Name _____

Dependent and Independent Variables

A **dependent** variable changes in response to another variable, an **independent variable**.

An independent causes the change in a dependent variable. It is called *independent* because another variable does not cause it to change.

For example, the capacity (*c*) of this soup can, can depend in part on the diameter (*d*) of the top of the can. So, the diameter (*d*) is an independent variable that causes the dependent variable, the capacity (*c*) of the can, to change.
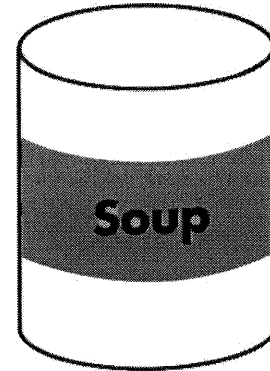
Underline the independent variable and circle the dependent variable in each situation.

1. The number of hours (*h*) studying and the score (*s*) on a test

2. The length (*l*) of a pencil and the number of times (*t*) it has been sharpened

3. The length of a book in pages (*p*) and the number of words (*w*) in a story

4. The number of students (*s*) ahead of you in the lunch line and the time (*t*) it takes you to get lunch

5. The amount of time (*t*) to finish a race and the number of laps (*l*) around a track

6. Tickets (*t*) sold for a race and the amount of money (*m*) collected

7. The height (*h*) of a fence and the amount of wood (*w*) to make the fence

8. The height (*h*) of a fence and the time (*t*) it takes to climb the fence

9. **Writing to Explain** Write your own situation where speed (*s*) is an independent variable.

   Sample answer: The time (*t*) it takes me to walk to school and the speed (*s*) I walk.

Name _____

Dependent and Independent Variables

Underline the independent variable and circle the dependent variable in each situation.

1. The number of days (d) working and the amount of money (m) you make

2. The pounds (p) of sand in a sandbox and the diameter (d) of a sandbox

3. The thickness of a book in inches (i) and the weight (w) of the book

4. The number of windows (w) in a building and the hours (h) it takes to clean them

5. The hours (h) it takes to clean windows and the number of people (p) cleaning

6. Tickets (t) sold for a play and the amount of money (m) collected

7. The number of gallons (g) a gas tank holds and the cost (c) to fill it

8. The number of laps (l) you swim and the time (t) you spend swimming

9. Which of the following could be an independent variable that affects how long a candle will burn?

   A color of the candle

   B diameter of the candle

   C day the candle was made

   D state the candle was made in

10. **Reason** Sue says time (t) can only be an independent variable. Do you agree? Explain.

    No, time (t) can be a dependent variable, too. For example, the time (t) it takes to build a house could depend on the number of people (p) building it.

11. Write your own situation that has an independent and dependent variable. Underline the independent variable and circle the dependent variable in the situation.

    Check students' work.

    _____

    _____

Name_____

Which Operation?

The Williams family is doing a lot of driving on their vacation. Use the chart to answer the questions.

Number Sense

Family Vacation

Day	Distance
1	480 mi
2	260 mi
3	40 mi
4	150 mi
5	100 mi
6	320 mi

1. How many miles is the Williams family driving altogether?

1,350 mi

2. On one day of their trip, the Williams family will be staying in one city to see the sights. On which day are they most likely staying in one city? Explain.

Day 3, because they are only traveling 40 mi that day

3. If they drive nonstop at 60 mi each hour on day 1, for how many hours will they drive?

8 hr

4. How far will the Williams family drive on days 4, 5, and 6 combined?

570 mi

5. Which is greater, the distance they will drive on days 1, 2, and 3 combined or the distance they will drive on days 4, 5, and 6 combined?

The distance they will drive on days 1, 2, and 3 combined is greater.

6. If they drive a constant 50 mi each hour on day 6, for how many hours will they have to drive?

6.4 hr

Name _____

Patterns and Equations

Write a rule and an equation for the pattern in the table.

x	1	4	7	8	9
y	3	12	21	24	27

Think: How can I get to the value of y if I start at the value of x?
Think: 3 is 1×3 12 is 4×3
State a theory: It seems that $3 \times x$ is equal to y.
Test the other pairs: $7 \times 3 = 21$ ✔ $8 \times 3 = 24$ ✔ $9 \times 3 = 27$ ✔
Write a rule: The value of y is the value of x times 3.
Write an equation: $y = x \times 3$, or $y = 3x$

Write a rule and an equation for the pattern in each table.

