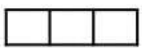


1) Describe the pattern rule in your own words.

2) Represent the pattern using an algebraic expression:

3) How many blocks will the 15th term have?4) How many blocks will the 30th term have?

B)



1) Describe the pattern rule in your own words.

2) Represent the pattern using an algebraic expression:

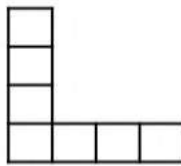
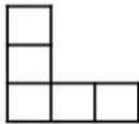
3) How many blocks will the 25th term have?4) How many blocks will the 50th term have?

Growing Patterns

Instructions

How many blocks are in each term? Sketch the next 3 terms.

A)



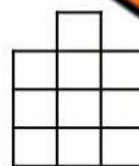
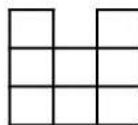
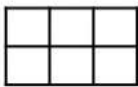
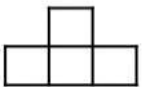
1) Describe the pattern rule in your own words.

2) Represent the pattern using an algebraic expression:

3) How many blocks will the 10th term have?

4) How many blocks will the 20th term have?

B)



1) Describe the pattern rule in your own words.

2) Represent the pattern using an algebraic expression:

3) How many blocks will the 12th term have?

4) How many blocks will the 50th term have?

Identifying Independent and Dependent Variables

A **variable** is a quantity that changes. In an expression or equation, we use a variable to represent changing quantities, like money made while working.

There are two types of variables – dependent and independent variables. **Dependent variables** have values that change due to other factors. These values are dependent on the other variable. An **independent variable** has a value that does not rely on anything else.

Example – Emma earns \$15 an hour. We can represent this situation using two variables: $e = 15h$. In this equation, earnings equals 15 multiplied by the number of hours she works. We have used 2 variables – e for earnings and h for hours worked. The dependent variable is earnings because it will change based on how many hours Emma works. The independent variable is hours because it is not affected by how much money she makes.

Identify the independent and dependent variables in the situations below.

1) Jeff earns \$1000 a month.	Independent		Dependent	
	Earnings	Month	Earnings	Month
2) Kim runs 10km every hour.	Independent		Dependent	
	Time	Distance	Distance	Hours
3) The plant grows 1cm a week.	Independent		Dependent	
	Weeks	Growth	Growth	Weeks
4) The temperature decreases 1 degree every hour after 3:00 pm.	Independent		Dependent	
	Time	Temperature	Temperature	Time
5) Stacey's hair grows 5mm every week.	Independent		Dependent	
	Growth	Weeks	Growth	Weeks
6) A baby gains 1 kg every month.	Independent		Dependent	
	Months	Weight	Months	Weight
7) Tony's test results improve by 1 mark for every hour he studies.	Independent		Dependent	
	Test Results	Hours	Test Results	Hours
8) Sam finishes 10 questions every hour.	Independent		Dependent	
	Hours	Questions	Hours	Questions

Identifying Independent and Dependent Variables

Identify

What is the independent and dependent variable?



Situation	Independent Variable	Dependent Variable
1) Carl earns \$15 an hour.	hours	earnings
2) Courtney drives 100 km per hour.		
3) Kerry eats 3 meals every meal		
4) Brianna blinks 15 times every minute		
5) Jane types 45 words per minute		
6) A child grows 1 cm a month		
7) The water level rises 2mm each year.		
8) A company earns \$10,000 a month.		
9) The temperature of a boiling pot rises 10 degrees every minute.		
10) Nick adds 2 kg to his bench press every workout.		

Write

Write your own situation with an independent and dependent variable

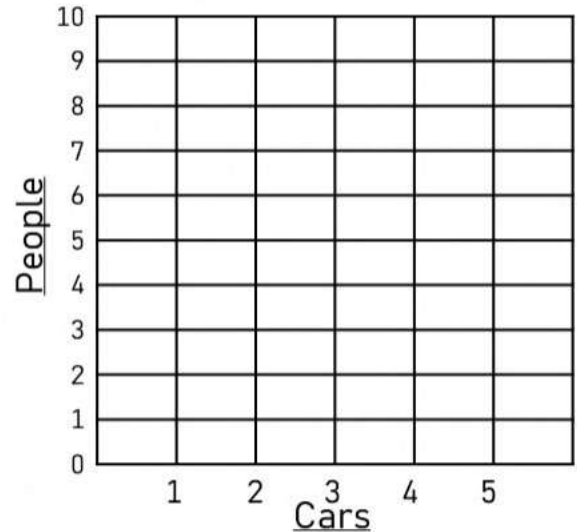
Situation	Independent Variable	Dependent Variable

Graphing Increasing Patterns

Instructions

Translate the increasing patterns into a table of values and a line graph.

1) A train has the following people in each train car.



Term Number (Cars)

3

4

5

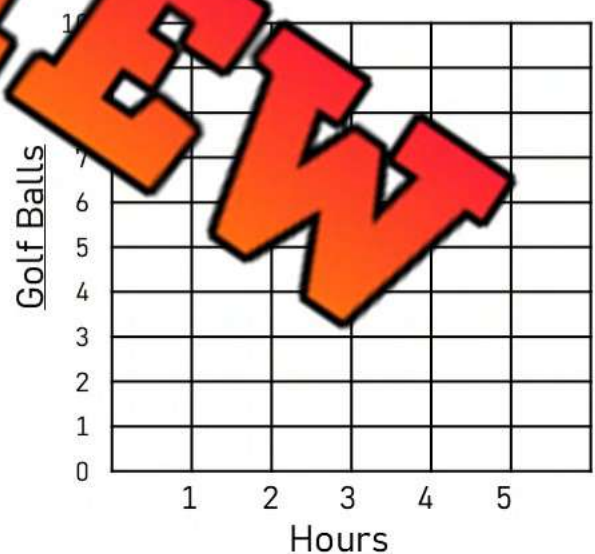
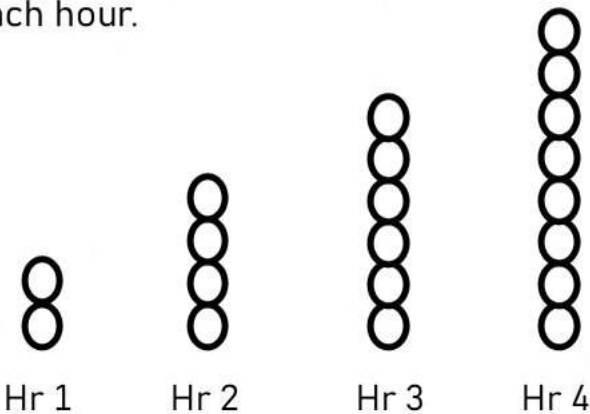
15

Term Value (People)

What is the dependent variable?

What is the independent variable?

2) Steven is looking for golf balls in the woods. He finds the following balls each hour.



Term Number (Hour)

1

2

3

4

5

20

Term Value (Golf Balls)

What is the dependent variable?

What is the independent variable?

Writing Algebraic Expressions



Practice

Answer the question below.

1)	Situation	Expression/Answer
a)	Blake sells lemonade at his stand. For every sale (s), he earns \$5. Write the expression.	
b)	Blake made 12 sales Monday. How much money did he make? Write the expression and the answer.	
c)	Blake sold 225 cups of lemonade this week, how much money did he make? Write the expression and the answer.	
d)	Blake earned \$60 yesterday selling lemonade. How many cups (c) did he sell?	

2)	Situation	Expression/Answer
a)	Sandy earns \$14 for every hour (h) she works. She has to spend \$2 each time she works to take the bus. Write the expression.	
b)	Sandy worked 8 hours yesterday. How much money did she take home? Write the expression and the answer.	
c)	Sandy worked 12 hours today. How much money did she take home? Write the expression and the answer.	

3)	Situation	Expression/Answer
a)	Jake is driving across Alberta to visit a friend. For every hour (h) he drives, he travels 110km. Write the expression.	
b)	Jake drove 8 hours today. How far did he go? Write the expression and the answer.	
c)	Jake needs to drive 1430km. How many hours he needs to drive?	

Constant Rate of Change

A **constant rate** is a rate of change that remains the same and does not go up or down. For example, when you are paid \$20 an hour, the rate of change is constant because for every hour you work, your pay goes up by the same amount - \$20.

Instructions

Fill in the tables below to show a constant rate of change.

- 1) Phil's earnings today has been represented in the table below



Hours Worked	1	2	3	4	5	6	7	8
Money Earned		42	63					

What is the rate of change? _____ Is the rate of change constant? Yes No

- 2) Laura sells cars. She earns commission when she sells a car. Her earnings for last week are represented in the table below. There were some days she did not earn commission.

Days Worked	1	2	4	6	7
Money Earned (\$)	105	210	315	420	1300

- a) Is the rate of change constant? Yes No
 b) What day do you think Laura sold the most cars? _____
 c) How much did she earn that day? _____
 d) How much do you think Laura made if she didn't sell a car? _____

- 3) Kim sells necklaces that she made. Her sales have been represented in the table.

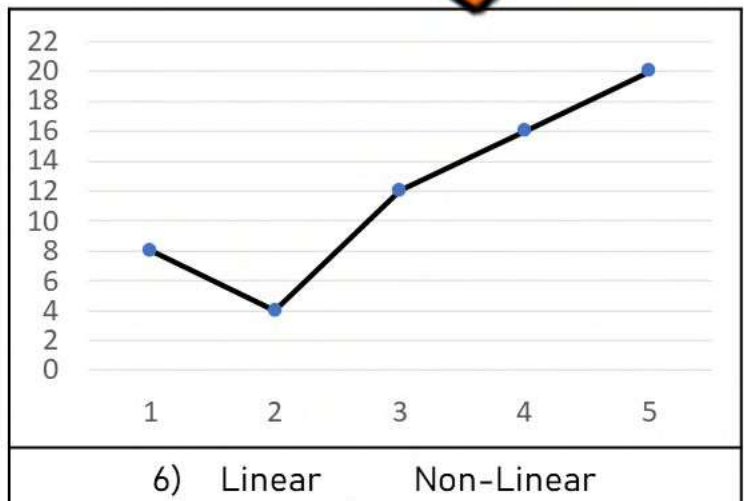
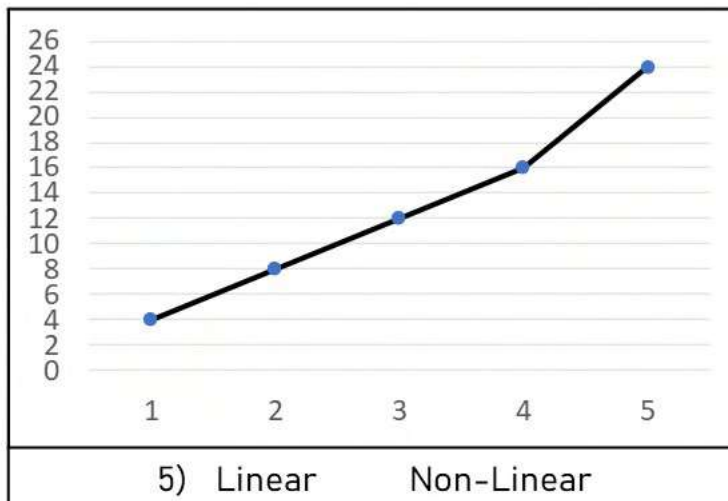
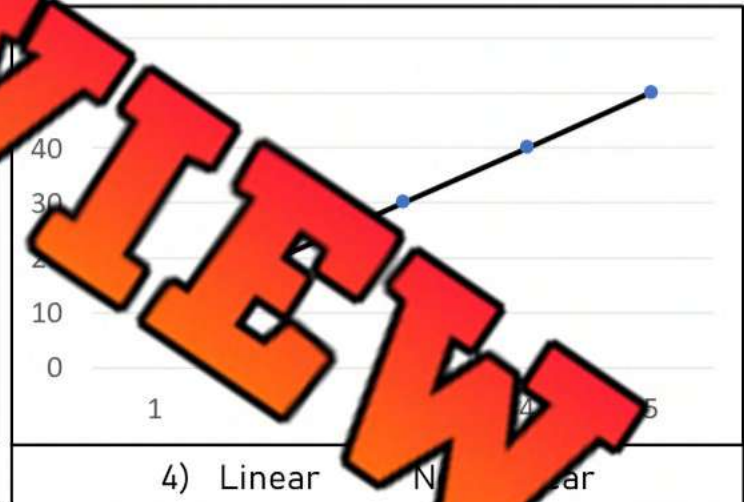
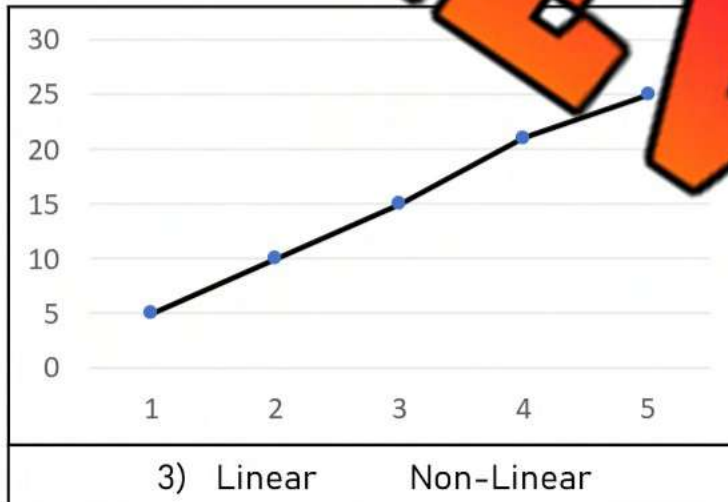
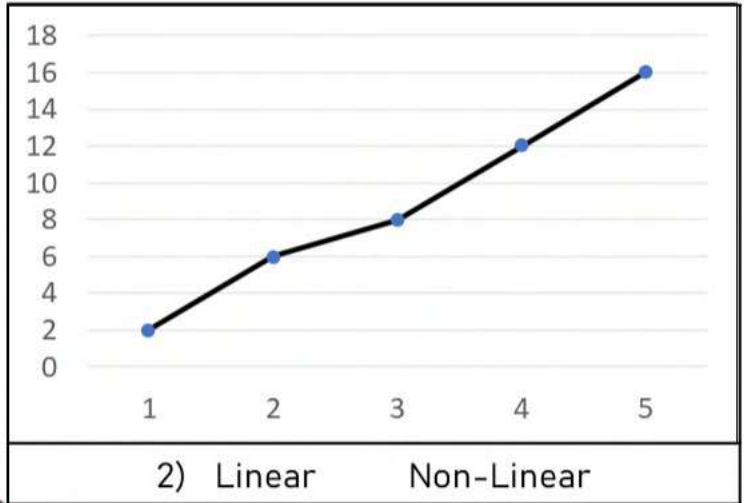
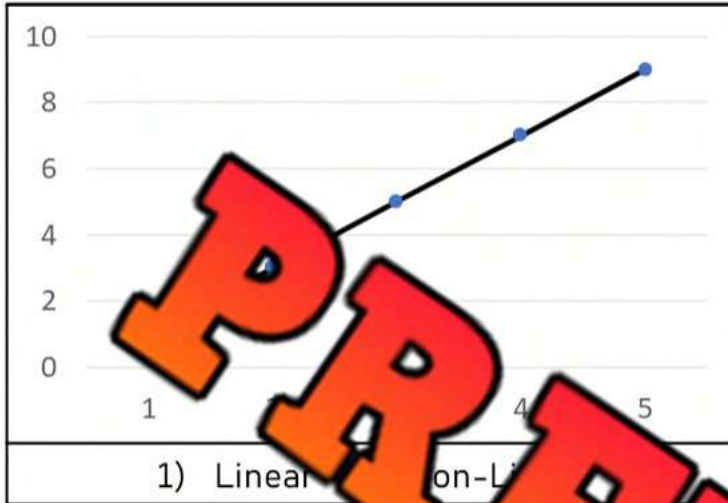
Necklaces Sold	10	20	30	40	50	60	70	80
Money Earned (\$)	30	60	90					

- a) What is the rate of change? _____ Is the rate of change constant? Yes No
 b) How much would Kim sell 1000 necklaces for? _____ 5000 necklaces: _____

Increasing Linear Patterns – Yes or No?

