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Google Slides Lessons Preview





Manitoba 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 recognize and describe increasing number patterns using addition and multiplication to understand how numbers grow and change.

Increasing Patterns - Addition

Increasing Patterns											
+10	+10	+10	+10	+10		+5	+5	+5	+5		
^	^	^	^	^		^	^	^	^		
10	20	30	40	50	60	3	8	13	18	23	28

Determine the pattern rule and fill in the blanks in the increasing pattern.

1) 17, 24, 31, _____, _____, _____	2) 56, 65, 74, _____, _____, _____
3) 124, 129, 134, _____, _____, _____	4) 318, 323, 328, _____, _____, _____
5) 448, 458, 468, _____, _____, _____	6) 590, 596, 602, _____, _____, _____

Part 2 – Action!

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

Part 3 – Consolidation!

- Exit Cards
- Quizzes
- Reflection
- And More!

Consolidation – Multiple-Choice Questions

Drag the checkmark to answer the following multiple-choice questions about the topic.

1) Which pattern is increasing, but not by a constant amount each time?		2) The pattern 4, 9, 14, 19, 24 can be described by which rule?		3) Which statement best describes how these two patterns grow? Pattern A: 6, 9, 12, 15, 18 Pattern B: 6, 12, 24, 48, 96	
1) 10, 12, 14, 16, 18		1) Start at 4 and multiply by 5 each time		1) Both patterns increase by adding the same number each time	
2) 1, 2, 4, 8, 16		2) Start at 9 and add 4 each time		2) Pattern A increases by multiplication; Pattern B increases by addition	
3) 3, 6, 9, 12, 15		3) Start at 4 and add 4 each time		3) Pattern A increases by addition; Pattern B increases by multiplication	
4) 30, 25, 20, 15, 10		4) Start at 4 and add 5 each time		4) Both patterns increase by multiplying by the same number each time	



Manitoba Math Curriculum Patterns & Relations – Grade 7

Decreasing Pattern Rules

Fill in the boxes and blanks to complete the patterns by figuring out the pattern rules.

#	PATTERN	RULE
1)	420 400 380	Start at _____, then subtract _____ each time
2)	335 320 305	Start at _____, then subtract _____ each time
3)	222 215 208	Start at _____, then subtract _____ each time
4)	504 490 476	Start at _____, then subtract _____ each time
5)	626 617 608	Start at _____, then subtract _____ each time

Use the following to complete the decreasing patterns below.

1)	24.16	24.11	24.06	24.01				
2)	119.55	119.30	119.05					
3)	215.22	215.11	215.00					
4)	386.93	385.88	384.83					

Use the algebraic expression to fill in the tables.

$3x + 5$	
Term Number	Term Value
0	
1	
2	
3	
4	
12	

$6x - 4$	
Term Number	Term Value
1	
2	
3	
4	
5	
15	

$20 \div x + 7$	
Term Number	Term Value
1	
2	
3	
4	
5	
10	

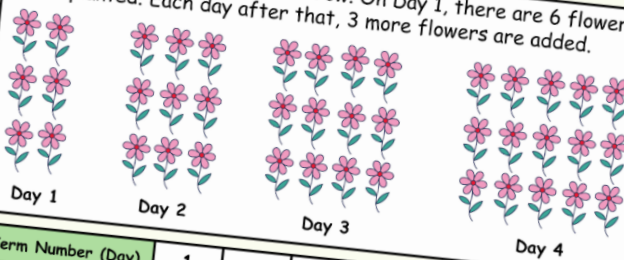


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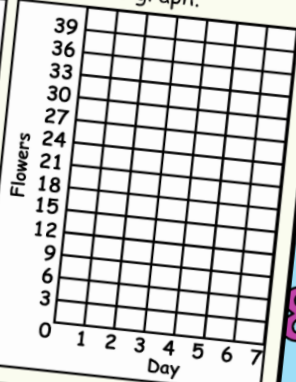
Graphing Increasing Patterns

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

A gardener plants flowers in a row. On Day 1, there are 6 flowers planted. Each day after that, 3 more flowers are added.

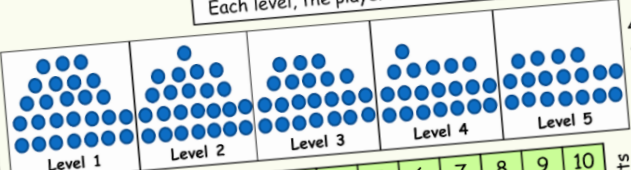


Term Number (Day)	1	2	3	4	5	9	15
Term Value (Flowers)							



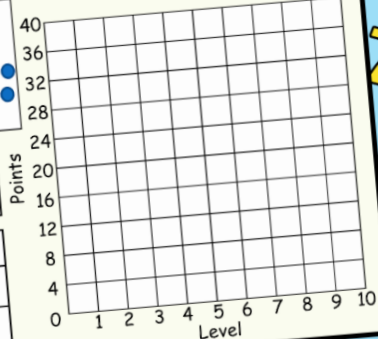
Word Problems - Decreasing Patterns

Sketch the next 2 terms. Complete the table and answer the questions below.
A video game player loses points during a challenge.
Each level, the player loses more points than in the level before.