1.

x	3	6	11	13	15
y	5	8	13	15	17

The value of y is 2 more than the value of x; y = x + 2

2.

x	2	5	6	8	9
y	6	15	18	24	27

The value of y is the value of x times 3; y = 3x

3.

x	4	12	20	36	40
y	1	3	5	9	10

The value of y is the value of x divided by 4; y = x ÷ 4

4.

x	5	7	9	10	12
y	0	2	4	5	7

The value of y is 5 less than the value of x; y = x − 5

5. Write a Problem Complete the table to show a pattern. Then write a rule and an equation for the pattern.

Answers will vary.
Check student's work.

x					
y					

6. Writing to Explain Explain how you would find the pattern in this table, and how you would write a rule and an equation for the pattern.

x	4	5	7	10	12
y	0	1	3	6	8

I saw that for every pair of numbers, I could subtract 4 from x to get y. The rule is: The value of y is 4 less than the value of x. The equation is: y = x − 4.

R 3-2

Name _____

Patterns and Equations

Write a rule and an equation to fit the pattern in each table in **1** through **6**.

1.

x	0	1	2	3	4
y	5	6	7	8	9

The value of y is 5 more than the value of x; $y = x + 5$

2.

x	12	18	21	24	36
y	4	6	7	8	12

The value of y is x divided by 3; $y = x \div 3$

3.

x	11	14	18	21	25
y	3	6	10	13	17

The value of y is 8 less than the value of x; $y = x - 8$

4.

x	0	1	2	4	6
y	0	4	8	16	24

The value of y is x multiplied by 4; $y = 4x$

5.

x	3	9	13	22	27
y	10	16	20	29	34

The value of y is x plus 7; $y = x + 7$

6.

x	0	1	2	3	4
y	0	3	6	9	12

The value of y is 3 times x; $y = 3x$

7. The Gadget Factory sells winkydiddles in different quantities, as shown by the table. How much would ten winkydiddles cost?

Number of Winkydiddles	7	12	26	31
Cost	$24.50	$42.00	$91.00	$108.50

$35.00

8. Which equation best describes the pattern in the table?

x	4	9	12	16	19
y	2	4.5	6	8	9.5

A $y = 2x$ **B** $y = x - 1$ Ⓒ $y = \frac{x}{2}$ **D** $y = x + 1$

9. Writing to Explain All the values of x in a table are greater than the corresponding values of y. If x is a positive integer, what operation(s) and circumstance(s) could explain this pattern?
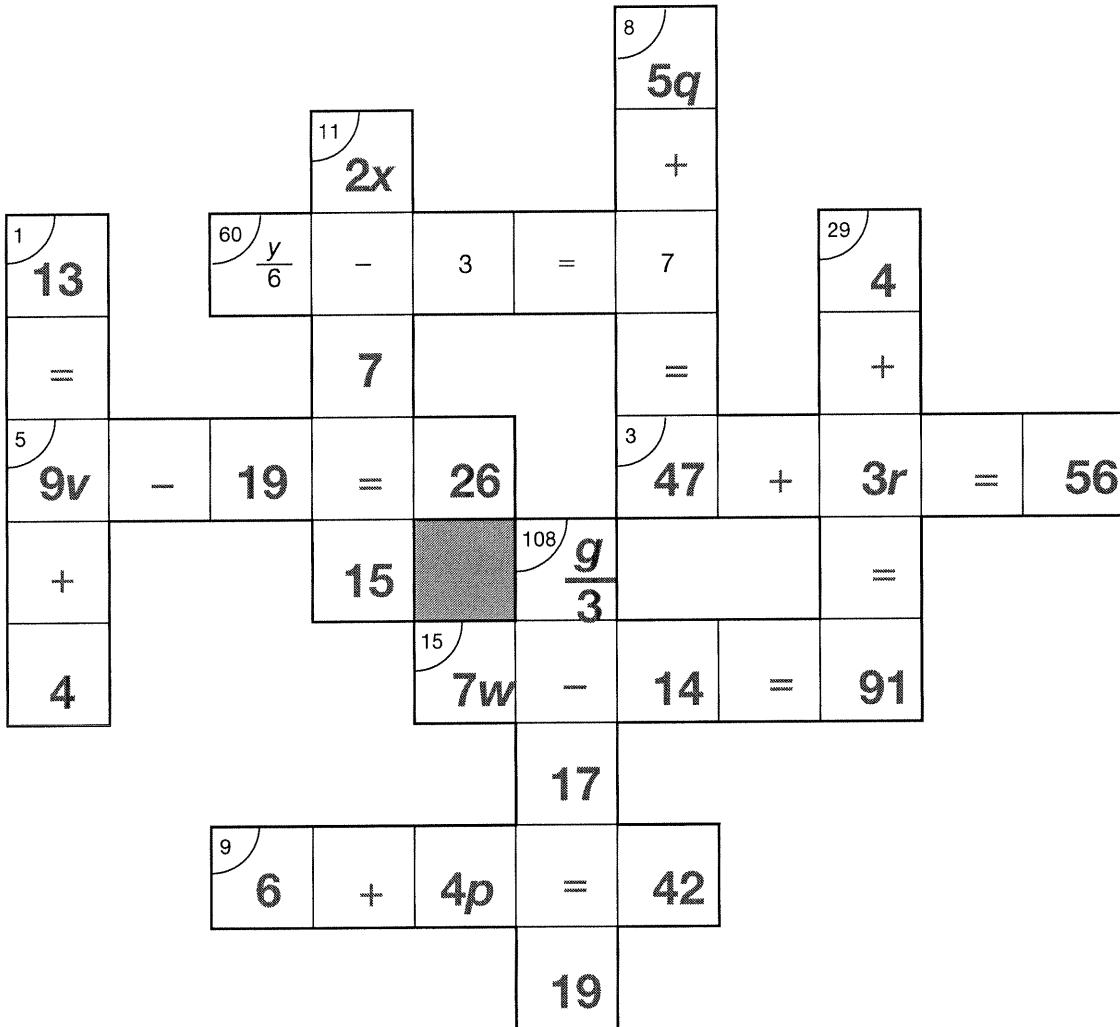
Sample answer: Something is subtracted from x.