Instructions

Circle if the pattern displayed on the graph is linear.



Increasing Linear Patterns – Yes or No?

Instructions

Circle if the pattern is linear, based on the table of values.

Term Number	Term Value
1	2
2	6
3	10
4	14
5	18
Linear	Non-Linear

Term Number	Term Value
1	10
2	16
3	20
4	26
5	32
Linear	Non-Linear

Term Number	Term Value
1	15
2	18
3	21
4	25
5	28
Linear	Non-Linear

Term Number	Term Value
1	14
2	19
3	24
4	29
5	34
Linear	Non-Linear

Term Number	Term Value
1	2
2	5
3	8
4	60
5	74
Linear	Non-Linear

Term Number	Term Value
1	25
2	75
3	125
4	175
5	225
Linear	Non-Linear

Term Number	Term Value
1	112
2	126
3	138
4	152
5	166
Linear	Non-Linear

Term Number	Term Value
1	210
2	260
3	310
4	360
5	410
Linear	Non-Linear

Term Number	Term Value
1	500
2	650
3	700
4	850
5	1000
Linear	Non-Linear

Comparing Rates of Change

Questions

Circle which variable (x or y) increases at a greater rate of change?

1) Term Number	1	2	3	4	5
x	15	30	45	60	75
y	5	25	45	65	85
x or y					

2) Term Number	1	2	3	4	5
x	35	70	105	140	175
y	50	80	110	140	170
x or y					

3) Term Number	1	2	3	4	5
x	220	240	260	280	300
y	125	150	175	200	225
x or y					

4) Term Number	1	2	3	4	5
x	612	635	658	681	704
y	548	575	602	629	656
x or y					

5) Term Number	1	2	3	4	5
x	315	450	585	720	855
y	438	579	720	861	1002
x or y					

6) Term Number	1	2	3	4	5
x	530	715	900	1085	1270
y	655	829	1003	1177	1351
x or y					

Comparing Rates of Change - Employees

Jeffrey is the boss at his company. He determines how much to pay his employees. Sometimes, Jeffrey pays his employees a starting bonus, where they get a one-time payment for starting their job.



Questions

Who will get paid more money over time?

Weeks	0	1	2	3	4	5	6	7
Colton's Earnings (\$)	750	1000	1250	1500	1750			
Spencer's Earnings (\$)	0	400	800	1200	1600			

- a) Who will earn more after 7 weeks? _____
- b) How much is Colton's earnings per week? _____
- c) How much is Spencer's earnings per week? _____
- d) Whose earnings increase at a greater rate? _____



Weeks	0	1	2	3	4	5	6	7
Jacob's Earnings (\$)	1550	2000	2450	2900				
Jeremy's Earnings (\$)	0	650	1300	1950				

- a) Who will earn more after 7 weeks? _____
- b) How much is Jacob's earnings per week? _____
- c) How much is Jeremy's earnings per week? _____
- d) If we graphed both of their earnings, whose graph would be steeper? _____



Weeks	0	1	2	3	4	5	6	7
Amelia's Earnings (\$)	0	600	1200	1800	2400			
Raven's Earnings (\$)	250	825	1400	1975	2550			

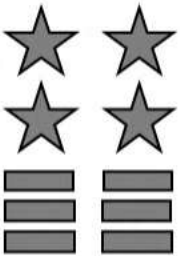
- a) Who earned a bonus to start their job? _____
- b) How much is Amelia's earnings per week? _____
- c) How much is Raven's earnings per week? _____



Writing Algebraic Expressions – Growing Pattern

Questions

Draw the 4th and 5th term, then answer the questions.

				
Term 1	Term 2	Term 3	Term 4	Term 5

1) Questions	Expression
a) Write an expression that represents how many shapes are in the pattern?	
b) How many shapes will be in the 10 th term?	
c) How many shapes will be in the 20 th term?	
d) How many rectangles will be in the 5 th term?	
e) How many stars will be in the 1000 th term?	

				
Term 1	Term 2	Term 3	Term 4	Term 5

2) Questions	Expression
a) Write an expression that represents how many shapes are in the pattern?	
b) How many shapes will be in the 10 th term?	
c) How many shapes will be in the 20 th term?	
d) How many rectangles will be in the 50 th term?	

Finding Term N – Word Problems

Word ProblemUse a table of values and find the n^{th} term.

- 1) Jared has been saving money since he was born. He is now 15. He started saving with \$45 when he was 1, \$95 when he was 2, \$145 when he was 3 and \$195 when he was 4.

i) How much did he have when he was 7?

ii) How much does he have now that he is 15?



- 2) Stephanie is ramping up her exercise each week. In week 1, she exercised 15 minutes. In week 2, she exercised 35 minutes. In week 3, she exercised 55 minutes. In week 4, she exercised 75 minutes.

If the pattern continues...

i) How much will she exercise in week 10?

ii) How much will she exercise in week 30?

iii) How much will she exercise during the last week of the year (week 52)?



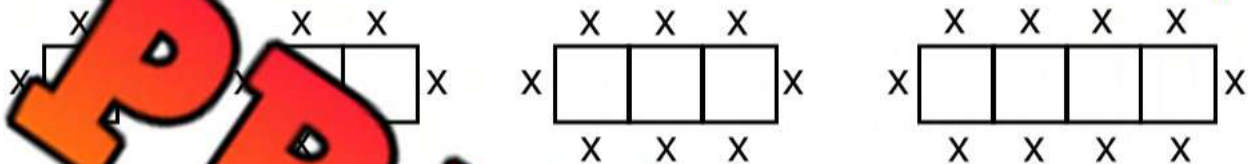
Picnic Word Problem – T-Tables

Challenge

Answer the word problem below. Use the T-Table to help.

You have been put in charge of organizing the end of the year banquet for your baseball team. You want to have as many seats as you can.

The diagram below shows how many people can sit at the tables.



a) Fill in the table below to learn more about the pattern of how many people can attend the banquet.

Tables	1	3	5	10	20	50
# of Seats						

b) Write the algebraic expression you used to find the number of seats.

c) What if you didn't put the tables together? Would 8 tables together have more or less than 8 tables apart? Draw a diagram to help and fill in the table below.

Tables	1	2	3	4	5	6	20	50
# of Seats	4							

d) Write the algebraic expression you could use to solve any number of tables.

Hockey Tickets – Challenge Problem

Challenge

Answer the word problem below.

Nathan is organizing a trip to see a hockey game with his friends. The cost for the bus rental is \$200. The cost per person is \$20.

a) Write an algebraic expression that represents the cost if p people go.

b) How much will the trip cost Nathan if 5 people go?

c) How much will the trip cost Nathan if 20 people go?

d) Nathan wants to offer food as well. Suppose the food costs \$10 per person. Write an algebraic expression that represents the cost of the bus, food, and ticket if p people go.

e) Suppose 20 people attend the hockey game and get food. How much will it cost Nathan?

f) How much will Nathan charge each person if 20 people go?



Ice Cream Sundae – Challenge Problem

Challenge

Answer the word problem below.

At Ivy's Ice Cream Shop, a plain ice cream sundae costs \$5.00. Each extra topping costs \$0.50.

- a) Write an algebraic expression that represents the cost of a sundae with e extra toppings.



- b) Al wants to buy a sundae with 5 toppings. How much will it cost?

- c) Warren ordered a sundae with 8 toppings. How much will it cost Warren?



- d) Warren paid with a \$20 bill. How much change will he receive?

- e) On Thursdays, sundaes are half price! Write an algebraic expression that represents the cost of a sundae with e extra toppings.

- f) Dan ordered a sundae on Thursday with 10 toppings. How much did it cost him?



Exit Cards

Cut Out

Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Answer the word problem below:

At Bella's Bookstore, a notebook costs \$3.00. Each additional sticker for the notebook costs \$0.25.

- 1) Write an algebraic expression that represents the cost of a notebook with s extra stickers.

- 2) Jamie wants to buy a notebook with 6 stickers. How much will it cost?

- 3) Jamie paid with a \$20 bill. How much will they receive as change?

Name: _____

Answer the word problem below:

At Bella's Bookstore, a notebook costs \$3.00. Each additional sticker for the notebook costs \$0.25.

- 1) Write an algebraic expression that represents the cost of a notebook with s extra stickers.

- 2) Jamie wants to buy a notebook with 6 stickers. How much will it cost?

- 3) Jamie paid with a \$20 bill. How much will they receive as change?

Name: _____

Answer the word problem below:

At Bella's Bookstore, a notebook costs \$3.00. Each additional sticker for the notebook costs \$0.25.

- 1) Write an algebraic expression that represents the cost of a notebook with s extra stickers.

- 2) Jamie wants to buy a notebook with 6 stickers. How much will it cost?

- 3) Jamie paid with a \$20 bill. How much will they receive as change?

Name: _____

Answer the word problem below:

At Bella's Bookstore, a notebook costs \$3.00. Each additional sticker for the notebook costs \$0.25.

- 1) Write an algebraic expression that represents the cost of a notebook with s extra stickers.

- 2) Jamie wants to buy a notebook with 6 stickers. How much will it cost?

- 3) Jamie paid with a \$20 bill. How much will they receive as change?

Name: _____

45

Curriculum Connection
P7.1

Integer Patterns - Adding

-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----	----	----	----	----	----

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----

Instructions

Fill in the blanks below using the pattern rule.

1) Start at _____, add 2 each time

--	--	--	--	--	--

2) Start at -10, add _____ each time

--	--	--	--	--	--

3) Start at -19, add 4 each time

--	--	--	--	--	--

4) Start at 18, add -5 each time

--	--	--	--	--	--

5) Start at 14, add -4 each time

--	--	--	--	--	--

6) Start at -1, add -2 each time

--	--	--	--	--	--

7) Start at 19, add -5 each time

--	--	--	--	--	--

8) Start at -20, add 3 each time

--	--	--	--	--	--

Name: _____

46

Curriculum Connection
P7.1

Integer Patterns - Adding

-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----	----	----	----	----	----

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----

Instructions

Write the pattern rule and complete the pattern.

1)

-5

3

7

2)

-19

-1

3)

8

5

2

4)

15

11

7

3

5)

-17

-12

-7

-2

6)

-20

-14

-8

-2

7)

17

12

7

2

8)

20

15

10

5

Pattern Rule – Input/Output Tables - Integers**Instructions**

Fill in the input/output tables below.

In n	Out $n + (-3)$
1	
2	
3	
4	
5	

In n	Out $2n + (-5)$
1	
2	
3	
4	
5	

In n	Out $n + 6$
-1	
-2	
-3	
-4	
-5	

In x	Out $x + (-2)$
-2	
-4	
-6	
-8	
-10	

In x	Out $x + 4$
2	
4	
6	
8	
10	

In x	Out $x + 11$
-1	
-3	
-5	
-7	
-9	

In p	Out $3p + (-10)$
20	
40	
60	
80	
100	

In p	Out $p + (-12)$
-3	
-6	
-9	
-12	
-15	

In p	Out $p + (-8)$
-3	
-1	
2	
4	
6	

Exit Cards

Cut Out

Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Fill in the input/output tables below:

In n	Out $(-5)n + 7$
-5	
-3	
-1	
1	
3	

Name: _____

Fill in the input/output tables below:

In n	Out $(-5)n + 7$
-5	
-3	
-1	
1	
3	

Name: _____

Fill in the input/output tables below:

In n	Out $(-5)n + 7$
-5	
-3	
-1	
1	
3	

Name: _____

Fill in the input/output tables below:

In n	Out $(-5)n + 7$
-5	
-3	
-1	
1	
3	

Integer Pattern – Adding Word Problem

-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----	----	----	----	----	----

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----

Instructions

Answer the word problem below.

Richard is playing football. He plays defense, so he is often running backwards. He decides to track his steps forwards and backwards. For every step forward, he adds 1. For every step backward, he adds -1.

- a) Each quarter, Richard takes 50 steps forwards, and -100 steps backwards. If every step forward is a positive step forward, how many steps did Richard take in the 4 quarters of the game?



- b) Fill in the table of values that records how many steps Richard takes in two games (8 quarters).

1	2	3	4	5	6	7	8

- c) Write an algebraic expression to help you solve how many steps Richard took in n number of quarters.



- d) In 5 games, does Richard take more steps forward or backward?
- e) How many steps does Richard take in 5 games?

Pattern Using Negative Integers – Olivia's Money

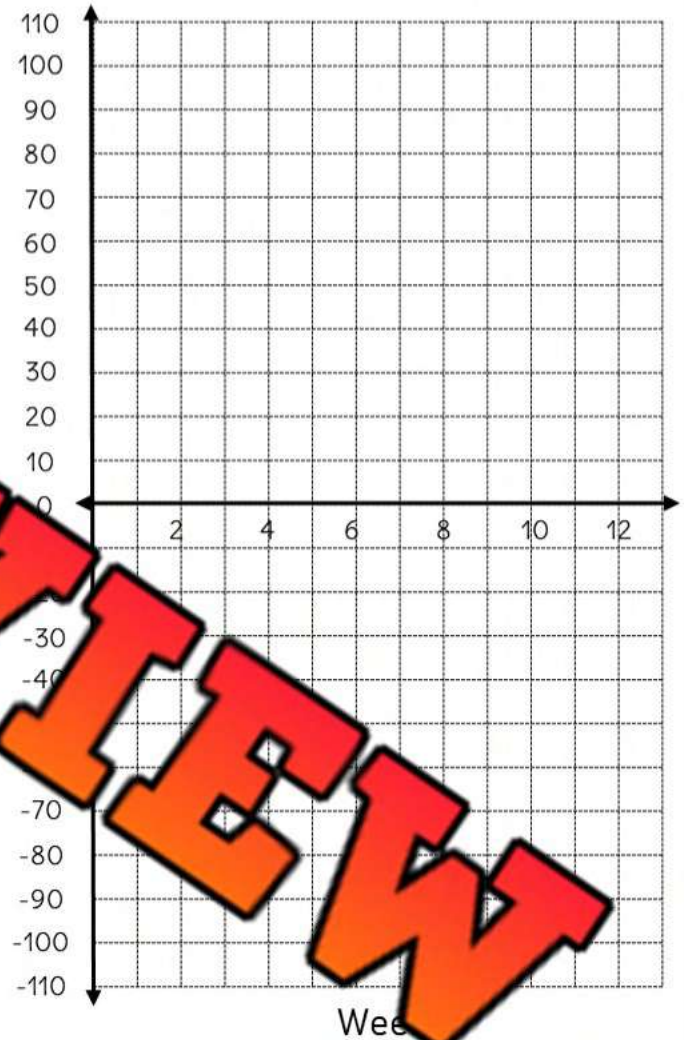
Instructions

Answer the problems below.

Olivia owes her sister \$100, and she has no other money. Therefore, she has $-\$100$. Luckily, she gets an allowance of \$15 a week.

Fill in the table of values below to learn more about how long it will take Olivia to pay back her sister.

Term Number	Term Value (Money)



- Graph the table of values.
- How many weeks will it take for Olivia to pay back her sister?
- Is this a linear pattern? Explain how you know.
- Use the graph to determine how much money Olivia will have in 12 weeks.
- Use an algebraic expression to determine how much money Olivia will have in 26 weeks.

Name: _____

51

Curriculum Connection
P7.1

Integer Patterns - Subtraction

-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----	----	----	----	----	----

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----

Instructions

Fill in the blanks below using the pattern rule.

1) Start at _____ subtract 2 each time

--	--	--	--	--	--

2) Start at 5, subtract _____ each time

--	--	--	--	--	--

3) Start at -3, subtract 4 _____ each time

--	--	--	--	--	--

4) Start at 2, subtract -2 each time

--	--	--	--	--	--

5) Start at -7, subtract -4 each time

--	--	--	--	--	--

6) Start at -16, subtract -3 each time

--	--	--	--	--	--

7) Start at -1 subtract 2 each time

--	--	--	--	--	--

8) Start at 2, subtract -3 each time

--	--	--	--	--	--

Pattern Rule – Input/Output Tables - Integers**Instructions**

Fill in the input/output tables below.