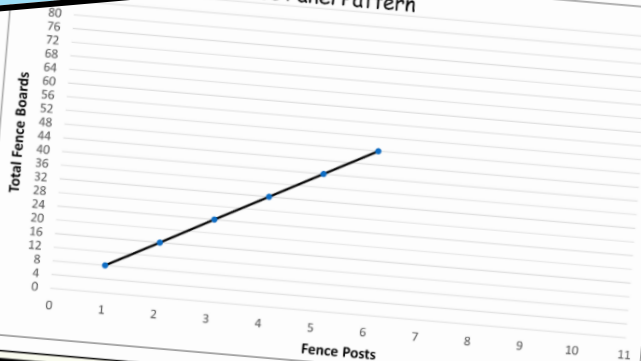


Term Number (Level)	1	2	3	4	5	6	7	8	9	10
Term Value (Points)										

- Describe the pattern rule:
- How many points will he lose in the 10th round?
- How many points will he lose in the 12th round?



Fence Panel Pattern



Term Number	Term Value
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	



Workbook Preview



Grade 7 Patterns

	Curriculum Expectations	Pages That Cover the Expectations
PR.1	Demonstrate an understanding of oral and written patterns and their equivalent linear relations	20 – 32, 39 – 40, 42 – 43, 45 – 46, 48 – 51, 53
P	Preview of 50 pages from this product that contains 230 pages total.	

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.

Part 1

Is Jeffrey describing the recursive or functional relationship?

	Pattern					Jeffrey's Description	Recursive or Functional
1)	x	1	2	3	4	The pattern goes up by 3 each time.	
	y	5	8	11	14		
2)	x	10	20	30	40	Each term number is multiplied by 10	
	y	100	200	300	400		
3)	x	1	2	3	4	Each term number is multiplied by 4 and 1 is added	
	y	5	9	13	17		
4)	x	1	2	3	4	The pattern goes up by 3	
	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		

Pattern Rule - Input/Output Tables

Questions

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 $x + 2$
1	
4	
6	
8	
10	

In x	Out $20 + x$
1	
3	

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

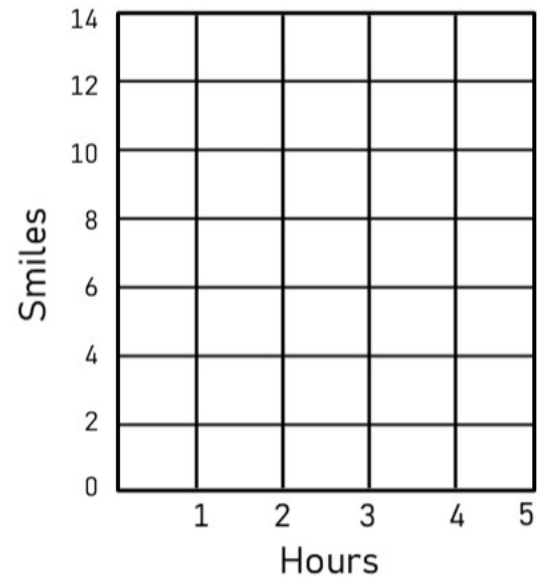
In p	Out $10p - 12$
3	
6	
9	
12	
15	

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

Graphing Shrinking Patterns

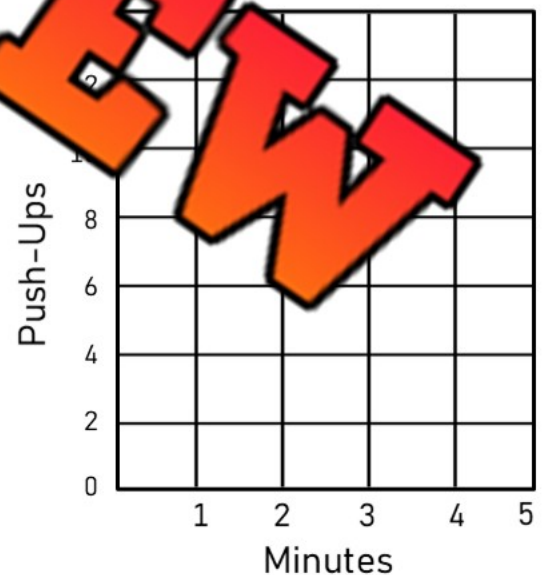
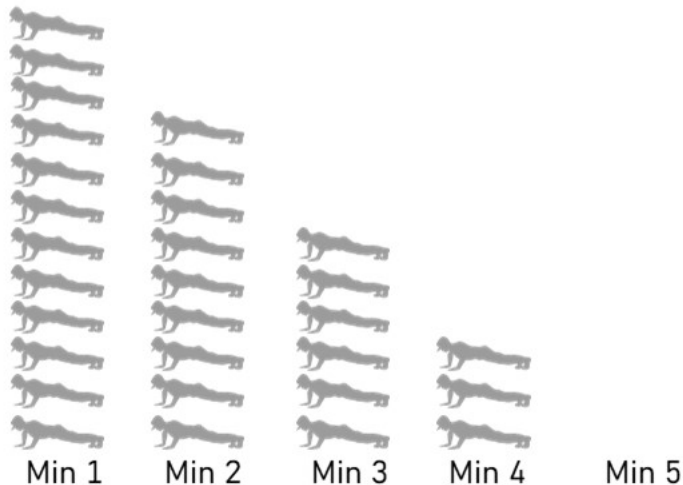
Questions Translate each shrinking pattern into a table of values and a line graph

1) Jane kept track of how many times she smiled in an hour



Term Number				
Term Value				

2) Sam counted how many push-ups he could do every minute for 5 minutes.