Kriss-Kross

Solve each equation. The values for the variables are given in the corner of a puzzle square. Put each term and symbol of the equation in a separate box. If you are correct, certain equations will "kriss-kross." The first one is done for you.

Algebra

Across

$\frac{y}{6} - 3 = 7$

$47 + 3r = 56$

$9v - 19 = 26$

$7w - 14 = 91$

$6 + 4p = 42$

Down

$2x - 7 = 15$

$5q + 7 = 47$

$4 + 3r = 91$

$13 = 9v + 4$

$\frac{g}{3} - 17 = 19$

Name _____

More Patterns and Equations

The entry fee to a carnival is $3. Each ride ticket is $2. The cost of going to the carnival equals the entry fee plus two times the number of tickets purchased, $c = 3 + 2t$.

You can substitute numbers into the equation to make a table showing the cost compared to the number of tickets purchased.

$c = 3 + 2t.$

Tickets t	3 + 2t	Cost c
0	3 + 2(0)	$3
2	3 + 2(2)	$7
4	3 + 2(4)	$11
6	3 + 2(6)	$15

In **1** through **4**, use the equation to complete each table.

1. $y = 3x + 7$

x	0	1	2	3
y	7	10	13	16

2. $y = 4x - 4$

x	2	4	6	8
y	4	12	20	28

3. $y = 2x + 7$

x	1	3	5	7
y	9	13	17	21

4. $y = \frac{1}{4}x + 5$

x	0	4	8	12
y	5	6	7	8

5. Reasoning For the equation $y = 1x - 25$, will the value of y increase or decrease as x increases?

Increase

6. Algebra Write an equation in words and in symbols to represent this situation:
Grace has $100. She is buying charms for her bracelet that cost $5 each. Write an equation showing the relationship between the number of charms (c) she buys and the amount of money she has left (l).

The amount of money Grace has left equals $100 minus $5 times the number of charms she buys; l = 100 − 5c

7. Number Sense How many charms can Grace buy before she runs out of money?

20 charms

Name _____

More Patterns and Equations

In **1** through **4,** use the equation given to complete each table.