In n	Out $n - (-2)$
1	
2	
3	
4	
5	

In n	Out $3n - 5$
1	
2	
3	
4	

In n	Out $n - 4$
-1	
-2	
-3	
-4	
-5	

In x	Out $x - (-5)$
-2	
-4	
-6	
-8	
-10	

In x	Out $x - 1$
2	
4	
6	
8	
10	

In x	Out $x - 9$
-1	
-3	
-5	
-7	
-9	

In p	Out $3p - 10$
20	
40	
60	
80	
100	

In p	Out $p - (-15)$
-3	
-6	
-9	
-12	
-15	

In p	Out $p - (-12)$
-3	
-1	
2	
4	
6	

Integer Patterns – Average Temperatures

Instructions

Fill in the blanks below using the pattern rule.

In one of the coldest cities in Canada, the average temperature in January is -32°C . Every month after January until August, the temperature warms $+8^{\circ}\text{C}$. In September, the pattern reverses, with the temperature decreasing each month by -11°C . From December to January, the temperature drops -12°C .

Month	Temperature
January	-32
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	

a) Fill in the table to display the average temperatures each month.

b) What is the difference in temperatures between January and August?



c) What is the pattern rule from January to

d) What is the pattern rule from September to December?

e) What is the difference in temperatures between February and July?

f) Which month has the biggest change in temperature?

g) If you wanted to escape the coldest winter months, which months would you travel south for?



Task Cards: Patterning – All Operations

Objective

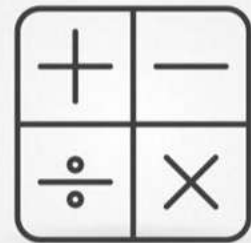
What are we learning about?

To recognize and create patterns using the four basic mathematical operations.

Materials

What you will need for the activity.

- 24 task cards
- Student answer sheets for answers
- Pencils



Instructions

What you will do for the activity

1. Introduce the concept of patterns in mathematics and their relevance to problem-solving in everyday life.
2. Organize the students into pairs and provide each pair with their sets of task cards.
3. Give each pair an answer recording sheet to record their answers.
4. Encourage teamwork by having students collaborate on finding solutions.
5. Allow students to select any task card to begin with, emphasizing that they can complete the cards in any order they prefer.
6. Instruct students to record the letter of their chosen answer (A, B, or C) on their answer sheet beside the task card's number.
7. Consider using a timer to create a dynamic challenge, adjusting the duration to fit the lesson's objectives and complexity.
8. After the activity, review the answers collectively, discussing any challenging patterns and strategies used to solve them.
9. Have students reflect on the activity, sharing the methods they applied and obstacles they overcame.

Task Cards

Cut out the task cards below.

Card 1:

Start with 60. Add 20 and then divide by 4 for the next number. What is the second number?

- a) 20
- b) 15
- c) 25

Card 5:

Begin with 25. Subtract 5 and then divide by 2 for the next number. What is the third number?

- a) 7.5
- b) 10
- c) 12.5

Card 6:

Start at 50 and subtract 10 each time. What is the fourth number?

- a) 10
- b) 20
- c) 30

Card 3:

Start with 30. Divide by 3 and then add 10 for the next number. What is the second number?

- a) 20
- b) 15
- c) 30

Card 7:

Start with 10. Multiply by 2 and then subtract 1 for the next number. What is the third number?

- a) 10
- b) 20
- c) 32

Card 4:

Start at -10, add 5 each time. What is the third number?

- a) 0
- b) 5
- c) 10

Card 8:

Begin with 200. Divide by 5 and then subtract 15 for the next number. What is the third number?

- a) 5
- b) 10
- c) 20

Task Cards

Cut out the task cards below.

Card 9:

Start with 12. Multiply by 3 and then add 6 for the next number. What is the second number?

- a) 36
- b) 42
- c) 48

Card 13:

Start at 75, subtract 15 each time. What is the fourth number?

- a) 30
- b) 45
- c) 60

Card 14:

Begin with 90. Subtract 10 and then multiply by 3 for the next number. What is the third number?

- a) 240
- b) 180
- c) 210

Card 11:

Begin with 60. Add 30 and then divide by 6 for the next number. What is the second number?

- a) 10
- b) 15
- c) 12

Card 15:

Start with 100. Multiply by 4 and then subtract 10 for the next number. What is the second number?

- a) 400
- b) -110
- c) -120

Card 12:

Start with 48. Divide by 4 and then add 10 for the next number. What is the second number?

- a) 22
- b) 18
- c) 12

Card 16:

Begin with 140. Divide by 7 and then add 5 for the next number. What is the third number?

- a) 25
- b) 15
- c) 20

Task Cards

Cut out the task cards below.

Card 17:

Start with -32 . Divide by 8 and then subtract 2 for the next number. What is the second number?

- a) -2
- b) 6
- c) -6

Card 21:

Start with 36. Divide by 6 and then add 7 for the next number. What is the second number?

- a) 13
- b) 12
- c) 15

Card 22:

Begin with 120. Subtract 40 and then divide by 4 for the next number. What is the third number?

- a) 20
- b) 10
- c) 15

Card 19:

Begin with 45. Subtract 15 and then multiply by 2 for the next number. What is the second number?

- a) 30
- b) 15
- c) 60

Card 23:

Start with 100. Multiply by 2 and then subtract 25 for the next number. What is the second number?

- a) 100
- b) -30
- c) -42

Card 20:

Start with 50. Multiply by 2 and then subtract 25 for the next number. What is the second number?

- a) 75
- b) 50
- c) 100

Card 24:

Start at 100, subtract 25 each time. What is the fourth number?

- a) 25
- b) 0
- c) 50

Algebra Quiz - Patterning

Part 1

Is Anna describing the recursive or functional relationship?

	Pattern					Anna's Description	Recursive or Functional
1)	x	1	2	3	4	The term number is multiplied by 3 and then 4 is added.	
	y		10	13	16		
2)	x	1	2	3		The y variable has 15 added each time.	
	y		20	35			

Part 2

How many blocks are in each term? Sketch the next 3 terms.

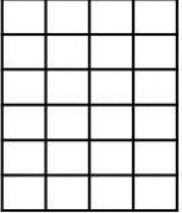
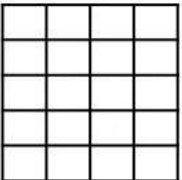
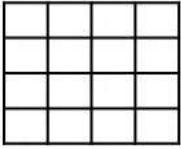
1)					

1) Describe the recursive relationship between the number of blocks.

2) Represent the pattern using an algebraic expression.

3) How many blocks will the 15th term have?

4) How many blocks will the 30th term have?

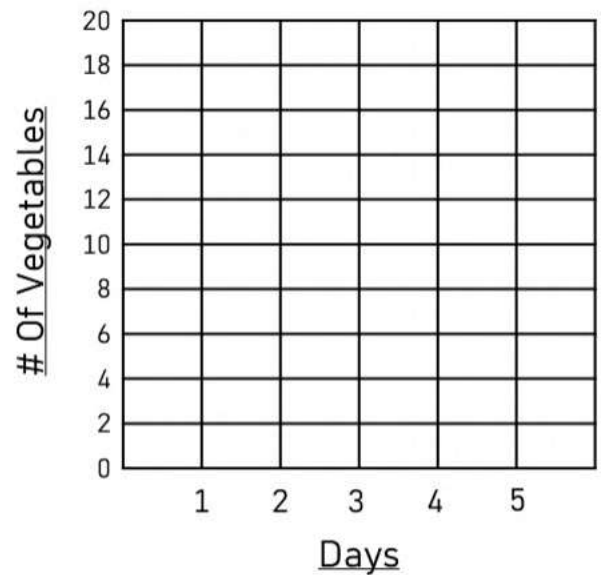
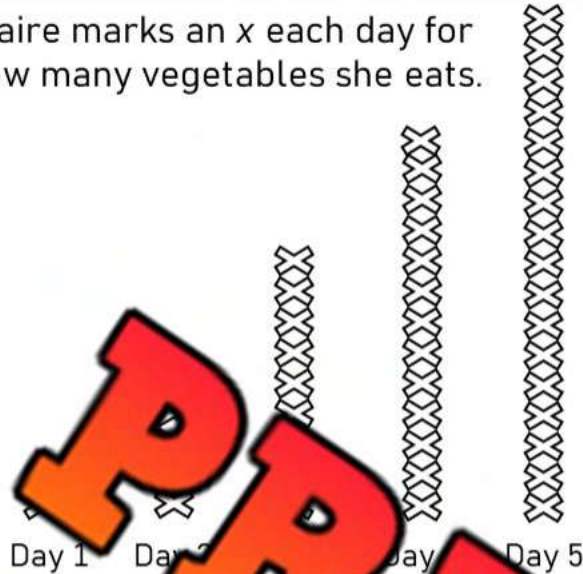
2)						

Describe the recursive relationship between the number of blocks.

Part 3

Translate the growing patterns into a table of values and a graph.

Claire marks an x each day for how many vegetables she eats.



Term Number (Days)

10

25

Term Value (Vegetables)

Part 4

Fill in the input/output tables below.

Rule: add 7

In	Out
135	
142	
163	
178	

Rule: multiply

In	Out
3	
5	
8	
11	

Rule: subtract 8

In	Out
453	
488	

In

 n

Out

 $2n + 5$

1

2

3

4

5

In

 n

Out

 $2n + (-3)$

5

10

15

20

25

In

 n

Out

 $n - (-5)$

-1

-2

-3

-4

-5

Part 5

Answer the word question below.

Admission to Fun Haven is \$10. For each ride in Fun Haven, it costs an additional \$2.

a) Write an algebraic expression that represents the cost to enter Fun Haven and ride extra e rides.

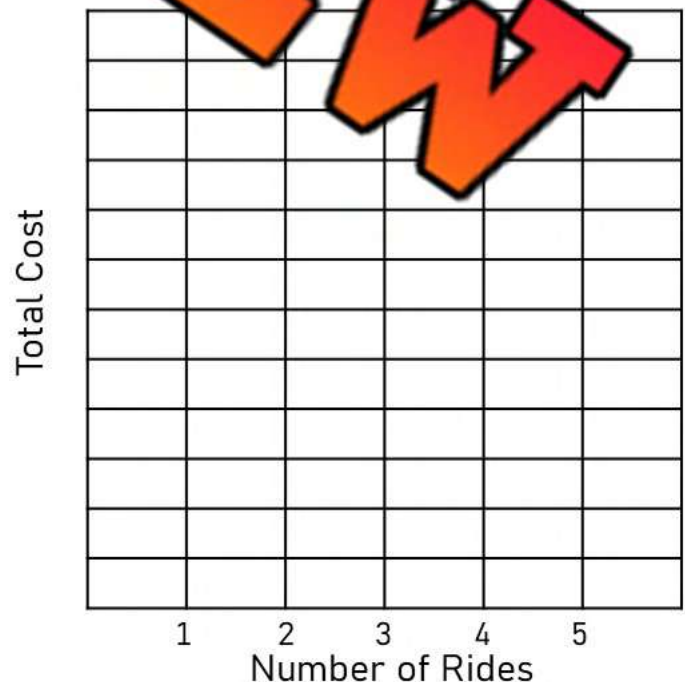
b) Claire entered the park and has gone on 8 rides. How much did it cost her?

c) Claire has \$20 at the park. How many rides can she go on?

d) Fill in the table below to represent costs related to going to Fun Haven.

Number of Rides	0	1	2	3	4	5	6
Total Cost							

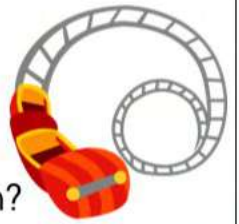
e) Translate the table of values into a line graph.



f) Is the rate of change constant?

YES NO

g) What is the rate of change?



Part 6

Who will get paid more money over time?

Weeks	0	1	2	3	4	5	6	7
Sam's Earnings (\$)	500	650	800	950				
Logan's Earnings (\$)	0	250	500	750				

- a) Who will earn more after 7 weeks? _____
- b) How much is Sam's earnings per week? _____
- c) How much is Logan's earnings per week? _____
- d) Whose earnings increase at a greater constant rate? _____
- e) Who received money without working? _____



Part 7

Draw the first 5 terms and answer the questions.

Term 1	Term 2	Term 3	Term 4	Term 5

Questions	Expression
a) Write an expression that represents how many shapes are in the pattern?	
b) How many shapes will be in the 10 th term?	
c) How many shapes will be in the 20 th term?	
d) How many rectangles will be in the 100 th term?	
e) How many stars will be in the 1000 th term?	

Equation or Expression?

Questions

Is the number sentence an expression or equation?

1) Paul has 5 cookies but needs enough for 10 people. $5 + c = 10$	Equation	Expression
2) The park has the following rule: $c \times 3 - 1$	Equation	Expression
3) Maria wants to run 30km in the week. She has already run 22km. $22 + 8 = 30$	Equation	Expression
4) The cost to enter an arena is \$20 plus \$5 per ticket. $20 + 5t$	Equation	Expression
5) Jeff works at a garden centre and earns \$15 an hour. He can figure out his pay by using the following equation: $h \times 15$	Equation	Expression
6) Bailey made \$200 last week working with her mom. She worked 10 hours. $10 \times w = 200$	Equation	Expression
7) Jane had 150 candies to give away on Halloween. She has 30 left. $150 - c = 30$	Equation	Expression
8) Ashley had 200 candies to give away on Halloween. She will give 2 candies to each kid. How many kids can she give candy to? $200 \div 2 = k$	Equation	Expression
9) Candy bags come in 30 packs. The total number of candies is represented below: $b \times 30$	Equation	Expression

Exit Cards

Cut Out

Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Is the number sentence an expression or equation? Circle the answer:

1) The total cost of bananas at \$0.30 per banana can be calculated using the following: $0.30b$

Expression Equation

2) Jake has 48 marbles and wants to divide them equally among his 6 friends. The number of marbles each friend will get is represented by: $48 \div 6 = m$

Expression Equation

Name: _____

Is the number sentence an expression or equation? Circle the answer:

1) The total cost of bananas at \$0.30 per banana can be calculated using the following: $0.30b$

Expression Equation

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Expression Equation

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Expression Equation

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Expression Equation

Name: _____

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1) The total cost of bananas at \$0.30 per banana can be calculated using the following: $0.30b$

Expression Equation

2) Jake has 48 marbles and wants to divide them equally among his 6 friends. The number of marbles each friend will get is represented by: $48 \div 6 = m$

Expression Equation

Writing Algebraic Expressions

Using algebraic expressions helps us understand mathematical situations. We can use a variable to replace a changing number, like how many tickets are sold to a game – $t \times 10$

Part 1

Write each algebraic expression in words.
Use the words "a number" in place of the variable.

1) $7 - t$

Seven subtract a number

2) n

3) $8 + b$

4) $9r$

5) $\frac{y}{5}$

Part 2

Write an algebraic expression for each situation.

1) Nineteen add a number

2) Divide a number by three

3) A number is subtracted by nineteen

4) Triple a number and add seven

5) Subtract 19 from a number, then multiply by four

Writing Algebraic Expressions - Treats

A mathematical expression is similar to an equation, but it does not have an equal sign. We use expressions to describe a mathematical situation.

Instructions

Write the expressions for the situations below.

1) Lindsay has y amount of cookies. She gives 27 cookies away to the students in her class.

Expression:



2) Cora has b brownies and divides them into b pieces. She eats 3 brownies.

Expression:



3) Alyse makes t cupcakes and shares them equally with her 5 friends.

Expression:



4) Hani gives 3 candies to each of his m friends.

Expression:



5) Scott has 14 sodas in his fridge and buys s more sodas.

Expression:



6) Dan buys 3 dozen donuts and eats d number of donuts before going to school.