Term Number					
Term Value					

Shrinking Patterns

Questions

How many total blocks are in each term. Sketch the next 2 terms

1)

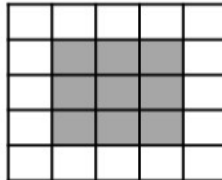
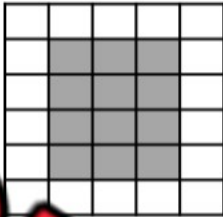
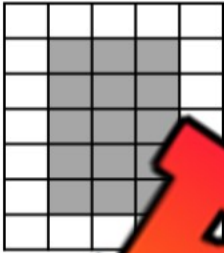


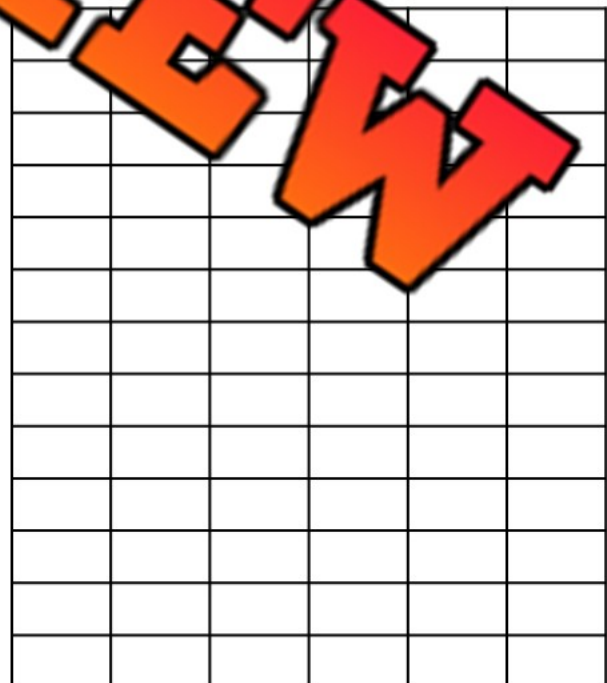
Figure Number	3	4	5	6
Number of grey blocks				
Number of white blocks				
Number of total blocks				

1) Describe the pattern rule for the total blocks?

2) Describe the pattern rule for the white blocks?

3) Describe the pattern rule for the grey blocks?

Total Blocks



1 2 3 4 5

Figure Number

Writing Algebraic Expressions



Practice

Answer the questions 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 made 20 sales the week, how much money did he make? Write the expression and the answer.	
d)	Blake earned \$100 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 home. 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?	

Uncovering the Relation Between Variables

When we discover a pattern between two things (variables), we need to identify the term number and the term value.

Example: determine the number of students and adults in a school if there are 20 times more students than adults.

Clues

- There are two terms to quantify – students and adults
- There are 20 times more students than adults, so the number of students is adults $\times$ 20
- We can use adults as the term number. The letter a will represent the number of adults
- The number of students is the term value. The letter s will represent the number of students
- The relation is $s = 20a$ or $30a = s$

Scenarios Write the relations for each of the scenarios below

		Relation
Ex.	The number of chairs in a room if there is 1 chair (c) for every 1 student (s)	$c = s$
1)	The number of wheels present in a collection of cars if each car has 4 wheels	
2)	The number of pencils there are in class if each student has 3 pencils each	
3)	The number of shoes that are in your class if each student has 2 shoes	
4)	How many total cans collected for a food drive in a school if each class brings on average 25 cans	
5)	The number of students absent today if there is always 1 person absent for every 10 students in a class	

Your Turn Write your own scenarios and the relation that solves the problem

	Scenario	Relation
1)		
2)		

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.

Questions

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

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

Hour	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 a 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	3	4	5	6	7
Money Earned (\$)	105	210	315	420		715	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 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: _____

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	225	240	340	400	460
y	125	150	175	275	325
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					

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 20 th term?				
c) How many shapes will be in the 100 th term?				
d) How many rectangles will be in the 100 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?				

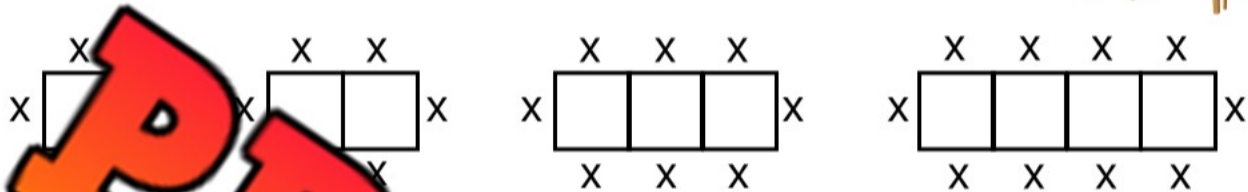
Picnic Word Problem - T-Tables

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 for 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 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?



Name: _____

45

Curriculum Connection
PR.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

Questions

Fill in the blanks below using the pattern rule

1) Start at 0, add 2 each time

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

2) Start at _____, 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

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

Pattern Rule - Input/Output Tables - Integers

Questions

Fill in the input/output tables below

In n	Out $n + (-3)$
1	
2	
3	
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 $x + (-5)$
4	
6	
8	
10	