1. $y = 2x + 4$

x	0	1	2	3
y	4	6	8	10

2. $y = 4x - 3$

x	5	6	7	8
y	17	21	25	29

3. $y = 100 - 4x$

x	2	4	6	8
y	92	84	76	68

4. $y = \frac{1}{3}x + 1$

x	0	3	6	9
y	1	2	3	4

5. Writing to Explain Complete the table and write an equation for the pattern. Tell how you do it.
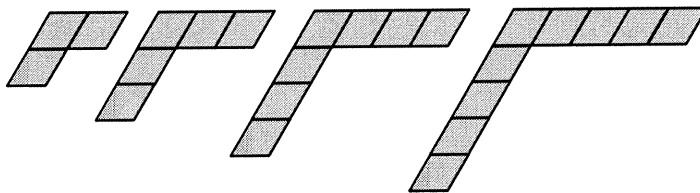
Pattern Number, *p*	1	2	3	4
Number of Blocks, *b*	3	5	7	9

Sample answer: Two blocks are added for each new figure, so I wrote that as 2p. Then for the corner block, I added 1, so the equation is b = 2p + 1

6. Algebra How many blocks are needed to make the 10ᵗʰ figure in the pattern above?

A 11   **B** 20   Ⓒ 21   **D** 22

7. Reasoning Justin used 35 blocks to make a figure for the pattern above. What was the pattern number for the figure? __17__

8. Write a Problem Write a problem that can be represented by this equation and table.

$y = 20x + 5$

x	1	2	3	4
y	25	45	65	85

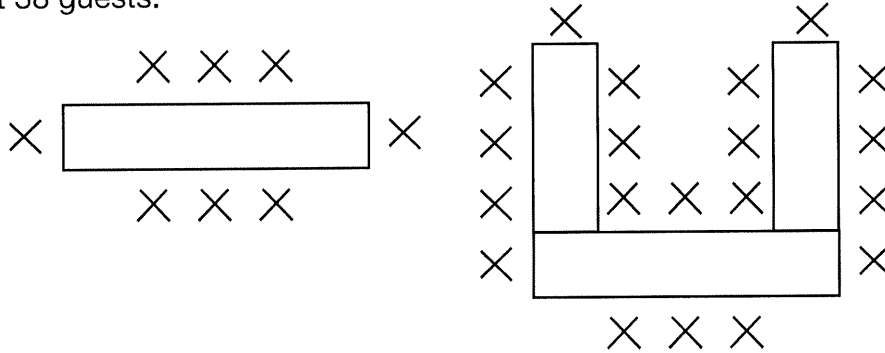Sample answer: A florist charges $20 a dozen for roses plus a $5 delivery fee.

Name _____

Sit by Me!

One banquet table seats 8 people. Three banquet tables in a
U-shape will seat 20 people. Six banquet tables in a U-shape will
seat 38 guests.

Patterns

1. Complete the chart below if the tables are arranged in a U-shape
with an equal number of tables on the three sides of the U-shape.

Number of Tables	Number of Guests
1	8
3	20
6	38
9	56
12	74
15	92

2. Write an equation to describe the pattern in the chart.

Guests = 6n + 2

3. Write and solve the equation that determines how many people
can be seated if 30 such tables were placed equally on the three
sides of the U-shape.

6(30) + 2 = 182

Name _____

Problem Solving: Use Reasoning

You can use counters, tables, ordered pairs, and graphs to act out a problem and show your reasoning.

Jenna is creating a display of photographs at her school for shark-awareness week. She has 24 photographs that she can display on 4 walls and 4 bulletin boards. She wants to put the same number of photographs on each wall and the same number of photographs on each bulletin board. How many different ways can Jenna display the photographs on the walls and bulletin boards?

Make a Table
Use walls and bulletin boards as the labels in the table.

Use counters to find the possible ways.

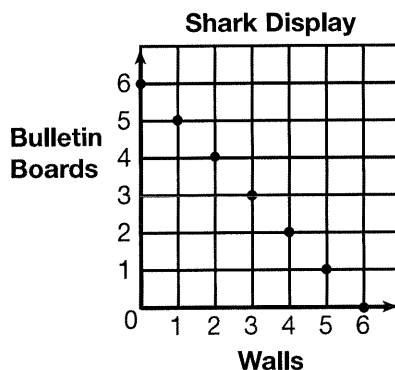| Walls	0	1	2	3	4	5	6
Bulletin Boards	6	5	4	3	2	1	0

Write Ordered Pairs
(walls, bulletin boards)

(0, 6), (1, 5), (2, 4), (3, 3), (4, 2), (5, 1), (6, 0)

Make a Graph
You can use the table or ordered pairs to graph the different ways.

Shark Display

So, Jenna can display the shark photographs in 7 different ways on the walls and bulletin boards.