Expression:



7) Steve buys x number of cookies and gives 31 to his staff.

Expression:



8) Alexa has 100 suckers that she shares equally with her f number of friends.

Expression:



9) Brian has 250 gummy worms and takes n number of gummies from his brother.

Expression:



10) Howard gives 4 books each to s number of students.

Expression:



Finger Signals Quiz - Understanding Algebraic Expressions

Objective

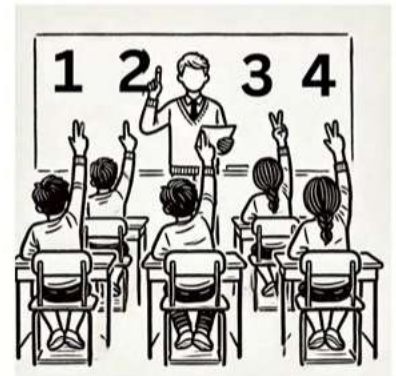
What are we learning about?

Students will reinforce their understanding of algebraic expressions through an interactive finger signals quiz.

Material

What you will need for the activity.

- A list of algebraic expressions



Instructions

How you will complete the activity

1. Prepare a list of questions with answers labeled A, B, C, and D.
2. Explain the finger signals for each answer choice: one finger for A, two fingers for B, three fingers for C, and four fingers for D.
3. Inform the students they will show their answer using the finger signal when you read each question.
4. Read the first question aloud clearly and repeat if necessary.
5. Give students a few moments to think about their answer and decide independently.
6. After a countdown (e.g., "3, 2, 1"), have all students show their answer simultaneously by raising the appropriate number of fingers.
7. Reveal the correct answer and explain why it is correct.
8. Repeat with different questions to reinforce understanding of algebraic expressions.

Name: _____

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Question	A	B	C	D
A teacher has s students and divides them evenly into 5 groups. How many students are in each group?	$5s$	$5 - s$	$s \div 5$	$5 \div s$
A gardener plants f flowers in each of 8 rows. What is the total number of flowers planted?	$8+f$	$8-f$	$8f$	$f \div 8$
A farmer has c cows and buys 14 more. How many cows does he have now?	$c-14$	$c+14$	$c \div 14$	$14c$
A painter uses p litres of paint each day for 10 days. How much paint does he use in total?	$p+10$	$p-10$	$10p$	$p \div 10$
A painter uses p litres of paint each day, for 10 days. He then spends 2 more litres. How much paint is used?	$10p-2$	$10+p-2$	$10p+2$	$p \div 10-2$
A cyclist rides b miles each day and then 10 more kilometres. What is the total distance?	$b+10$	$b-10$	$10b$	$b \div 10$
A baker uses b cups of flour in a recipe and then adds 7 more cups. How much flour is used?	$b+7$	$b-7$	$7b$	$b \div 7$
A writer types w words each minute for 30 minutes. What is the total number of words typed?	$w+30$	$w-30$	$30w$	$w \div 30$
An artist splits a litres of paint into 6 containers and then uses 2 more litres in each container. How much paint is used in each container?	$a \div 6$	$a \div 6 + 2$	$6a + 2$	$6a \div 2$
A factory produces p parts and then packages them into 4 boxes. How many parts are in each box?	$p \div 4$	$4p$	$p \div 4$	p
Lily has m marbles. She buys 5 more and then gives away 2. How many marbles does she have now?	$m+5-2$	$m-5+2$	$m \div 2$	$m \div 2 + 5$
A baker bakes b batches of cookies, each with 12 cookies. What is the total number of cookies?	$12+b$	$12-b$	$12b$	$b \div 12$
Sam has p pencils. He buys 3 packs of pencils with 4 pencils each and then loses 2 pencils. How many pencils does he have now?	$p+3 \times 4 - 2$	$p+3-2 \times 4$	$p-3+2 \times 4$	$p \div 3 \times 4 - 2$
A gardener plants g flowers in each of 7 rows. He then plants 3 more flowers in each row. How many flowers are there in total?	$7g+3g$	$g \times 7 + 3$	$g \times 7 + 3g$	$7g-3g$

Evaluating Algebraic Expressions - Addition

Part 1Evaluate the following expressions for $x = 8$

1) $x + 12$	2) $8 + x$	3) $23 + x$	4) $x + 24$
5) $41 + x$	6) $63 + x$	7) $82 + 13 + x$	8) $92 + x + 11$

Part 2Evaluate the following expressions for $y = 8$ and $n = -2$

1) $y + (n)$	2) $5 + (n) + y$	3) $22 + (n) + y$	4) $y + 12 + (n)$
5) $43 + y + (n)$	6) $(n) + y + 20$	7) $5 + (n) + y$	8) $53 + (n) + y$

Part 3Evaluate the following expressions for $x = -5$ and $p = 5$

1) $(x) + (p) - 10$	2) $10 + (x) + (p)$	3) $15 + (x) + (p)$	4) $(x) + 11 + (p)$
5) $(p) + 20 + (x)$	6) $(x) + 18 + (p)$	7) $(x) + 5 + (p)$	8) $22 + (p) + (x)$

Evaluating Algebraic Expressions - Subtraction

Subtraction Integers Rule

To subtract integers, it is easiest to change the operation to addition and then follow the addition rules. We can do this by using the rule – Keep, Flip, Change. We keep the first number the same, flip the operation from subtraction to addition, and then change the third number's sign.

Example: $5 - (-6) = ?$ becomes $5 + 6 = 11$

Keep the
first
integer

Flip the
operation

Change the
sign of the next
integer

Part 1

Evaluate the following expressions for $x = 5$

1) $x - 12$	2) $x + 18 - 23 - x$	4) $x - 24$
5) $41 - x$	6) $63 - x$	7) $5 - 12 + x$
		8) $92 - x - 11$

Part 2

Evaluate the following expressions for $y = 10$ and $n = 3$

1) $y - (n)$	2) $11 - (n) - y$	3) $15 - y - (n)$	4) $y - 6 - (n)$
5) $21 - y - (n)$	6) $(n) - y - 13$	7) $y - (n) - 3$	8) $32 - (n) - y$

Evaluating Algebraic Expressions - Cafe

Whitney works at a café selling muffins, coffee, tea, and scones. She uses algebraic expressions to determine the cost of her customer's orders.



Menu	
Scone (s)	\$3.50
Muffin (m)	\$2.25
Tea (t)	\$2.00
Coffee (c)	\$2.50

Solve Write the algebraic expression and then evaluate using the menu prices.

Customer Order	Expression	Answer
1) 2 coffees, 1 muffin	$2c + m$ $2 \times 2.50 + 2.25$	\$7.25
2) 3 teas, 1 scone		
3) 4 coffees, 2 teas		
4) 2 coffees, 2 teas, 2 muffins		
5) 3 teas, 4 muffins, 2 scones		
6) 10 coffees, 10 muffins		
7) 5 teas, 3 muffins, 2 scones		
8) 3 coffees, 3 scones		

Evaluating Algebraic Expressions - Canteen

Brad works at a canteen selling chips, drinks, and gummies. He calculates the cost of orders (o) and subtracts it from the payment (p) he is given - to determine how much change to give his customers.

Menu	
Chips	\$1.50
Drinks	\$2.50
Gummies	\$1.00

Evaluate

Solve the subtraction expressions below.

Order Values	Expression - Customer's Change
p	$p - o$
\$20.00	
\$17.50	
\$9.25	
\$35.65	

Evaluate

Calculate the order and determine the customer's change.



Order			Expression	Payment	Change (c)
c	d	g			
1	0	2	$c + (2 \times g)$ $1.50 + (2 \times 1.00)$ $1.50 + 1.00$ $\$2.50$	\$5.00	
3	1	0		\$10.00	
1	2	1		\$10.00	
2	2	2		\$20.00	
3	3	5		\$20.00	

Evaluating Algebraic Expressions – (x ÷)

Part 1

Evaluate for $x = 3$. Use brackets to separate the numbers.

1) $5x$	2) $9x$	3) $3x$	4) $8x + 6$
5) $21x$	6) $12x - 12$	7) $5x - x$	8) $9x + 8 - x$

Part 2

Evaluate for $y = 10$

1) $\frac{y}{2}$	2) $\frac{30}{y}$	4) $\frac{y}{5} + 5$
5) $\frac{30}{y} + 8$	6) $\frac{100}{y} + y$	7) $\frac{120}{y}$

Part 3

Write the expressions using the values/operations below

9 8 4 n + x - ÷

1) Nine times a number, add four	
2) Eight divided by four, subtract a number	
3) A number multiplied by eight, add nine	
4) Eight more than four divided by a number	
5) A number divided by nine, add eight	

Writing Expressions

An **equation** is a statement that **two expressions** are **equal**. An expression has no equal sign, whereas an equation has an equal sign. When we can solve the answer to an expression, it becomes an equation because we add an equal sign.

Expression

Eight more than a number

$$8 + n$$

$$n = ?$$

Equation

Eight more than a number is 14

$$8 + n = 14$$

$$n = 6$$

Part 1 Write equations for each sentence.

Equation	Equation	Answer
1) Nine less than a number is 14		
2) Fifteen more than a number is 22		
3) Eight times a number is 24		
4) Twelve divided by a number is three		
5) A number plus eight divided by two is 10		
6) Seven times a number plus four is 39		

Part 2 Write a sentence in words for each equation.

Equation	Sentence	Value of n
1) $4n = 24$		
2) $8 + n - 3 = 10$		
3) $5 + \frac{12}{n} = 7$		
4) $3n - 3 = 12$		

Exit Cards

Cut Out

Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Write a sentence in words for each equation:

1) $7d -$

2) $4 + \frac{10}{n} = 9$

Name: _____

Write a sentence in words for each equation:

1) $7d - 5 = 9$

2) $4 + \frac{10}{n} = 9$

Name: _____

Write a sentence in words for each equation:

1) $7d - 5 = 9$

2) $4 + \frac{10}{n} = 9$

Name: _____

Write a sentence in words for each equation:

1) $7d - 5 = 9$

2) $4 + \frac{10}{n} = 9$

Addition – Are They Equal?

Are the equations equal? Put a slash through the equal sign for any equations that are not equal.

$8 + 4 = 12$

$23 + 15 \neq 36$

$47 + 13 = 50$

Part 1

Put a slash through the equal sign ($\neq$) if it is not balanced.

1) $8 + 4 = 12$	2) $51 + 15 = 67$	3) $47 + 13 = 50$
4) $65 + 1 = 71$	5) $74 + 13 = 87$	6) $92 + 11 = 103$
7) $95 + 25 = 110$	8) $12 + 26 = 38$	9) $144 + 17 = 171$
10) $155 + 26 = 181$	11) $144 = 1$	12) $212 + 12 = 224$

Part 2

Fill in the missing number to balance the equation.

1) $\square + 12 = 95$	2) $\square + 25 = 50$	3) $\square = 36$
4) $72 + 14 = \square$	5) $64 + \square = 80$	6) $\square + 50 = 65$
7) $68 + \square = 82$	8) $83 + 15 = \square$	9) $89 + \square = 102$
10) $105 + \square = 116$	11) $121 + 14 = \square$	12) $145 + \square = 160$

Addition – Find the Variable

When we write an algebraic expression with an equal sign, it becomes an equation. An equation is a statement that two expressions are equal.

We can solve for a variable by balancing an equation, making sure both sides of the equal sign have the same value.



Part 1

Find out the value of the variable.

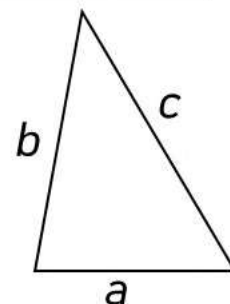
1) $12 + n = 18$ $n =$	2) $n + 15 = 22$ $n =$	3) $32 + n = 41$ $n =$
4) $45 + p = 58$ $p =$	5) $41 + p = 62$ $p =$	6) $p + 63 = 81$ $p =$
7) $77 + y = 96$ $y =$	8) $y + 115 = 150$ $y =$	9) $132 + 15 = y$ $y =$
10) $157 + t = 192$ $t =$	11) $117 + t = 217$ $t =$	12) $236 + t = 248$ $t =$
13) $123 + a = 243$ $a =$	14) $165 + a = 300$ $a =$	15) $150 + a = 308$ $a =$
16) $238 + 449 = s$ $s =$	17) $311 + n = 445$ $s =$	

Part 2

The formula for calculating the perimeter of a shape is to add the side lengths.

Use the following equation to find the perimeter of a triangle: $p = a + b + c$

1) $a=6$ $b=12$ $c=10$	$p=$	4) $a=22$ $b=15$ $c=41$	$p=$
2) $a=7$ $b=15$ $c=19$	$p=$	5) $a=19$ $b=32$ $c=49$	$p=$
3) $a=9$ $b=17$ $c=23$	$p=$	6) $a=25$ $b=23$ $c=46$	$p=$



Activity – Math Hot Seat: Addition Challenge

Objective

What are we learning about?

Students will practice solving addition problems to find unknown values by participating in a fun and interactive game, enhancing their arithmetic skills and quick thinking.

$$X+10=25$$

Material

What you will need for the activity.

- Index cards with addition problems
- Chairs arranged in a circle
- Stopwatch or timer
- Whiteboard and marker

Instructions

How you will complete the activity.

1. Prepare a stack of index cards with various addition problems. Ensure some problems require finding a missing number.
2. Arrange chairs in a circle with one "hot seat" in the middle.
3. Explain the rules of the game to the students. One student will sit in the hot seat while the rest sit in the surrounding chairs.
4. The teacher will read an addition problem from the stack. The student in the hot seat has a limited time (e.g. 30 seconds) to solve the problem.
5. If the student in the hot seat answers correctly within the time limit, they stay in the hot seat for the next round. If they answer incorrectly or run out of time, they switch places with another student from the circle.
6. Continue the game until each student has had the opportunity to sit in the hot seat multiple times, or until the designated game time is up.
7. Keep track of the number of correct answers each student provides while in the hot seat. The student with the most correct answers wins the game.

Index Cards

Use the math problems below.

$2 + b - 1 = 5$

$b = 4$

$3p + 4 = 19$

$p = 5$

$x / 2 = 7$

$x = 14$

$4x - 3 = 9$

$x = 3$

$6 + y - 2 = 8$

$y = 8$

$5y / 2 = 4$

$y = 4$

$3a - 1 = 2$

$a = 3$

$m + 4 = 12$

$m = 8$

$j + 7 = 20$

$j = 13$

$9x + 4 = 22$

$x = 2$

$m + 3 = 10$

$m = 7$

$2 + n = 8$

$n = 6$

$6z - 4 = 8$

$z = 2$

$x / 2 + 3 = 10$

$x = 14$

$4x / 2 = 10$

$x = 5$

$x / 4 + 3 = 7$

$x = 20$

$3y - 1 = 5$

$y = 2$

$2x - 3 = 5$

$x = 4$

$3a + 6 = 15$

$a = 3$

$4z - 2 = 10$

$z = 3$

$7 - 2 + x = 12$

$x = 7$

$6 + 2x = 14$

$x = 4$

$3x - 4 = 5$

$x = 3$

$6 + o + 4 = 20$

$o = 10$

Index Cards

Use the math problems below.