In x	Out $x + 11$
-1	
-3	

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	

Pattern Using Negative Integers - Olivia's Money

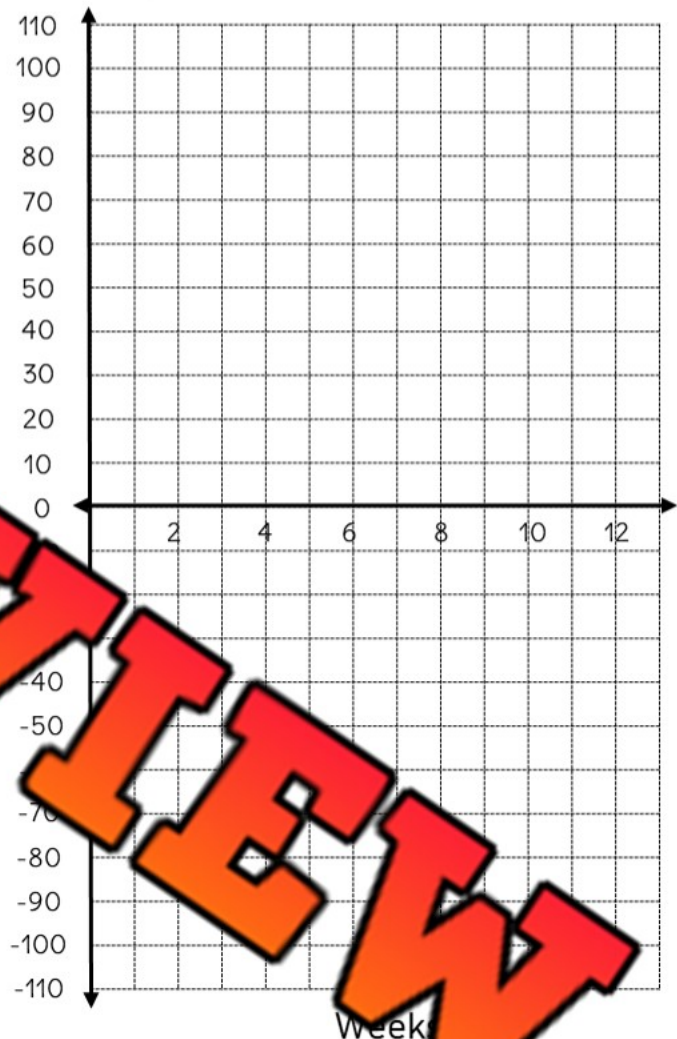
Questions

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 (Week)	Term Value (Olivia's 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.

Integer Patterns - Average Temperatures

Questions

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 August?

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?



Algebra Quiz - Patterning

Part 1

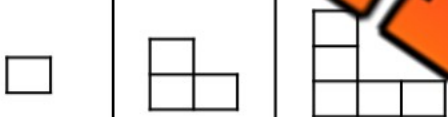
Is Anna describing the recursive or functional relationship?

	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	7	10	13	16		
2)	x	1	2	3		The y variable has 15 added each time	
	y	5	20	35			

Part 2

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

1)



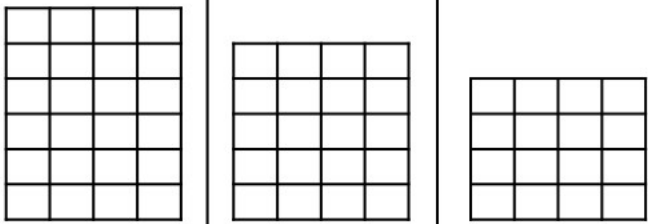
1) Describe the recursive relationship between the number of blocks.

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.

Grade 7

Variables and Equations

	Curriculum Expectations	Pages That Cover the Expectations
PR.3	Demonstrate an understanding of preservation of equality by: • modelling the preservation of equality, concretely, pictorially and symbolically • applying the preservation of equality to solve equations.	69 – 102
PR.4	Explain the difference between an expression and an equation	59 – 60
PR.5	Evaluate an expression, given the value of the variable(s)	61 – 68
PR.6	Model and solve, concretely, pictorially and symbolically, problems that can be represented by one-step linear equations of the form $x + a = b$, where a and b are integers.	
PR.7	Model and solve, concretely, pictorially and symbolically, problems that can be represented by linear equations of the form: • $ax + b = c$ • $ax = b$ • $=x b$ where a, b and c are whole numbers.	104 – 106, 108 – 111

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 pattern has the following rule: $n \times 3 - 1$	Equation	Expression
3) Maria wants to run this week. She has already run 22km. $22 + n$	Equation	Expression
4) The cost to enter an amusement park is \$20 per ticket. $20 \times n$	Equation	Expression
5) Jeff works at a garden centre and earns \$15 an hour. He can figure out his pay by using the following: $h \times 15$	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

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 statement

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.

Questions

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: $y - 27$



2) Courtney bakes b brownies into b pieces. She eats 3 brownies.

Expression:



3) Alyse makes c cupcakes to share equally with her 5 friends.

Expression:



4) Hani gives 3 candies to each of his f 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 for breakfast.

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:



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) $5 + y + (n)$	3) $12 + y + (n)$	4) $y + 12 + (n)$
5) $43 + y + (n)$	6) $(n) + y + 20$	7) $(n) + 53 + (n) + y$	

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

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 Rules

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 $x = 5$

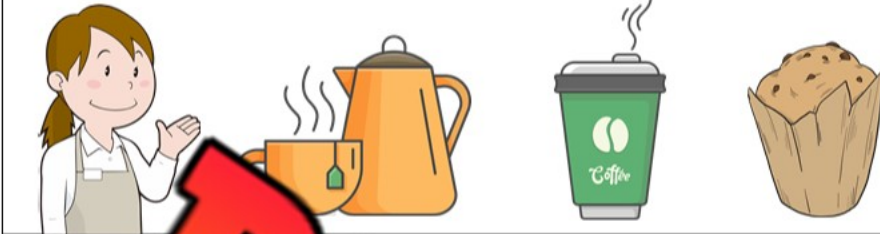
1) $x - 12$	2) $8 - x$	3) $23 - x$	4) $x - 24$
5) $41 - x$	6) $63 - x$	7) $100 - 13x$	8) $92 - x - 11$