---

1. Cory is arranging 12 baseball caps on 2 shelves. He wants at least 2 caps on each shelf and the number of caps on each shelf to be even. How many possible ways can he arrange the caps on 2 shelves? Show your answer as ordered pairs.

Baseball Caps

Shelf 2

5 possible ways: (2, 10), (4, 8), (6, 6), (8, 4), (10, 2)

2. Graph the solution for the above problem.

Shelf 1
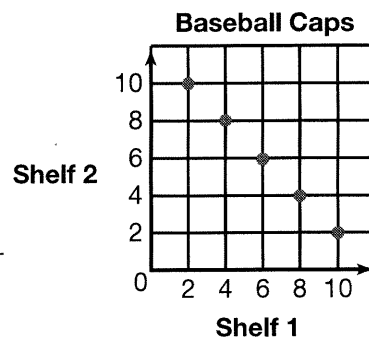
Problem Solving: Use Reasoning

1. A ranch owner has 18 bales of hay to distribute in 3 cow pastures and 3 horse pastures. He wants each cow pasture to have the same number of bales of hay and each horse pasture to have the same number of bales of hay. He wants at least 1 bale of hay in each pasture. How many different ways can hay be distributed among the pastures? Make a table to show your reasoning.

5 different ways

Cow Pastures	1	2	3	4	5
Horse Pastures	5	4	3	2	1

2. A nursery has 10 tree seedlings to give out at 2 workshops. It wants to give out a minimum of 2 seedlings at each workshop. How many different ways can the nursery give out seedlings? Show your answer as ordered pairs.

7 different ways; (2, 8), (3, 7), (4, 6), (5, 5), (6, 4), (7, 3), (8, 2)

Tree Seedlings

Workshop 2

Workshop 1
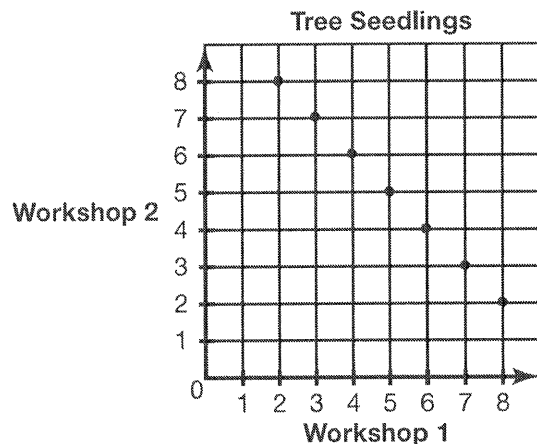
3. Graph the solution to the tree seedling problem above.

4. A reading club at a bookstore gives a certificate for one free book after the reader earns 150 points. Each book a person reads is worth 3 points. Sonja has 96 points. What is the least number of books she needs to read to get the certificate?

(A) 18

B 23

C 23

D 54

5. **Writing to Explain** Explain how you know you found all of the possible ways to distribute the bales of hay in Problem 1.

Sample answer: 1 is the least number and 5 is the greatest number of bales of hay that can be distributed to each pasture, so I made a table from 1 to 5 to find all of the different ways.

Name _____

3-4

Enrichment

Animals on the Moon

Objects weigh different amounts on Earth than they do on the Moon
because of the pull of gravity. An object that weighs 1 lb on Earth
weighs 0.16 lb on the Moon. Use this information to complete the table
of animal weights on Earth and on the Moon. The first row has been
done for you.

Algebra

Animal	Maximum Weight on Earth	Maximum Weight on the Moon
Western lowland gorilla	400 lb	64 lb
African elephant	17,000 lb	**2,720 lb**
Cheetah	**145 lb**	23.2 lb
Squirrel monkey	**1.5 lb**	0.24 lb
African lion	500 lb	**80 lb**
Black rhinoceros	**4,000 lb**	640 lb
King penguin	40 lb	**6.4 lb**
Spectacled bear	350 lb	**56 lb**
Baringo giraffe	**1,320 lb**	211.2 lb
Jaguar	**250 lb**	40 lb
North American otter	**30 lb**	4.8 lb
Chimpanzee	175 lb	**28 lb**
Bactrian camel	**1,500 lb**	240 lb
Grevy's zebra	800 lb	**128 lb**
Snow leopard	110 lb	**17.6 lb**
Pygmy hippopotamus	**600 lb**	96 lb

E3•4

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