$6 + 4x = 26$	$x = 5$
$3x - 5 = 19$	$x = 8$
$x / 2 + 5 = 11$	$x = 12$
$4x - 7 = 21$	$x = 7$
$8 + x / 4 = 10$	$x = 8$
$9x + 3 = 30$	$x = 3$
$7 + 3x = 22$	$x = 5$
$x / 5 = 6$	$x = 30$
$5x + 6 = 36$	$x = 5$
A farmer has 4 fields. Each field produces the same number of bags of wheat. After harvesting, he has 15 bags left. How many bags of wheat did each field produce?	10
A teacher has 5 boxes of pencils. Each box contains the same number of pencils. She gives 12 pencils to each of her 4 students and has 4 pencils left. How many pencils were in each box?	8
A chef buys 6 crates of oranges. Each crate contains the same number of oranges. He uses 40 oranges to make juice and has 20 oranges left. How many oranges were in each crate?	15
A warehouse has 80 boxes. Each box contains the same number of items. They ship out 30 items and have 450 items left. How many items are in each box?	6
A gardener plants 7 rows of flowers. Each row has the same number of flowers. She then plants 8 more flowers and has 71 flowers in total. How many flowers were in each row?	9
A bookstore received 10 boxes of books. Each box has the same number of books. They sold 20 books and have 100 books left. How many books were in each box?	12
A factory produces the same number of gadgets per hour. After working for 4 hours, they give 60 gadgets as samples and have 140 gadgets left. How many gadgets do they produce per hour?	50
A runner completes 5 laps. Each lap is the same distance. After running, he walks an additional 600 meters to cool down, covering a total of 2600 meters. How long is each lap?	12
A chef has 96 eggs. He uses the same number of eggs for each cake. After baking 8 cakes, he has 48 eggs left. How many eggs does he use for each cake?	6
A car rental company has 45 cars. They divide the cars into 5 groups and then add 3 more cars to each group. How many cars were originally in each group?	6

Adding Decimals – Solve The Variable

Practice

Find the value of the variables below.

1) $4.5 + n = 6$

2) $n + 5.5 = 7$

3) $s + 5.3 = 8$

$n =$

$s =$

5) $9.2 + p = 11$

6) $10.1 + r = 11.5$

$p =$

$r =$

7) $15.3 + n = 20.5$

8) $t + 6.5 = 20.5$

9) $t + 14.4 = 18$

$n =$

$t =$

10) $24.6 + n = 28.2$

11) $28.6 + 4 = t$

12) $31.6 + 5 = p$

$n =$

$t =$

Word Problem

Write the equations below and find the

- 1) Jake has 1.25 pizzas left over from last night. His friend brings over some more pizza. They now have 4.25 pizzas. How much pizza did his friend bring?



- 2) Kelly is 1.5 meters tall. She hopes to grow to be 1.75 metres tall. How much will she have to grow?

- 3) Carter has \$1.33 but needs \$1.88 to buy a bag of chips. How much more does he need?



Addition Equations – Golf Tournament

Zack hosted a 2-round golf tournament. He has the results and needs to find out who won the tournament. The leaderboard is below but is missing numbers.



Instructions

Fill in the leaderboard.

Player	Round 1	Round 2	Final Score
Paula	-2	-5	
Charlie			-5
Dominic		-2	-6
Kayden		-1	
Silas			-1
Lillian	3		
Brooklyn	-2		-5
Natalie			-1
Andrew	-4	6	
Santiago		5	

Results

Who won the golf tournament?

1) Who won the golf tournament?	
2) The entry fee for the tournament was \$100. All the money went to the prize (p). Write an equation that determines the value for (p).	
3) More golfers joined the tournament. The prize ended up being \$1400. Write an equation that determines how many golfers (g) participated in the tournament.	

Equation Pairs - Addition

When we add numbers or variables (letters) together, we can change the order of the numbers/letters without affecting the answer. This is called the **commutative property**.

Directions: Isaac works at a fast-food truck. He sells burgers (b) and fries (f). His job is to calculate how much the customer owes in total (t) for their order.



Part 1 Write 2 equations for the orders below.

#	Fries (f)	Burger (b)	Equation 1 ($f + b = t$)	Equation 2 ($b + f = t$)
1	3	8	$3 + 8 = 11$	$8 + 3 = 11$
2	7	10		
3	6	15		
4	8	8		
5	15	18		
6	10	13		
7	13	15		
8	11	16		

Part 2 Solve the addition equations below.

	Equation 1	Equation 2
1	$5 + 7 + 15 + 13 =$	$13 + 7 + 15 + 5 =$
2	$12 + 17 + 18 + 13 =$	$17 + 13 + 18 + 12 =$
3	$34 + 21 + 26 + 29 =$	$34 + 26 + 29 + 21 =$
4	$55 + 66 + 34 + 45 =$	$55 + 45 + 66 + 34 =$

Addition Equations – Perimeter of a Rectangle

When we calculate the perimeter of a rectangle, we need to add all the sides together. The order of how we decide to add the sides together will not affect the answer due to the commutative property of addition.

Formula 1 – $p = a + b + a + b$
 $p = 12 + 4 + 12 + 4$
 $p = 32$

$a = 12\text{cm}$



$b = 4\text{cm}$

Formula 2
 $p = 2(a + b)$
 $p = 2 \times (12 + 4) = 32$

Part 1 Use the equations for the side lengths below.

#	Side length a	Side length b	Equation 1	Equation 2
1	5			
2	7			
3	11			
4	15	12		
5	17	15		
6	23	21		
7	28	31		
8	41	46		
9	55	24		
10	35	43		

Part 2 Using multiplication and addition, write two equations for the side lengths.

#	Side Length a	Side Length b	Equation 1	Equation 2
1	7	3	$2 \times (7 + 3) = 20$	$2 \times (3 + 7) = 20$
2	6	8		
3	9	4		
4	5	7		

Subtraction – Are They Equal?

Are the equations equal? Put a slash through the equal sign for any equations that are not equal.

$16 - 8 = 8$

$95 - 11 \neq 86$

$105 - 12 = 93$

Part 1

Put a slash through the equal sign ($\neq$) if it is not balanced.

1) $36 - 11 = 25$	2) $56 - 11 = 45$	3) $59 - 16 = 42$
4) $72 - 16 = 56$	5) $66 - 27 = 49$	6) $79 - 16 = 64$
7) $126 - 20 = 109$	8) $142 - 14 = 128$	9) $174 - 13 = 161$
10) $181 - 15 = 166$	11) $126 - 20 = 106$	12) $195 - 30 = 165$

Part 2

Fill in the missing number to balance the equation.

1) $36 - 6 = \square$	2) $53 - 7 = \square$	3) $\square = 71$
4) $58 - \square = 45$	5) $48 - \square = 39$	6) $65 - \square = 55$
7) $105 - \square = 99$	8) $146 - 15 = \square$	9) $91 - \square = 75$
10) $158 - \square = 136$	11) $185 - 17 = \square$	12) $\square - 12 = 67$

Exit Cards

Cut Out

Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Fill in the missing number to balance the equation:

1) $201 - \underline{\hspace{2cm}} = 164$

2) $\underline{\hspace{2cm}} - 230 - 122 = 94$

3) $190 - 45 - 30 = \underline{\hspace{2cm}}$

Name: _____

Fill in the missing number to balance the equation:

1) $201 - \underline{\hspace{2cm}} = 164$

2) $\underline{\hspace{2cm}} - 230 - 122 = 94$

3) $190 - 45 - 30 = \underline{\hspace{2cm}}$

Name: _____

Fill in the missing number to balance the equation:

1) $201 - \underline{\hspace{2cm}} = 164$

2) $\underline{\hspace{2cm}} - 230 - 122 = 94$

3) $190 - 45 - 30 = \underline{\hspace{2cm}}$

Name: _____

Fill in the missing number to balance the equation:

1) $201 - \underline{\hspace{2cm}} = 164$

2) $\underline{\hspace{2cm}} - 230 - 122 = 94$

3) $190 - 45 - 30 = \underline{\hspace{2cm}}$

Subtraction – Find the Variable

A **variable** is a letter that represents an unknown number. When we don't know a number, we can use a letter to take the place of the unknown number.

Example: $39 - n = 25$

We can figure out the unknown number by balancing the equation. In this equation, $n = 14$.

Part 1 Find out the value of the variable.

1) $52 - n = 1$ $n =$	2) $n - 21 = 35$ $n =$	3) $52 - n = 41$ $n =$
4) $73 - 16 = p$ $p =$	5) $64 - p = 53$ $p =$	6) $p - 32 = 50$ $p =$
7) $87 - y = 61$ $y =$	8) $100 - y = 45$ $y =$	9) $102 - 13 = y$ $y =$
10) $109 - t = 94$ $t =$	11) $124 - t = 11$ $t =$	12) $143 - t = 129$ $t =$
13) $158 - a = 127$ $a =$	14) $174 - a = 142$ $a =$	15) $100 - a = 175$ $a =$

Part 2 Calculate the change a customer gets when they buy something.

When a customer buys something, the formula for calculating their change (c) is money given (m) subtracted from the price (p) of the item. Therefore, $c = m - p$

$m = 20$ $p = 12$	$c = 20 - 12$	$c = 8$	$m = 80$ $p = 61$	$c = \underline{\quad} - \underline{\quad}$	$c =$
$m = 40$ $p = 19$	$c = \underline{\quad} - \underline{\quad}$	$c =$	$m = 100$ $p = 68$	$c = \underline{\quad} - \underline{\quad}$	$c =$
$m = 60$ $p = 27$	$c = \underline{\quad} - \underline{\quad}$	$c =$	$m = 100$ $p = 44$	$c = \underline{\quad} - \underline{\quad}$	$c =$

Subtracting Decimals – Solve the Variable

Practice

Find the value of the variables below.

1) $6.5 - n = 2$ $n =$	2) $n - 4.5 = 3$ $n =$	3) $s - 5.2 = 3$ $s =$
4) $10.1 - p = 7$ $p =$	5) $10.1 - p = 7$ $p =$	6) $14.3 - r = 10.5$ $r =$
7) $17.4 - n = 12.5$ $n =$	8) $n - 4.5 = 12.5$ $n =$	9) $t - 5.4 = 15$ $t =$
10) $24.7 - n = 20.2$ $n =$	11) $34.6 - 5 = p$ $p =$	12) $34.6 - 5 = p$ $p =$

Word Problem

Write an equation and solve using a variable for the unknown amount.

- 1) Laura has \$4.35 to spend on candy. She leaves the candy store with \$1.85. How much did she spend on candy (c)?
- 2) Randy works for 8.5 hours today. He only has 2 hours left to work. How much time (t) has elapsed?
- 3) Ryan jumped 3.58m in long jump. Jody jumped 2.98m. What is the difference (d) between their jumps?
- 4) Rebecca has 200g of sugar. She used 42.5g of sugar to make cookies. How many grams of sugar (s) does she have left?



Activity: Decimal Subtraction Race

Objective

What are we learning about?

Students will practice subtraction of decimals to solve for a variable by racing to solve equations quickly and accurately.

Materials

What you will need for the activity.

- Index cards
- Markers or pens
- Timer (optional)



Instructions

How to play the activity

1. Prepare a stack of index cards with decimal equations involving variables. Include a mix of problems to ensure variety.
2. Have students line up in a single file.
3. Call the first two students in line to the front. They will race to answer the multiplication algebraic equation question that the teacher pulls from the stack.
4. Pull a card from the stack and read the question aloud.
5. The first student to answer correctly wins the round. If a student gives the wrong answer, they are out and go to the end of the line.
6. The student who answers correctly stays at the front to compete against the next student in line.
7. The student who loses goes to the end of the line.
8. Optional: If a student wins five rounds in a row, they move to the back of the line to give others a chance to play.
9. Continue the game until all students have had a chance to compete multiple times or until the designated game time is up.

Multiplication Equations

Use these for the race.

$x - 3.7 = 7.3$

$y - 2.5 = 5.5$

$z - 6.8 = 9.2$

$15.4 - a = 7.3$

$b - 3.4 = 10.6$

$18.3 - c = 5.1$

$d - 4.1 = 12.2$

$12.2 - e = 6.8$

$f - 3.5 = 7.7$

$26.6 - g = 14.2$

$14.4 - h = 13.9$

$28.7 - i = 15.5$

$j - 3.3 = 20.6$

$10.8 - k = 11.4$

$l - 6.7 = 22.8$

$29.4 - m = 16.7$

$n - 2.2 = 15.1$

$11.9 - o = 11.5$

$p - 4.8 = 9.4$

$16.5 - q = 7.9$

$r - 5.3 = 8.3$

$28.8 - s = 14.2$

$t - 13.9 = 22.8$

$19.1 - u = 15.6$

$v - 5.4 = 8.8$

$27.3 - w = 18.9$

$x - 2.1 = 16.4$

$26.9 - y = 14.7$

$z - 4.3 = 10.5$

$28.6 - a = 13.9$

Integer Patterns – Average Temperatures

Instructions

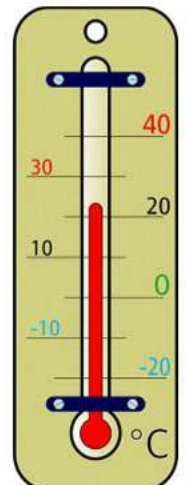
Answer the questions below.



The table below shows the average temperatures in four Canadian cities. We can use the table to compare the average temperatures in February and October.

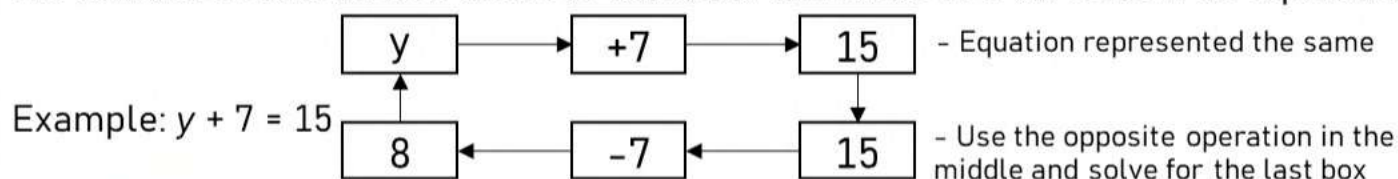
City	October (o) Temperature	February (f) Temperature	Temperature Difference (d)
Calgary (AB)	6	-7	
Edmonton (AB)	10	-3	
Victoria (BC)	12	6	
Yellowknife (NT)		-21	
Winnipeg (MB)	5	-14	
Ottawa (ON)		-8	
Eureka (NU)	-21	-8	
Quebec City (QC)	7	0	

- Fill in the table with the temperature difference from October to February.
- Write an equation using the variables: f , o , and d to show the difference between the temperatures in each city from October to February.
- Which city had the largest difference between their October and February months?
- What is the difference between Victoria's February temperature and Eureka's February temperature?
- What is the difference between Yellowknife's October temperature compared with Eureka's October temperature?



Adding and Subtracting Equations – Flow Chart

We can use a reverse flow chart to calculate the value of a variable in an equation.



Instruction Use the flow chart to find the value of the variable.

1) $t - 3 = 10$	<pre> graph LR t[t] --> minus3[-3] --> 10[10] 10 --> plus3[+3] --> box1[] box1 --> t </pre>
2) $r - 5 = 8$	<pre> graph LR r[r] --> minus5[-5] --> 8[8] 8 --> plus5[+5] --> box2[] box2 --> r </pre>
3) $c + 6 = 12$	<pre> graph LR c[c] --> plus6[+6] --> 12[12] 12 --> minus6[-6] --> box3[] box3 --> c </pre>
4) $b + 5 = 16$	<pre> graph LR b[b] --> plus5[+5] --> 16[16] 16 --> minus5[-5] --> box4[] box4 --> b </pre>
5) $p - 7 = 19$	<pre> graph LR p[p] --> minus7[-7] --> 19[19] 19 --> plus7[+7] --> box5[] box5 --> p </pre>
6) $x + 9 = 14$	<pre> graph LR x[x] --> plus9[+9] --> 14[14] 14 --> minus9[-9] --> box6[] box6 --> x </pre>
7) $t - 7 = 13$	<pre> graph LR t[t] --> minus7[-7] --> 13[13] 13 --> plus7[+7] --> box7[] box7 --> t </pre>
8) $r + 4 = 22$	<pre> graph LR r[r] --> plus4[+4] --> 22[22] 22 --> minus4[-4] --> box8[] box8 --> r </pre>
9) $c - 9 = 26$	<pre> graph LR c[c] --> minus9[-9] --> 26[26] 26 --> plus9[+9] --> box9[] box9 --> c </pre>
10) $b + 11 = 31$	<pre> graph LR b[b] --> plus11[+11] --> 31[31] 31 --> minus11[-11] --> box10[] box10 --> b </pre>
11) $p + 13 = 23$	<pre> graph LR p[p] --> plus13[+13] --> 23[23] 23 --> minus13[-13] --> box11[] box11 --> p </pre>
12) $x - 15 = 27$	<pre> graph LR x[x] --> minus15[-15] --> 27[27] 27 --> plus15[+15] --> box12[] box12 --> x </pre>

Adding and Subtracting Equations – Flow Chart

Instructions

Fill in the blank in the flow chart.