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 - Café

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 the algebraic expression and then evaluate using the menu prices

Customer Order	Expression	Answer
1) 2 coffees, 1 muffin	$2 \times c + m$ $2.50 + 2.25$	
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		

Name: _____

66

Curriculum Connection
PR.5

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

Variable Values		Expression - Customer's Change $p - o$
o	p	
\$17.00	\$20.00	
\$10.00	\$20.00	
\$9.25	\$20.00	
\$35.65	\$20.00	

Evaluate

Calculate the payment and the customer's change



Order			Expression	Payment (\$)	Change (\$)
c	d	g			
1	0	2	$c + (2 \times g)$ $1.50 + (2 \times 1.00)$ $1.50 + 1.00$ $\$2.50$	\$10.00	$p - o$ $10.00 - 2.50$ $\$7.50$
3	1	0		\$10.00	
1	2	1		\$10.00	
2	2	2		\$20.00	
3	3	5		\$20.00	

Name: _____

67

Curriculum Connection
PR.5**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 2Evaluate the following expressions for $y = 10$

1) $\frac{y}{2}$	2) $\frac{2}{y}$	4) $\frac{y}{5} + 5$
5) $\frac{30}{y} + 8$	6) $\frac{100}{y} + y$	7) $\frac{10}{y} \times y$

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 Equations

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	Answer
1) Nine less than a number is 2		
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) $3n - 3 = 12$		

Name: _____

70

Curriculum Connection
PR.3

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) $6 + 70 = 76$

2) $51 + 15 = 67$

3) $47 + 13 = 50$

4) $65 + 12 = 77$

5) $74 + 13 = 87$

6) $92 + 11 = 103$

7) $95 + 25 = 110$

8) $121 + 17 = 138$

9) $144 + 17 = 171$

10) $155 + 26 = 181$

11) $111 + 144 = 255$

12) $212 + 12 = 224$

Part 2

Fill in the missing number to balance the equation

1) $\square + 12 = 95$

2) $\square + 25 = 50$

3) $\square + 17 = 66$

4) $72 + 14 = \square$

5) $64 + \square = 80$

6) $\square + 50 = 65$

7) $68 + \square = 82$

8) $83 + 15 = \square$

9) $89 + \square = 102$

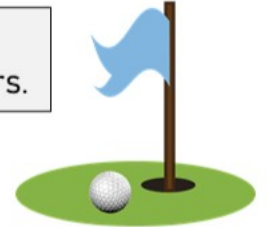
10) $105 + \square = 116$

11) $121 + 14 = \square$

12) $145 + \square = 160$

Addition 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.



Directions

Fill in the leaderboard

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

Results

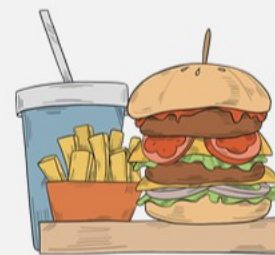
Who won the golf tournament?

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 determine 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	Burger	Equation 1 (f + b = t)	Equation 2 (b + f = t)
1	3	8	$3 + 8 = 11$	$8 + 3 = 11$
2	7	4		
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	$55 + 66 + 34 + 45 =$	$55 + 45 + 66 + 34 =$

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) $8.2 = p$ $p =$	5) $10.1 - p = 7$ $p =$	6) $14.3 - r = 10.5$ $r =$
7) $1.4 - n = 2$ $n =$	8) $n - 4.5 = 12.5$ $n =$	9) $t - 5.4 = 15$ $t =$
10) $24.7 - n = 20.2$ $n =$	11) $n - 4.5 = t$ $n =$	12) $34.6 - 5 = p$ $p =$

Word Problems

Write an equation and solve for a variable with an unknown amount

- Laura has \$4.35 to spend on candy. She leaves the shop with \$1.20. How much did she spend on candy (c)?
- Randy works for 8.5 hours today. He only has 2 hours left to work. How much time (t) has elapsed?
- Ryan jumped 3.58m in long jump. Jody jumped 2.98m. What is the difference (d) between their jumps?
- Rebecca has 200g of sugar. She used 42.5g of sugar to make cookies. How many grams of sugar (s) does she have left?



Integer Patterns - Average Temperatures

Questions

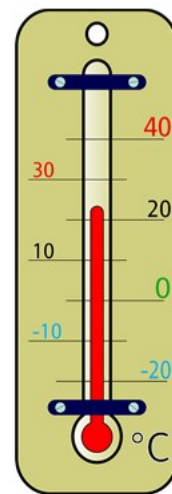
Answer the questions below



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.

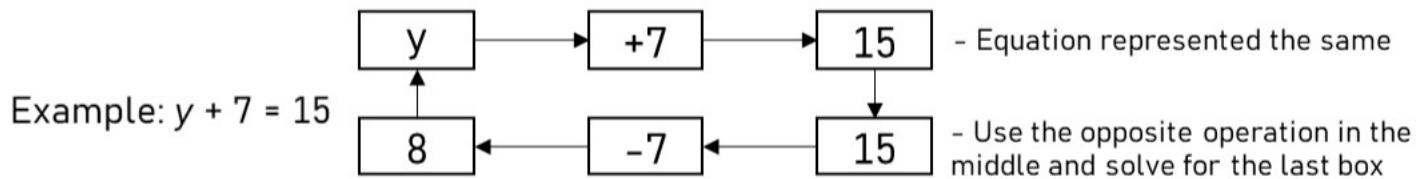
City	October (o) Temperature	February (f) Temperature	Temperature Difference (d)
Calgary (AB)	6	-7	
Thunder Bay (ON)	10	-3	
Victoria (BC)	12	6	
Yellowknife (NT)	1	-21	
Winnipeg (MB)	9	-14	
Ottawa (ON)	8	-8	
Eureka (NU)	-1	-38	
Quebec City (QC)	7		

- Fill in the table with the temperature difference from October to February.
- Write an equation using the variables: f , o , and d that adds 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

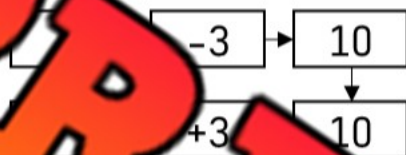
We can use a reverse flow chart to calculate the value of a variable in an equation.