1) $t - 7 + 9 = 15$	<pre> t → -7 → +9 → 15 ↑ 13 ← +7 ← -9 ← 15 </pre>
2) r	<pre> [] → [] → [] → [] ↑ [] ← [] ← [] ← [] </pre>
3) $c + 5 - 8 = 13$	<pre> [] → [] → [] → [] ↑ [] ← [] ← [] ← [] </pre>
4) $b - 11 + 7 = 19$	<pre> [] → [] → [] → [] ↑ [] ← [] ← [] ← [] </pre>
5) $p - 9 + 10 = 14$	<pre> [] → [] → [] → [] ↑ [] ← [] ← [] ← [] </pre>
6) $c + 4 - 11 = 4$	<pre> [] → [] → [] → [] ↑ [] ← [] ← [] ← [] </pre>
7) $b + 6 + 8 = 21$	<pre> [] → [] → [] → [] ↑ [] ← [] ← [] ← [] </pre>
8) $p - 7 - 11 = 21$	<pre> [] → [] → [] → [] ↑ [] ← [] ← [] ← [] </pre>

Multiplication – Are They Equal?

Are the equations equal? Put a slash through the equal sign for any equations that are not equal.

$6 \times 3 \neq 16$

$3 \times 8 = 24$

$7 \times 6 \neq 49$

Part 1

Put a slash through the equal sign ($\neq$) if it is not balanced.

1) $6 \times 3 = 16$	2) $8 \times 4 = 31$	3) $8 \times 3 = 21$
4) $8 \times 7 = 71$	5) $9 \times 2 = 18$	6) $4 \times 9 = 36$
7) $7 \times 7 = 49$	8) $5 \times 8 = 40$	9) $6 \times 6 = 42$
10) $3 \times 10 = 30$	11) $2 \times 7 = 14$	12) $8 \times 4 = 32$

Part 2

Fill in the missing number to balance the equation.

1) $6 \times 6 = \square$	2) $14 \times 4 = \square$	3) $4 \times 5 = \square$
4) $20 \times 3 = \square$	5) $6 \times \square = 18$	6) $11 \times \square = 110$
7) $4 \times \square = 44$	8) $\square \times 6 = 30$	9) $8 \times \square = 48$
10) $10 \times 9 = \square$	11) $7 \times \square = 56$	12) $12 \times \square = 48$

Multiplication – Find the Variable

When we multiply a number by a variable, we do not need to use the multiplication sign. It is known that any variable next to a number means the operation we are using is multiplication.

Example: $7n = 14$ means $7 \times n = 14$

We can figure out the unknown number by balancing the equation - $n = 2$.

Part 1

Find out the value of the variable.

1) $5n = 10$ $n =$	2) $4n = 16$ $n =$	3) $8(s) = 48$ $s =$
4) $9 \times 4 = p$ $p =$	5) $6n = 30$ $n =$	6) $7k = 21$ $k =$
7) $3n = 21$ $n =$	8) $2n = 10$ $n =$	9) $n \times 7 = 77$ $n =$
10) $5n = 45$ $n =$	11) $8 \times 7 = t$ $t =$	12) $9 \times 4 = p$ $p =$
13) $8n = 96$ $n =$	14) $10n = 100$ $n =$	15) $7d = 49$ $d =$
16) $9(s) = 27$ $s =$	17) $8 \times 8 = s$ $s =$	18) $6t = 30$ $t =$

Part 2

Calculate the area using the variables for length and width.

The formula for calculating area is: $A = L \times W$

Calculate the area in the questions below using the values for the variables L and W

L = 3 W = 9	A =
L = 8 W = 7	A =
L = 10 W = 11	A =

L = 5 W = 9	A =
L = 11 W = 7	A =
L = 4 W = 13	A =

Writing Multiplication Equations – Lottery Tickets

Amelia is selling lottery tickets for \$15 a ticket. She needs to calculate how much money her customers owe her for her tickets.



Part 1

Use multiplication equations to fill in the table.

#	# of Tickets (t)	Equation 1 $t \times 15 = ?$	Equation 2 $15 \times t = ?$
1	8		
2			
3	8		
4	3		
5	7		
6	9		
7	10		
8	5		

Part 2

Amelia sells tickets to two different people in the same session.

#	# of Tickets Person 1	# of Tickets Person 2	Equation
1	5	3	$(5 \times 15) + (3 \times 15) = 120$
2	4	7	
3	9	2	
4	2	5	
5	6	6	

Writing Multiplication Equations – Bakery

Jasmine works at a bakery. She sells bread, muffins, cakes, and donuts. When a customer orders from Jasmine, she uses an equation to figure out their total (t) – how much they owe for their order.

Bread (b)	Muffin (m)	Cake (c)	Donut (d)
\$5.00	\$3.00	\$14.00	\$2.00
			

Instructions: Complete the table below. The first one is done for you.

#	b	m	c	d	Equation	Answer
1	1	2	0	0	$t = 5 + 2m$	$t = 5 + 6$ $t = 11$
2	1	0	0	1		
3	0	2	1	0		
4	1	1	0	2		
5	2	2	0	0		
6	3	1	1	0		
7	0	2	1	2		
8	2	0	1	3		
9	1	2	1	4		

Multiplying Decimals – Solve the Variable

Practice

Find the value of the variables below.

1) $2.5n = 12.5$ $n =$	2) $5.5n = 11$ $n =$	3) $2.2s = 8.8$ $s =$
4) $2.5p = 12.5$ $p =$	5) $6.3p = 18.9$ $p =$	6) $11.1r = 55.5$ $r =$
7) $7.6n = 38$ $n =$	8) $10.1s = 50.5$ $s =$	9) $6.7n = 20.1$ $n =$
10) $6.5n = 45.5$ $n =$	11) $7.5s = 45$ $s =$	12) $7.5s = 45$ $s =$

Word Problem

Write the equation using the variable. Then solve the equation.

- 1) It rained 4.1mm every hour. In total, it rained 28.7mm. How many hours did it rain?



- 2) Parker earns \$13.50 per hour working on a farm. He made \$81 today. How many hours (h) did he work?



- 3) River bought 3 cookies. The 3 cookies have a total of 9.9 grams of sugar. How much sugar (s) is in each cookie?



Math Basketball: Multiplication Equations Challenge

Objective

What are we learning about?

To reinforce students' understanding and application of multiplication of decimals through engaging word problems and a fun basketball shooting game.



Materials

What you will need for the activity.

- Index cards with problems
- Recording sheet for each team
- Paper balls (one per team)
- Bins or baskets (one per team)
- Desks (one per team)

Instructions

How you will complete the activity.

1. Arrange the classroom so that there is enough space for multiple teams to work simultaneously. Place a desk about 6 feet away from the front of the room.
2. Place a stack of index cards with problems on each desk.
3. Provide each team with a recording sheet and a paper ball.
4. Divide the students into teams of about five members each.
5. Each team stands in a line behind their respective desk.
6. The first student in line flips over an index card and solves the problem.
7. Once the answer is recorded, the student attempts to shoot the paper ball into the bin.
8. If the student makes the shot, they place a tally mark on the team's tally sheet for a point. If they miss, no tally is given.
9. The student then goes to the end of the line, and the next student steps up to the desk to repeat the process.
10. The activity continues until all index cards have been solved.
11. Once all index cards are completed, the teacher collects the recording sheets and reviews the answers with the class.
12. For each incorrect answer, the team loses one point.
13. The team with the highest number of points after deductions is declared the winner.

Name: _____

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Index Cards

Use the following table for the game.

A car travels 7.5 miles per hour and covers a distance of 52.5 miles. How many hours (h) did the car travel?

A printer prints 12.4 pages per minute and prints a total of 99.2 pages. How many minutes (m) did it take to print all the pages?

A baker uses 2 cups of flour for each cake and used a total of 18.4 cups. How many cakes did the baker make?

A cyclist rides at 16 kilometers per hour and rides a total distance of 40.8 kilometers. How many hours (h) did the cyclist ride?

A factory produces 12 gadgets per hour and produced a total of 93.6 gadgets. How many hours (h) did the factory operate?

A garden has 3.5 plants per row and has a total of 17.5 plants. How many rows (r) are in the garden?

An athlete swims at a speed of 2.7 miles per hour and swam a total distance of 21.6 miles. How many hours (h) did the athlete swim?

A store sells 4.9 kilograms of apples per day and sold a total of 48.02 kilograms. How many days (d) did it take to sell all the apples?

A painter uses 1.8 litres of paint per wall and used a total of 14.4 litres. How many walls (w) did the painter paint?

A chef prepares 6.2 meals per hour and prepared a total of 49.6 meals. How many hours (h) did the chef work?

A photographer prints 8.5 photos per hour and printed a total of 68 photos. How many hours (h) did the photographer work?

A runner jogs at a speed of 5.4 miles per hour and jogged a total distance of 32.4 miles. How many hours (h) did the runner jog?

Name: _____

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Index Cards

Use the following table for the game.

A machine produces 9.3 parts per minute and produced a total of 74.4 parts. How many minutes (m) did the machine run?

A delivery truck travels at a speed of 10.2 kilometers per hour and travelled a total distance of 71.4 kilometers. How many hours (h) did it travel?

A worker earns \$7.8 per hour and earned a total of \$62.4. How many hours (h) did the worker work?

A student reads 4 pages per minute and read a total of 37.6 pages. How many minutes (m) did the student read?

A train travels at a speed of 120 miles per hour and traveled a total distance of 92 miles. How many hours (h) did the train travel?

A farmer plants 5.6 seeds per row and planted a total of 44.8 seeds. How many rows (r) did the farmer plant?

A construction worker lays 3.9 bricks per minute and laid a total of 31.2 bricks. How many minutes (m) did the worker lay bricks?

A hairdresser cuts 2.4 heads of hair per hour and cut a total of 12 heads. How many hours (h) did the hairdresser work?

A dog drinks 1.7 litres of water per day. It drank a total of 13.6 litres. How many days (d) did it take for the dog to drink that much water?

A bus travels at a speed of 12.6 miles per hour and travels a total distance of 88.2 miles. How many hours (h) did the bus travel?

A cook prepares 4.2 dishes per hour and has prepared a total of 33.6 dishes. How many hours (h) did the cook work?

A scientist measures 3.8 grams of a substance per sample and measured a total of 30.4 grams. How many samples (s) were measured?

Exit Cards

Cut Out

Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Find the value of the variables below.

1) $11.4w = 68.4$

 $w =$ _____

2) $12.6z = 75.6$

 $z =$ _____

3) $7.3y = 36.5$

 $y =$ _____

Name: _____

Find the value of the variables below.

1) $11.4w = 68.4$

 $w =$ _____

2) $12.6z = 75.6$

 $z =$ _____

3) $7.3y = 36.5$

 $y =$ _____

Name: _____

Find the value of the variables below.

1) $11.4w = 68.4$

 $w =$ _____

2) $12.6z = 75.6$

 $z =$ _____

3) $7.3y = 36.5$

 $y =$ _____

Name: _____

Find the value of the variables below.

1) $11.4w = 68.4$

 $w =$ _____

2) $12.6z = 75.6$

 $z =$ _____

3) $7.3y = 36.5$

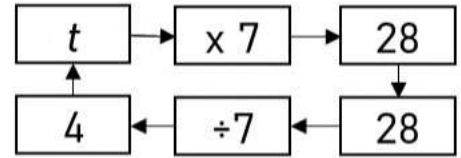
 $y =$ _____

Multiplying Equations – Flow Chart

Steps to fill in a flow chart:

- 1) Write the variable in the first box.
- 2) Write the second value in the second box.
- 3) Write the answer in the third box.
- 4) We are working in reverse now. Write the answer in the first box.
- 5) We do the opposite to the next box as we did with the second box.
- 6) Fill in the first box to find the value of the variable, which it points to.

Example: $7t = 28$



Instructions: Fill in the blank in the flow chart.

1) $4t = 12$			
2) $8r = 48$			
3) $5c = 35$			
4) $6b = 42$			
5) $9p = 72$			

Division – Are They Equal?

Are the equations equal? Put a slash through the equal sign for any equations that are not equal.

$8 \div 2 \neq 5$

$9 \div 3 = 3$

$15 \div 3 \neq 3$

Part 1

Put a slash through the equal sign ($\neq$) if it is not balanced.

1) $20 \div 4 =$	2) $45 \div 5 = 9$	3) $36 \div 4 = 8$
4) $48 \div 4 =$	5) $27 \div 3 = 9$	6) $35 \div 7 = 5$
7) $55 \div 5 = 11$	8) $8 \div 2 = 4$	9) $42 \div 7 = 6$
10) $110 \div 11 = 10$	11) $18 \div 2 = 9$	12) $24 \div 6 = 4$

Part 2

Fill in the missing number to balance the equation.

1) $42 \div 6 =$	2) $49 \div 7 =$	3) $24 \div 4 =$
4) $28 \div$ $= 4$	5) $18 \div$ $= 3$	6) $32 \div$ $= 4$
7) $\div 5 = 8$	8) $\div 8 = 7$	9) $\div 4 = 4$
10) $63 \div 7 =$	11) $48 \div$ $= 4$	12) $\div 8 = 9$

Exit Cards

Cut Out

Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Put a slash through the equal sign if it is not balanced.

1) $144 \div 12 = 14$

2) $210 \div 14 = 15$

3) $96 \div 8 = 9$

4) $192 \div 16 = 15$

Name: _____

Put a slash through the equal sign if it is not balanced.

1) $144 \div 12 = 14$

2) $210 \div 14 = 15$

3) $96 \div 8 = 9$

4) $192 \div 16 = 15$

Name: _____

Put a slash through the equal sign if it is not balanced.

1) $144 \div 12 = 14$

2) $210 \div 14 = 15$

3) $96 \div 8 = 9$

4) $192 \div 16 = 15$

Name: _____

Put a slash through the equal sign if it is not balanced.

1) $144 \div 12 = 14$

2) $210 \div 14 = 15$

3) $96 \div 8 = 9$

4) $192 \div 16 = 15$

Division – Find the Variable

A **variable** is a letter that represents an unknown number. When we don't know a number, we can use a letter to take the place of the unknown number.

Example: $27 \div n = 3$

We can figure out the unknown number by balancing the equation: $n = 9$.

Part 1 Find out the value of the variable.

1) $50 \div n = 7$ $n =$	2) $n \div 8 = 3$ $n =$	3) $s \div 4 = 3$ $s =$
4) $32 \div 4 = p$ $p =$	5) $28 \div p = 4$ $p =$	6) $56 \div r = 8$ $r =$
7) $42 \div n = 6$ $n =$	8) $8 \div n = 2$ $n =$	9) $t \div 11 = 7$ $t =$
10) $81 \div n = 9$ $n =$	11) $12 \div 8 = t$ $t =$	12) $63 \div 9 = p$ $p =$
13) $64 \div n = 8$ $n =$	14) $63 \div n = 7$ $n =$	15) $56 \div s = 7$ $s =$
16) $28 \div s = 4$ $s =$	17) $12 \div 4 = s$ $s =$	18) $5 \div n = 5$ $n =$

Part 2 Calculate the area using the variables for length and width.

Servers at a restaurant share tips (t) equally at the end of the day. The number of people that share the tips depends on how many servers (s) were working. We can use a formula to find out how much money (m) each server takes home: $m = t \div s$

$t = 150$ $s = 5$	$m = 150 \div 5$	$m = 30$
$t = 80$ $s = 4$	$m = \div$	$m =$
$t = 200$ $s = 5$	$m = \div$	$m =$

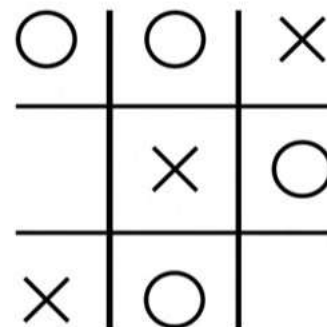
$t = 180$ $s = 3$	$m = \div$	$m =$
$t = 280$ $s = 7$	$m = \div$	$m =$
$t = 440$ $s = 4$	$m = \div$	$m =$

Math Tic-Tac-Toe: Solving Variables

Objective

What are we learning about?

To help students practice solving division equations involving variables in a fun and interactive way through a Tic-Tac-Toe game.



Materials

What you will need for the activity.

- Tic-Tac-Toe grid provided

Instructions

How you complete the activity

1. Find a partner to play the game.
2. The goal is to solve and balance the algebraic equation in each square to place your marker (X or O).
3. One player will be "X" and the other will be "O".
4. Take turns choosing a square and solving the equation in that square to find the value of the variable.
5. Write down the solution below the equation and place your marker (X or O) in the square.
6. If a player chooses a square and solves the equation incorrectly, they do not get to place their marker in that square. The other player gets a chance to solve it correctly and place their marker.
7. The first player to get three markers in a row (horizontally, vertically, and diagonally) wins the game. Continue playing with different tic-tac-toe grids on the sheet.

Tic-Tac-Toe

Use the following tic-tac-toe grids for the game.

$96 \div t = 12$	$64 \div 8 = x$	$y \div 5 = 6$
$45 \div 9 = z$	$84 \div 12 = t$	$k \div 11 = 4$
$p \div 6 =$	$\div x = 9$	$30 \div y = 5$

$120 \div p = 15$	$56 \div 8 = x$	$y \div 4 = 8$
$32 \div 8 = z$	$99 \div 11 = t$	$k \div 12 = 3$
$144 \div t = 12$	$80 \div x = 10$	$p \div 5 = 8$

$81 \div k = 9$	$108 \div x =$	$3 \div y = 6$
$50 \div 5 = z$	$33 \div 11 = t$	$k \div 8 =$
$72 \div t = 8$	$90 \div x = 9$	$p \div 10 = 4$

$144 \div p = 12$	$63 \div 7 = x$	$y \div 9 = 7$
$36 \div 6 = z$	$110 \div 10 = t$	$k \div 5 = 9$
$150 \div t = 10$	$56 \div x = 8$	$p \div 8 = 9$

$36 \div a + 7 = 13$	$90 \div b - 5 = 4$	$c \div 3 + 8 = 14$
$40 \div d + 6 = 14$	$84 \div e - 2 = 5$	$f \div 12 + 1 = 9$
$49 \div g - 4 = 3$	$75 \div h + 3 = 10$	$i \div 5 - 2 = 4$

$60 \div j + 4 = 10$	$108 \div k - 3 = 9$	$l \div 6 + 5 = 13$
$45 \div m + 7 = 14$	$64 \div n - 4 = 4$	$o \div 8 + 2 = 10$
$81 \div p - 5 = 4$	$100 \div q + 2 = 12$	$r \div 4 - 3 = 5$

Name: _____

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Curriculum Connection
P7.2**Tic-Tac-Toe**

Use the following tic-tac-toe grids for the game.

$66 \div r + 5 = 11$	$100 \div s - 8 = 2$	$t \div 25 + 2 = 6$
$42 \div u + 4 = 10$	$72 \div v - 6 = 3$	$w \div 8 + 5 = 14$
$55 \div x - 3 = 10$	$99 \div y + 2 = 10$	$z \div 6 - 2 = 5$

$81 \div j + 6 = 15$	$48 \div k - 2 = 6$	$y \div 4 + 7 = 16$
$54 \div l + 5 = 14$	$96 \div m - 3 = 9$	$n \div 12 + 1 = 7$
$60 \div o - 4 = 6$	$36 \div p + 2 = 8$	$q \div 9 - 3 = 2$

$72 \div a + 5 = 17$	$99 \div b = 5$	$63 \div c + 4 = 10$
$56 \div d - 3 = 4$	$108 \div e + 2 = 11$	$f \div 7 + 6 = 10$
$63 \div g - 4 = 5$	$90 \div h + 3 = 12$	$i \div 5 - 1 = 5$

$104 \div k - 2 = 10$	$75 \div 5 + x = 20$	$y \div 10 + 3 = 12$
$64 \div l + 8 = 16$	$121 \div 11 - 2 = 9$	$k \div 9 + 5 = 10$
$45 \div m + 9 = 18$	$84 \div n = 7$	$p \div 6 + 2 = 13$

$135 \div s + 5 = 14$	$56 \div t - 2 = 5$	$u \div 7 + 4 = 10$
$99 \div v - 3 = 6$	$48 \div w + 2 = 8$	$x \div 4 - 1 = 7$
$63 \div y + 5 = 14$	$72 \div z - 4 = 2$	$a \div 6 + 3 = 12$

$84 \div j + 4 = 11$	$120 \div k - 8 = 16$	$l \div 8 + 5 = 15$
$108 \div m - 6 = 3$	$75 \div n + 2 = 17$	$o \div 5 - 1 = 6$
$66 \div p + 3 = 12$	$96 \div q - 7 = 1$	$r \div 16 + 3 = 7$

Writing Division Equations - Sharing

Riley is the best boss! Every week, she brings in treats for her staff to share. Each week, there are different treats and a different number of staff members working at the office.



Questions

Use a formula to find out how many treats (t) each person gets.

#		# of Staff	Formula	Answer
1	16 donuts (d)	8	$\frac{d}{s} = t$	$\frac{16}{8} = 2$
2	12 cookies (c)	6	$\frac{c}{s} = t$	$\frac{12}{6} = 2$
3	24 muffins (m)	4		
4	60 slices of pizza (p)	20		
5	42 bagels (b)	7		
6	36 donuts (d)	12		
7	40 cookies (c)	10		
8	56 muffins (m)	8		
9	27 pastries (p)	9		
10	54 cookies (c)	6		
11	55 slices of pizza (p)	11		
12	60 bagels (b)	15		
13	48 muffins (m)	12		

Division Equations – Flow Chart



Instructions

Fill in the blank in the flow chart.

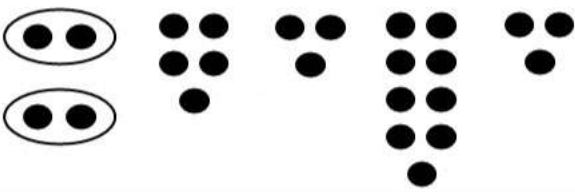
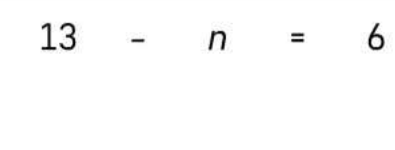
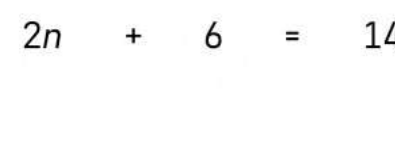
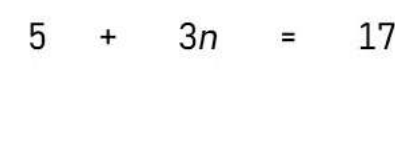
1) $\frac{t}{4} = 4$	t $\div 4$ 4 16 $\times 4$ 4	7) $\frac{t}{11} = 7$	
2) $\frac{r}{6} = 8$		8) $\frac{r}{8} = 9$	
3) $\frac{c}{3} = 9$		9) $\frac{c}{7} = 7$	
4) $\frac{b}{8} = 7$		10) $\frac{b}{12} = 4$	
5) $\frac{p}{4} = 9$		11) $\frac{p}{6} = 8$	
6) $\frac{n}{7} = 3$		12) $\frac{n}{9} = 5$	

Equivalent Forms of an Equation

When we add or subtract the same amount from both sides of an equal sign, the equation does not change. This is called **preservation of equality**.

Instructions

Draw circles to represent the equations.

#	Original Equation	Change	New Equation
1	$5 = 9$ 	Add 3	$2n + 5 + 3 = 9 + 3$ 
2	$7 + n = 9$ 		
3	$13 - n = 6$ 	Add 3	
4	$2n + 6 = 14$ 	Subtract 5	
5	$5 + 3n = 17$ 	Add 7	

Equivalent Forms of an Equation

Instructions

Write four equivalent forms of the equations below.

#	Original Equation
1	$5n = 20$
	Add _____ to each side
	Subtract _____ from each side
	Multiply each side by _____
	Divide each side by _____

#	Original Equation
2	$3x - 11 = 2$
	Add 6 to each side
	Subtract 11 from each side
	Multiply each side by 2
	Divide each side by 7

#	Original Equation
3	$7n - 8 = 34$
	Add 25 to each side
	Subtract 20 from each side
	Multiply each side by 4
	Divide each side by 2

Equivalent Forms of an Equation

When we change an equation by adding, subtracting, multiplying, and dividing the same amount from both sides, does the equation change? Investigate below!

Instructions

Fill in the table below.

#	Original Equation	Change	New Equation
1	$5n + 8 = 20$ $n =$	Add 8 to each side	$5n + 8 = 20 + 8$ $n = 4$
2	$18 - 6 =$	Add 6 to each side	
3	$15 + n = 3$ $n =$	Subtract 15 from each side	
4	$6n = 18$ $n =$	Multiply each side by 2	
5	$4n = 24$ $n =$	Divide each side by 4	
6	$52 - n = 38$ $n =$	Subtract 15 from each side	
7	$68 + n = 93$ $n =$	Add 14 to each side	
8	$5n = 50$ $n =$	Multiply each side by 5	
9	$2n = 24$ $n =$	Divide each side by 2	

Representing Equivalent Equations – Balance Scale

Blocks are placed on a balance scale. Some of the blocks on the left side of the scale are put in a bag before being placed on the scale. Use b to represent 'bag' in your equation.

Instructions

Write 2 different equations for each pictorial representation.

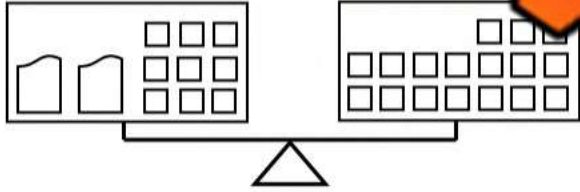
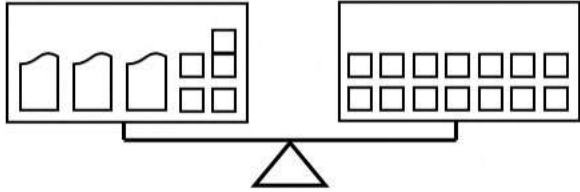
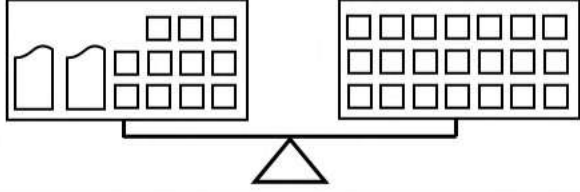
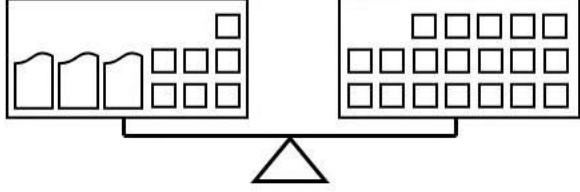
#	Pictorial Representation	Equation # 1	Equation # 2
Ex)		$b + 8 = 14$	$2b + 2 = 14$
1)			
2)			
3)			
4)			
5)			

Representing Equivalent Equations – Balance Scale

Blocks are placed on a balance scale. Some of the blocks on the left side of the scale are put in a bag before being placed on the scale. Use b to represent 'bag' in your equation.

Instructions

Write 2 different equations for each pictorial representation.

#	Pictorial Representation	Equation # 1	Equation # 2
1)		$b + 8 = 14$	$2b + 2 = 14$
2)			
3)			
4)			
5)			
6)			

Name: _____

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Matching Game: Do The Variables Match?

Objective

What are we learning about?

To enhance students' understanding of equivalent variables. Students will identify and match pairs of equations where the variable yields the same value, fostering critical thinking and problem-solving skills in a collaborative group setting.

Materials

What will you need for the activity.

- Pre-prepared pre-cut matching cards
- Small bags or envelopes to hold the cards for each group

Instructions

How you will complete the activity

1. Before the class, the teacher will cut out the pre-prepared matching game cards.
2. Divide the students into small groups and give each group a bag or envelope containing a set of the matching cards.
3. In their groups, students will spread out the cards face down on their table.
4. Each person takes a turn to try to match two cards. They will need to solve both equations to see if they match (equal the same).
5. If they find a correct match, they keep the cards out and continue with their next turn. If the cards don't match, they turn them back over in the same place, and the next player takes a turn.
6. The activity continues until all pairs are correctly matched within each group.



Cards

Matching Game Cards

$$x + 3 = 7$$

$$2x - 1 = 7$$

$$4y + 1 = 15$$

$$2y + 1 = 11$$

$$2z + 1 = 11$$

$$3z + 2 = 13$$

$$3w - 2 = 16$$

$$5w - 7 = 23$$

$$x + 6 = 20$$

$$2x - 4 = 24$$

Cards

Matching Game Cards

$$5y - 10 = 25$$

$$3y - 2 = 19$$

$$2z - 10 = 18$$

$$4z - 10 = 18$$

$$4w - 6 = 22$$

$$2w - 8 = 22$$

$$x + 8 = 26$$

$$2x - 10 = 26$$

$$4y - 7 = 29$$

$$2y + 11 = 29$$

Cards

Matching Game Cards

$$2z - 1 = 15$$

$$4z - 17 = 15$$

$$5w - 3 = 39$$

$$4w + 5 = 37$$

$$x - 4 = 12$$

$$5x - 4 = 76$$

$$2y + 1 = 23$$

$$3y - 10 = 23$$

$$3z - 2 = 19$$

$$5z - 16 = 19$$

Name: _____

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Curriculum Connection
P7.2

Cards

Matching Game Cards

$$4w + 1 = 37$$

$$3w + 10 = 37$$

$$5x - 4 = 166$$

$$5x - 4 = 166$$

$$2y - 1 = 29$$

$$4y - 31 = 29$$

$$3z + 4 = 31$$

$$5z + 2 = 47$$

$$4w - 8 = 36$$

$$2w + 14 = 36$$

Using Linear Equations and Pictorial Representations

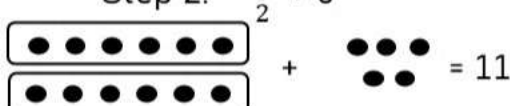
Instructions Write a pictorial representation and linear equation of the example.

#	Real-World Example	Linear Equation	Pictorial Representation
Ex)	Kennedy has 25 socks. She has an equal number of black and white socks that she keeps in 2 piles. She randomly coloured some of the socks. How many socks are in each pile?	$2p + 7 = 25$ $p = 9$	
1)	Sally brought 25 books to school and gave 7 to all her friends. She gave the same number of books to each of her friends. How many friends did she give books to?		
2)	Harley earned \$42 from her job today after she worked for 2 hours. She received a \$10 tip as part of the \$42. What does Harley earn per hour at her job?		
3)	You paid \$15 for admission to the movies. Snacks were \$4 each. If you spent \$27 in total, how many snacks did you buy?		
4)	In a basketball game, Henry scored 23 points. This was 5 more than double the points he scored last game. How many points did he score last game?		
5)	Katie and Sam went on an Easter egg hunt. Katie found 24 eggs. Katie found 3 times more eggs than Sam. How many eggs did Sam find?		

Representing Linear Equations – $ax/b + c = d$

Instructions

Write a pictorial representation of the linear equations provided.