Direction

Use the flow chart to find the value of the variable

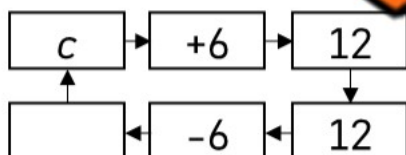
1) $t - 3 = 10$



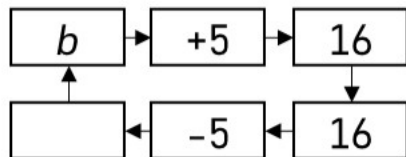
2) $r - 5 = 8$



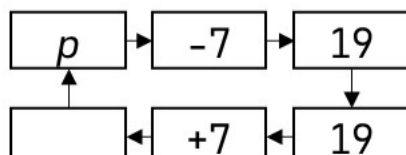
3) $c + 6 = 12$



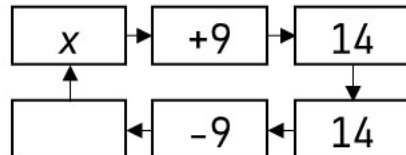
4) $b + 5 = 16$



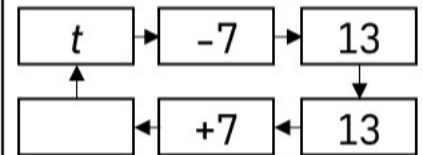
5) $p - 7 = 19$



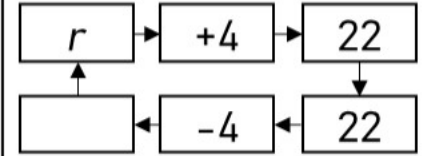
6) $x + 9 = 14$



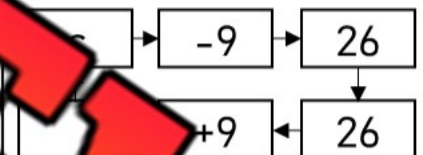
7) $t - 7 = 13$



8) $r + 4 = 22$



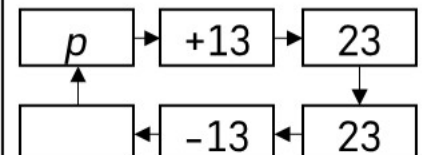
9) $s - 9 = 26$



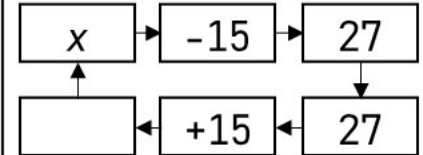
10) $b + 11 = 31$



11) $p + 13 = 23$



12) $x - 15 = 27$



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) $5n = 15$ $n =$	2) $4n = 16$ $n =$	3) $8(s) = 48$ $s =$
4) $9 \times 4 = p$ $p =$	5) $5n = 35$ $n =$	6) $7k = 21$ $k =$
7) $3n = 21$ $n =$	8) $6n = 42$ $n =$	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) $7 \times 3 = s$ $s =$
16) $9(s) = 27$ $s =$	17) $8 \times 8 = s$ $s =$	18) $6 \times 2 = t$ $t =$

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 =

Name: _____

88

Curriculum Connection
PR.3

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
			

Questions

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

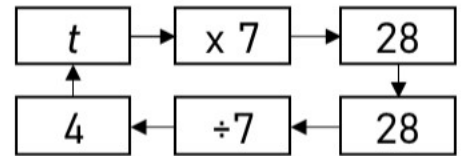
#	Order				Equation	Answer
	B	M	C	D		
1	1	0	0	0	$t = 1b + 2m$	$T = 5 + 6$ $T = 11$
2	1	0	0	0		
3	0	2	1	0		
4	1	1	0	2		
5	2	2	0	0		
6	3	1	1	0		
7	0	2	1	2		
8	2	0	1	3		
9	1	2	1	4		

Multiplying 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 last box to find the value of the variable, which it points to

Example: $7t = 28$



Directions: Fill in the blank in the flow chart

1) $4t = 12$		6) $11t = 77$	
2) $8r = 48$		7) $11t = 48$	
3) $5c = 35$		8) $7c = 56$	
4) $6b = 42$		9) $12b = 144$	
5) $9p = 72$		10) $9n = 63$	

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) $50 \div n = 5$ $n =$	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) $n \div 8 = 7$ $n =$	9) $t \div 11 = 7$ $t =$
10) $81 \div n = 9$ $n =$	11) $s \div 5 = t$ $t =$	12) $63 \div 9 = p$ $p =$
13) $64 \div n = 8$ $n =$	14) $63 \div n = 7$ $n =$	15) $s \div 7 = 8$ $s =$
16) $28 \div s = 4$ $s =$	17) $12 \div 4 = s$ $s =$	18) $s \div 7 = 8$ $s =$

Part 2

Calculate the area using the variables 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: $m = t \div s$

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

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

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

#	Treat	# of Staff (s)	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	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