#	Linear Equation ($ax/b + c = d$)	Pictorial Representation
Ex)	$\frac{4 \times 3}{2} + 5 = d$	Step 1: 4×3  Step 2: $\frac{12}{2} + 5$ 
1)	$\frac{5 \times 2}{2} + 3 = d$	Step 1: 5×2 Step 2: $\frac{10}{2} + 3$ + =
2)	$\frac{3 \times 6}{2} + 4 = d$	Step 1: 3×6 Step 2: $\frac{18}{2} + 4$ + =
3)	$\frac{4 \times 5}{4} + 6 = d$	Step 1: 4×5 Step 2: $\frac{20}{4} + 6$ + =

Representing Linear Equations – $ax/b + c = d$

Instructions

Write your own linear equation and represent it pictorially.

#	Linear Equation ($ax/b + c = d$)	Pictorial Representation
1)		Step 1: _____
		Step 2: _____
2)		Step 1: _____
		Step 2: _____
3)		Step 1: _____
		Step 2: _____
4)		Step 1: _____
		Step 2: _____

Representing Linear Equations – $ax/b + c = d$

Instructions Represent the problems with linear equations ($ax/b + c = d$) and solve for d.

Ex)	Jake and 3 friends are going on a trip in a rental car. Jake said he would pay for the base cost of the rental car, which was \$100. For every km they drive, they are charged \$1. The 4 friends will split this cost. If they drive 100 km, how much will Jake owe?	
	$a = \text{km driven (100 km)}$ $x = \text{cost per km driven (\\$1)}$ $b = \text{who will split the cost of km driven (4 people)}$ $c = \text{extra cost only Jake will pay (\\$100)}$	
	Linear Equation	$\frac{100 \times 1}{4} + 100 = 125$

1)	Fiona and 3 friends are going to a movie theatre. Fiona said she would pay the base entrance fee, which was \$6. Every time they play, they are charged \$10. The 4 friends will split this cost. If they decide to buy 10 snacks, how much will Fiona owe?	
	Linear Equation	

2)	Brian and 2 friends are going to a movie theatre that charges a group admission fee. Brian agreed to pay the group admission fee, which is \$30. Each additional snack they purchase costs \$6. The 3 friends will split this cost. If they decide to buy 9 snacks, how much will Brian owe?	
	Linear Equation	

Representing Linear Equations – $ax/b + c = d$

Instructions

Represent the problems with linear equations ($ax/b + c = d$) and solve for d .

1)

Carla and 4 friends are going to an amusement park. Carla said she would pay for the base entrance fee, which was \$50. For every ride they go on, they are charged \$2. The 5 friends will split this cost. If they go on 10 rides, how much will Carla owe?



Linear Equation

2)

David and 3 friends are going to a bowling alley. David agreed to pay the base cost for renting the lane, which is \$40. For every game they play, they are charged \$8. The 4 friends will split this cost. If they play 4 games, how much will David owe?



Linear Equation

3)

Emily and 2 friends are going to a karaoke night. Emily said she would pay the base reservation fee for the room, which was \$15. For every song they sing, they are charged \$5. The 3 friends will split this cost. If they sing 6 songs, how much will Emily owe?



Linear Equation

Representing Linear Equations ($x + a = b$)

Questions

Write a pictorial representation of the linear equations provided.

#	Linear Equation ($x + a = b$)	Pictorial Representation
Ex)	$x + 8 = 15$ $x = 7$	 $7 + 8 = 15$
1)	$x + \dots = \dots$ $x = \dots$	
2)	$x + 6 = 12$ $x = \dots$	
3)	$x + 15 = 42$ $x = \dots$	
4)	$x + 6 = 35$ $x = \dots$	
5)	$x + 22 = 37$ $x = \dots$	
6)	$x + 12 = 31$ $x = \dots$	
7)	$x + 17 = 33$ $x = \dots$	

Exit Cards

Cut Out

Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Write a pictorial representation of the linear equation provided. And calculate n .

$$14 + n = 45$$

Name: _____

Write a pictorial representation of the linear equation provided. And calculate n .

$$14 + n = 45$$

Name: _____

Write a pictorial representation of the linear equation provided. And calculate n .

$$14 + n = 45$$

Name: _____

Write a pictorial representation of the linear equation provided. And calculate n .

$$14 + n = 45$$

Representing Problems with Linear Equations ($x + a = b$)**Instructions**Represent the problems with linear equations ($x + a = b$) and solve for x .

1)

Camila had some markers and then bought 24 more. Now she has 56 markers. How many markers did she have before she bought more?

Linear equation: _____

 $x =$ _____

2)

Carter had some money in his bank account last year and has been adding to it. Today he added \$15 and now has \$50. How much did he have before?

Linear equation: _____

 $x =$ _____

3)

Mia tracks how many steps she takes each day. In the afternoon, she had taken a lot of steps. From noon until the end of the day, she took 7,340 steps. In total, she took 16,340 steps for the day. How many steps did she take before noon?

Linear equation: _____

 $x =$ _____

4)

Caleb scored a bunch of points in the first half of a basketball game. In the second half, he only had 7 points. At the end of the game, he finished with 31 points. How many points did he score in the first half?

Linear equation: _____

 $x =$ _____

Representing Problems with Linear Equations ($x + a = b$)**Instructions**Represent the problems with linear equations ($x + a = b$) and solve for x .

1)

Nick's new business sold quite a few products in May. In June, they sold 572 products. In May and June combined, they sold 931 products. How many products did Nick's business sell in May?

 $x =$ 

2)

Daniel drove to a friend's house who lives far away. He drove for awhile this morning before stopping for gas. He then drove another 362km before arriving at his friend's house. He was 710km away. How far did he drive before stopping?

Linear equation: _____

 $x =$ 

3)

Jenny has a total of \$75 in her wallet. She just received her allowance of \$30. How much money did she have in her wallet before receiving her allowance?

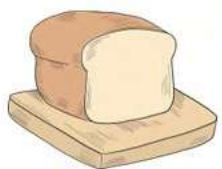
Linear equation: _____

 $x =$ 

4)

A bakery has 45 loaves of bread in stock. They just baked an additional batch of 12 loaves. How many loaves of bread did the bakery have in stock before baking the new batch?

Linear equation: _____

 $x =$ 

Representing Problems with Linear Equations ($x + a = b$)**Instructions**Represent the problems with linear equations ($x + a = b$) and solve for a .

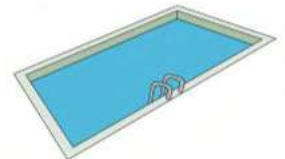
1)

Samantha has \$50 in her wallet. She wants a total of \$145 to buy a new pair of shoes. How much more money does she need to reach her goal?

 $a =$

2)

A swimming pool currently has 1952 litres of water. The pool needs to be filled to a capacity of 5000 litres. How many more litres of water are required to fill the pool to capacity?



Linear equation:

 $a =$

3)

A factory has produced 300 toys so far. It wants to produce 450 toys by the end of the day. How many more toys does it need to produce to meet their target?



Linear equation:

 $a =$

4)

A charity has received 1750 cans of food during a food drive. Their goal is to collect 3500 cans. How many more cans do they need to reach their goal?



Linear equation:

 $a =$

Representing Problems with Linear Equations ($x + a = b$)

Instructions

Represent the problems with linear equations ($x + a = b$) and solve for b .

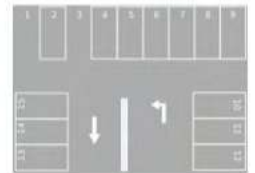
1)

A movie theatre has 62 seats. They add 30 more seats to accommodate more viewers. How many seats will the movie theatre have in total after adding the new seats?

 $b =$

2)

A parking lot has 75 parking spaces. The management decides to expand the parking area and add 25 more parking spaces. How many parking spaces will the parking lot have in total after adding the new spaces?



Linear equation:

 $b =$

3)

A farmer has 88 apple trees in his orchard. He decides to plant 40 more apple trees to increase his production. How many apple trees will the farmer have afterwards?



Linear equation:

 $b =$

4)

A public park has 113 benches for visitors to sit and relax. The park administration installs 25 more benches to accommodate more visitors. How many benches will the park have in total after installing the new benches?



Linear equation:

 $b =$

Algebraic Bottle Flip Challenge

Objective

What are we learning about?

To practice and reinforce understanding of representing and solving linear equations through an engaging and physically active bottle flip game.

Materials

What you will need for the activity.

- Plastic bottles (or pair/group) filled to approximately halfway with water (or use cups)
- Set of problem cards that can be represented with linear equations.



Instructions

How you will implement the activity

1. Start with a short lesson on representing and solving linear equations.
2. Arrange the students into pairs or small groups and give each group a bottle and a set of question cards to each.
3. Each pair or group receives an answer sheet to record their answers.
4. Explain the rules: One student draws a question card and tries to solve the subtraction algebra problem.
5. Once they believe they have the correct answer, they write it on their answer sheet.
6. The student then gets to attempt a bottle flip. After answering each question, the student gets only one flip. After they flip their bottle, they should keep track of successful flips and unsuccessful flips.
7. Alternate turns within each group or pair until they have completed all the question cards.
8. Groups or pairs tally their successful flips and compare with the rest of the class to determine the winning team (team with the most successful flips/correct answers). For incorrect answers, deduct a point from their successful bottle flips.
9. Go through the answer sheet with the class to ensure understanding and correct any misconceptions.
10. Discuss the strategies used to solve the linear equations and how this type of algebra is used in real-life situations.

Directions

Cut out the questions below and use for the game

$$x + 8 = 19$$

$$(5 * 6) / 2 + 3 = d$$

$$14 = 25$$

$$(3 * 6) / 2 + 4 = d$$

$$6 + 15$$

$$(6x) / 2 + 2 = 23$$

$$37 + a = 52$$

$$(4x) + 4 + 6 = 17$$

$$63 + a = 107$$

$$(7x) / 5$$

$$85 + 31 = b$$

$$(5 * 8) / b + 8 = 18$$

$$121 + 157 = b$$

$$(10 * 6) / 20 + c = 15$$

Directions

Cut out the questions below and use for the game

$$x + 78 = 115$$

$$(2 * 5) / 2 + 6 = d$$

$$124 = 205$$

$$(4 * 8) / 4 + 14 = d$$

$$126 + e = 28$$

$$(7x) / 4 + 12 = 26$$

$$317 + a = 522$$

$$(5x) / 2 + 6 = 21$$

$$263 + a = 425$$

$$(4x) / 5 + 1 = 11$$

$$183 + 316 = b$$

$$(5 * 11) / b + 8 = 19$$

$$341 + 213 = b$$

$$(12 * 8) / 6 + c = 31$$

Directions

Cut out the questions below and use for the game

A library has 45 fiction books. They receive more books, making the total 75 fiction books. How many new books did they receive?

Sarah and 5 friends are going to a trampoline park. Sarah agreed to pay the base entrance fee, which was \$30. For every hour they jump, they are charged \$3. The 6 friends will split this cost. If they jump for 3 hours, how much will Sarah owe?

A park has 28 benches. They add more benches, making the total 53 benches. How many benches were added?

Kevin and 3 friends are going to a museum. Kevin said he would pay the base ticket price, which was \$35. For every exhibit they view, they are charged \$3. The 4 friends will split this cost. If they view 10 exhibits, how much will Kevin owe?

A classroom has 10 desks. They add 15 more desks, making the total 25 desks. How many desks were added?

Alice and 5 friends are going to an ice skating rink. Alice agreed to pay the base entrance fee, which was \$25. For every hour they skate, they are charged \$2. The 6 friends will split this cost. If they skate for 5 hours, how much will Alice owe?

A bakery sells some cupcakes. They bake 121 more cupcakes, making the total 241 cupcakes. How many cupcakes did they bake?

Paul and 3 other friends are going to a theme park. Paul said he would pay the base entrance fee, which was c dollars. For every ride they went on, they were charged \$3. The 4 friends split this cost. They went on 8 rides and it cost Paul \$42. What is the value of c ?

A garden has 74 flowers. They plant more flowers, making the total 132 flowers. How many flowers did they plant?

Lisa and 3 friends are going to a water park. Lisa agreed to pay the base entrance fee, which was \$50. For every slide they go down, they are charged \$5. The 4 friends will split this cost. If they ride 12 slides, how much will Lisa owe?

A sports team has 16 players. They recruit more players, making the total 31 players. How many players were recruited?

Tom and 3 friends are going to a laser tag arena. Tom said he would pay the base fee for the game, which was c dollars. For every match they played, they were charged \$8. The 4 friends split this cost. They played 5 matches, and it cost Tom \$42. What is the value of c ?

A warehouse has some boxes. They receive 138 more boxes, making the total 333 boxes. How many boxes did they receive?

Grace and 4 friends are going to a paintball field. Grace agreed to pay the base entrance fee, which was \$40. For every game they play, they are charged \$6. The 5 friends will split this cost. If they play 7 games, how much will Grace owe?

Algebra Quiz - Equations

Part 1

Is the example an expression or equation? Circle your answer.

	Sentence	Answer
1)	$8n$	Expression Equation
2)		Expression Equation
3)	$8 + 4$	Expression Equation

	Sentence	Answer
4)	$11x + 12 = 26$	Expression Equation
5)	$\frac{28}{x} + 12 = 16$	Expression Equation
6)	$\frac{35}{x} + x$	Expression Equation

Part 2

Evaluate the following expressions for $x = 5$

1) $x - 10$	2) $9 - x$	3) $2x$	4) $x - 14$
5) $44 + x$	6) $67 + x$	7) $65 + x$	8) $x + 11$

Part 3

Evaluate the following expressions for $y = 8$

1) $5y$	2) $9y - 5$	3) $3y + 5$	4) $8y + 6$
5) $\frac{32}{y} + 8$	6) $\frac{64}{y} + y$	7) $\frac{24}{y} - 9$	8) $\frac{y}{y} \times y$

Part 4

Write the expressions using the values/operations below

6 8 2 n + x - $\div$

1) Six times a number, add two	
2) Eight divided by two, subtract a number	
3) A number multiplied by eight, add six	
4) Eight more than six divided by of a number	

Part 5

Write equations for each sentence.

	Equation	Answer
1) Seven less than a number is 5		
2) Twelve more than a number is 31		
3) Six times a number is 48		
4) Eighteen divided by a number is 3		

Part 6

Fill in the missing number to balance the equation.

1) + 12 = 95	2) + 25 = 50	3) = 66
4) 58 - = 45	5) 48 - = 39	6) 65 - = 55
7) 4 x = 44	8) x 6 = 30	9) 8 x = 48
10) 63 $\div$ 7 =	11) 48 $\div$ = 4	12) $\div$ 8 = 9

Part 7 Whoops, some golfers forgot to fill in their scores. Help them out!

Player	Round 1	Round 2	Final Score
Ruby	-4	-1	
Iris	-2		-5
Emery		-1	-6
Roy	-1		5
Sam	3		-3

Part 8 Which equation helps solve the problem.

- Jayce walks at an average speed of 4 km/h. He walked a total of 3 hours. What distance (d) did he walk?
- It snowed 3.2cm every hour. In total, it snowed 9.6cm. How many hours (h) did it snow?
- Ayden earns \$15.50 per hour working at a grocery store. He made \$93 today. How many hours (h) did he work?
- Zara bought a case with 4 cans of tomato soup. The case has 4.8L of soup in total. How many litres (l) are in each can?



Part 9

Write four equivalent forms of the equation below.

Original Equation	
$3n + 5 = 20$	
Add 4 to each side	
Subtract 8 from each side	
Multiply each side by 4	
Divide each side by 5	

Part 10

Represent the problems with linear equations ($ax/b + c = d$) or $x + a = b$

1)	Julia and Zane are at a virtual reality gaming centre. Julia said she would pay the set rental, which was \$20. For every hour they play, they are charged \$15. The friends will split this cost. If they play for 4 hours, how much will they pay?
	Linear Equation

2)	Samuel had some books on his shelf and then received 4 more as a gift. He now has 56 books on his shelf. How many books did he have before the gift?
	Linear Equation

3)	Nina had a collection of stickers and then received 82 more as a gift. Now she has 156 stickers in total. How many stickers did she have in her collection before she received the gift?
	Linear Equation