Directions

Fill in the blank in the flow chart

1) $\frac{t}{5} + 6 = 11$	t → ÷ 5 → + 6 → 11 25 ← x 5 ← - 6 ← 11
2) $\frac{r}{8} - 7 = 1$	→ → → ← ← ←
3) $\frac{c}{4} + 8 = 16$	→ → → ← ← ←
4) $\frac{b}{6} - 9 = 0$	→ → → ← ← ←
5) $\frac{p}{7} - 7 = 2$	→ → → ← ← ←
6) $\frac{n}{3} + 12 = 22$	→ → → ← ← ←
7) $\frac{t}{2} - 6 = 5$	→ → → ← ← ←
8) $\frac{r}{11} + 8 = 15$	→ → → ← ← ←

Name: _____

97

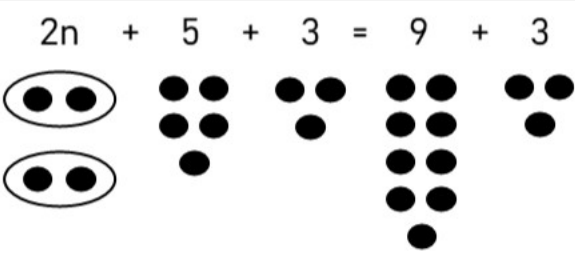
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PR.3

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. Investigate this theory below.

Questions

Draw circles to represent the equations

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

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!

Questions

Fill in the table below

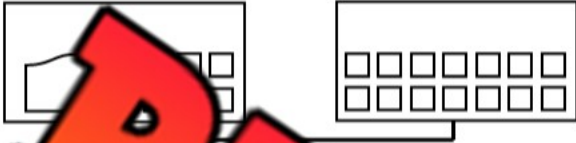
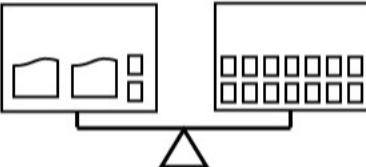
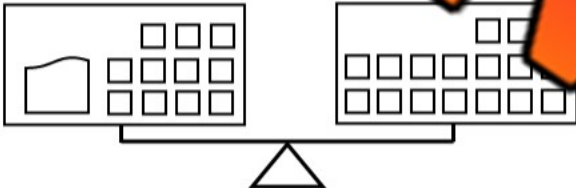
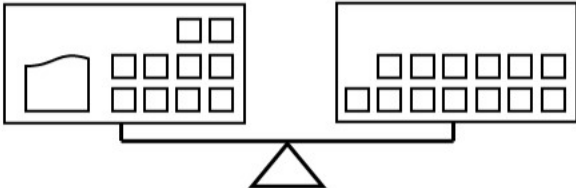
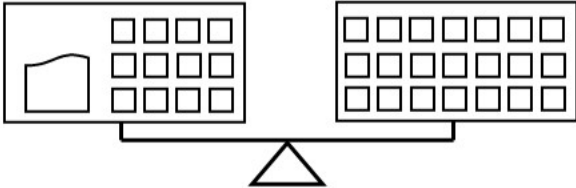
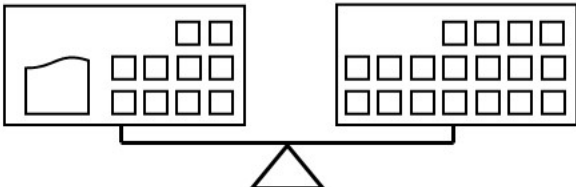
#	Original Equation	Change	New Equation
1	$5n = 20$ $n = 4$	Add 8 to each side	$5n + 8 = 20 + 8$ $n = 4$
2	$n = 7$	Add 6 to each side	
3	$15 + n = 26$ $n =$	Subtract 11 from each side	
4	$6n = 18$ $n =$	Multiply each side by 3	
5	$4n = 24$ $n =$	Divide each side by 4	
6	$52 - n = 38$ $n =$	Subtract 15 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.

Questions

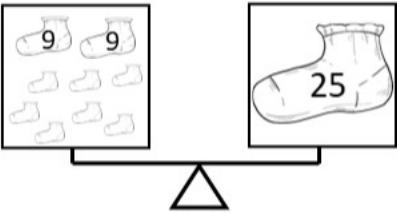
Write 2 different equations for each pictorial representation

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

Using Linear Equations and Pictorial Representations

Questions

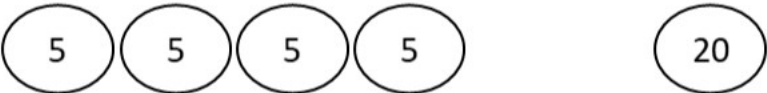
Write a pictorial representation and linear equation of the example

#	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 has 7 randomly coloured socks. How many black socks are in each pile?	$2p + 7 = 25$ $p = 9$	
1)	Antonia brought cookies to school and gave the rest to her friends. She gave 8 to her teacher and 10 to each of her friends. If she gave cookies to 5 friends, how many cookies did she give to her teacher?		
2)	Harley earned \$42 from her job today after she worked for 4 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 ($ax = b$)

Questions

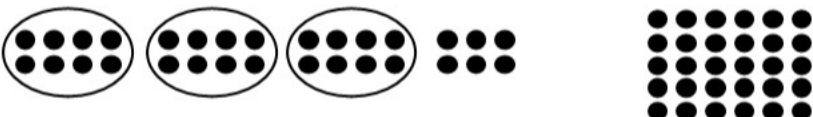
Write a pictorial representation of the linear equations provided

#	Linear Equation ($ax = b$)	Pictorial Representation
Ex)	$4x = 20$ $x = 5$	 4 groups of 5 = 20
1)	$x =$	
2)	$7x =$ $x =$	
3)	$9x = 45$ $x =$	
4)	$8x = 48$ $x =$	
5)	$2x = 96$ $x =$	
6)	$6x = 72$ $x =$	
7)	$4x = 52$ $x =$	

Representing Linear Equations ($ax + b = c$)

Questions

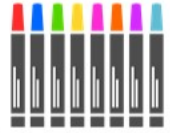
Write a pictorial representation of the linear equations provided

#	Linear Equation	Pictorial Representation
Ex)	$3x + 6 = 30$ $x = 8$	 3 groups of 8 + 6 = 30
1)		
2)	$8x + 4 = 28$ $x =$	
3)	$5x + 4 = 29$ $x =$	
4)	$7x + 6 = 34$ $x =$	
5)	$2x + 9 = 23$ $x =$	
6)	$4x + 9 = 25$ $x =$	
7)	$8x + 5 = 29$ $x =$	

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

Carlos opened a bank account last year and has been adding to it. Today he has \$312. How much did he have before?



Linear equation: _____

 $x =$ _____

3)

Mia tracks how many steps she takes each day. Before noon, she had taken a lot of steps. From noon until the end of the day, she took 7,450 steps. In total, she took 16,340 steps. 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 had scored 31 points. How many points did he score in the first half?



Linear equation: _____

 $x =$ _____

5)

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?

Linear equation: _____

 $x =$ _____

6)

Daniel is going 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, which was 710km away. How far did he drive before stopping?

Linear equation: _____

 $x =$ _____

Representing Problems with Linear Equations ($ax + b = c$)

Questions Represent the problems with linear equations ($ax + b = c$) and solve for x

1)

Hunter's cousin is 24 years old. He is 2 years older than twice Hunter's age. How old is Hunter?

Linear equation:

 $x =$

2)

Jessie bought 32 treats to work and gave them all away. She gave 8 to her brother and the rest to each of her friends. How many friends did she give treats to?

Linear equation:

 $x =$ 

3)

Cindy has \$8. Her sister has twice as much as her brother. The three of them have \$44. How much money does her brother have?

Linear equation:

 $x =$

4)

Dylan went to an amusement park. He had to pay \$5 to get in. While he went on. He decided to go on 8 rides. He also had to pay \$6 for each ride. In total, it cost him \$52 at the amusement park. How much money did he have left?

Linear equation:

 $x =$

5)

Carson earned \$63 from work today. He worked for 4 hours and received a bonus of \$15. How much does he earn per hour?

Linear equation:

 $x =$ 

6)

Shelly collected 66 treats on Halloween. She went to 15 houses and started with 6 candies at the beginning. How many candies on average did she collect at each house?

Linear equation:

 $x =$ 

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

Questions

Represent the problems with linear equations ($\frac{x}{a} = b$) and solve for x

1)

Claire bought a lot of donuts for her party. She is expecting 32 guests and bought enough for each guest to have 3 donuts. How many donuts did she buy?

Linear equation: _____

 $x =$ _____

2)

Every day, his friends earned some money by selling lemonade. They split the money equally between the 6 friends and each got \$24. How much total money did they earn?

Linear equation: _____

 $x =$ _____

3)

Amara collected some eggs during a hunt. She split her eggs up equally between her 4 sisters and her brother. Each sibling got 36 eggs. How many eggs did she collect?

Linear equation: _____

 $x =$ _____

4)

David is given some money to spend on vacation. He is spending it all during the 5-day vacation, spending \$13 each day. How much money was he given?

Linear equation: _____

 $x =$ _____

5)

Weston practiced piano for a long time this week. He practiced each day for 44 minutes. How many minutes total did he practice for the week?

Linear equation: _____

 $x =$ _____

6)

Declan doesn't have many chocolates left from Valentine's Day. He rationed them out for the next 8 days, allowing himself to eat 13 chocolates each day. How many chocolates did he have left before the 8 days?

Linear equation: _____

 $x =$ _____

Representing Problems with Linear Equations

Questions

Represent the problems with linear equations

1)

Dominic went to the movie theatre and paid \$13 for admission. Each treat he bought inside was \$6. He ended up spending \$37 in total. How many treats did he buy?

Linear equation: _____

 $x =$ _____

2)

Piper got a new job where she worked 20 hours in her first week. She made \$_____ all the week. How much does Piper earn per hour?

Linear equation: _____

 $x =$ _____

3)

Quinn bought treats for her party. She is expecting 13 guests and bought enough to give 11 treats. How many treats did she buy in total?

Linear equation: _____

 $x =$ _____

4)

Silas has been saving money for a long time. He saved an extra \$132 today and now has a total of \$375. How much did Silas have before today?

Linear equation: _____

 $x =$ _____

5)

Alex earned \$89 in total from work today. He worked for 5 hours and received a tip of \$9. How much does he earn per hour?

Linear equation: _____

 $x =$ _____

6)

Micah had 26 points in the 2nd, 3rd, and 4th quarter of today's game. He finished with 39 points. How many points did he have in the first quarter?

Linear equation: _____

 $x =$ _____

Algebra Quiz - Equations

Part 1

Is the example an expression or equation? Circle your answer

	Sentence	Answer
1)	$8n$	Expression Equation
2)	$\frac{4}{n} + 3$	Expression Equation
3)	$4n + n - 3$	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) $9 - x$	4) $x - 14$
5) $44 + x$	6) $67 + x$	7) $50 - 39 + x + 11$

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) $\frac{y}{y} \times y$