Applications Connections Extensions ACE

Applications

1. The El Paso Middle School girls' basketball team is going from El Paso to San Antonio for the Texas state championship game. The trip will be 560 miles. Their bus travels at an average speed of 60 miles per hour.

a. Suppose the bus travels at an almost steady speed throughout the trip. Make a table and a graph of time and distance data for the bus.

b. Estimate the distance the bus travels in 2 hours, $2\frac{3}{4}$ hours, $3\frac{1}{2}$ hours, and 7.25 hours.

c. How are 2 hours and the distance traveled in 2 hours represented in the table? How are they shown on the graph?

d. How are $2\frac{3}{4}$ hours and the distance traveled in $2\frac{3}{4}$ hours represented in the table? How are they shown on the graph?

e. Describe in words a rule you can use to calculate the distance traveled for any given time on this trip.

f. The bus route passes through Sierra Blanca, which is 90 miles from El Paso. About how long does it take the bus to get to Sierra Blanca?

g. The bus route also passes through Balmorhea, which is $\frac{1}{3}$ of the way from El Paso to San Antonio. About how long does it take the bus to get to Balmorhea?

h. How long does it take the bus to complete its 560-mile trip to San Antonio?

2. Celia writes the equation $d = 8t$ to represent the distance in miles d that bikers could travel in t hours at a speed of 8 miles per hour.

a. Make a table that shows the distance traveled every half hour, up to 5 hours, if bikers ride at this constant speed.

b. How far would bikers travel in 1 hour, 6 hours, 8.5 hours, and 10 hours?

3. The equation $d = 70t$ represents the distance in miles covered after traveling at 70 miles per hour for t hours.

a. Make a table that shows the distance traveled every half hour from 0 hours to 4 hours.

b. Sketch a coordinate graph that shows the distance traveled between 0 and 4 hours.

c. What is d when $t = 2.5$ hours?

d. What is t when $d = 210$ miles?

e. You probably made your graph by plotting points. In this situation, would it make sense to connect these points?

4. a. Use the table to write an equation that relates lunch cost L and number of riders n.

Bike Tour Box Lunch Costs

Riders	1	2	3	4	5	6	7	8	9
Lunch Cost	$4.25	$8.50	$12.75	$17.00	$21.25	$25.50	$29.75	$34.00	$38.25

b. Use your equation to find the lunch cost for 25 riders.

c. How many riders could eat lunch for $89.25?

For Exercises 5–7, use the equation to complete the table.

5. $y = 4x + 3$

x	1	2	5	10	20
y					

6. $m = 100 - k$

k	1	2	5	10	20
m					

7. $d = 3.5t$

t	1	2	5	10	20
d					

8. Sean is buying a new DVD player and speakers for $315. The store offers him an interest-free payment plan that allows him to pay in monthly installments of $25.

a. How much will Sean still owe after one payment? After two payments? After three payments?

b. Use n to stand for the number of payments and a for the amount still owed. Write an equation for calculating a for any value of n.

c. Use your equation to make a table and a graph showing the relationship between n and a.

d. As n increases by 1, how does a change? How is this change shown in the table? How is it shown on the graph?

e. How many payments will Sean have to make in all? How is this shown in the table? How is this shown on the graph?

For Exercises 9–12, express each rule as an equation. Use single letters to stand for the variables. Identify what each letter represents.

9. The area of a rectangle is its length multiplied by its width.

10. The number of hot dogs needed for the picnic is two for each student.

11. The amount of material needed to make the curtains is 4 square yards per window.

12. Taxi fare is $2.00 plus $1.10 per mile.

13. The sales tax in a state is 8%. Write an equation for the amount of tax t on an item that costs p dollars.

14. An airplane is traveling at 550 miles per hour. Write an equation for the distance d the plane travels in h hours.

15. Potatoes sell for $0.25 per pound at the produce market. Write an equation for the cost c of p pounds of potatoes.

16. A cellular family phone plan costs $49 per month plus $0.05 per minute of long-distance service. Write an equation for the monthly bill b when m minutes of long-distance service are used.

For Exercises 17–19, describe the relationship between the variables in words and with an equation.

17.

x	1	2	5	10	20
y	4	8	20	40	80

18.

s	1	2	3	6	12
t	49	48	47	44	38

19.

n	1	2	3	4	5
z	6	11	16	21	26

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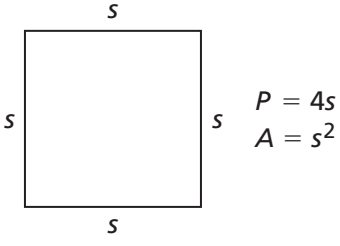
20. Multiple Choice Which equation describes the relationship in the table?

n	0	1	2	3	4	5	6
C	10	20	30	40	50	60	70

A. $C = 10n$ **B.** $C = 10 + n$ **C.** $C = 10$ **D.** $C = 10 + 10n$

Connections

21. The perimeter P of a square is related to the side length s by the formula $P = 4s$. The area, A, is related to the side length by the formula $A = s \times s$, or $A = s^2$.



a. Make a table showing how the perimeter of a square increases as the side length increases from 1 to 6 in 1-unit steps. Describe the pattern of change.

b. Make a table showing how the area of a square increases as the side length increases from 1 to 6. Describe the pattern of change.

For Exercises 22–27, find the indicated value or values.

22. the mean, or average, of 4.5 and 7.3

23. the area of a circle with radius 6 centimeters

24. the sum of the angle measures in a triangle, in a parallelogram, in a pentagon, and in a hexagon

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25. the 10th odd number (1 is the first odd number, 3 is the second odd number, and so on.)

26. the area of a triangle with a base of 10 centimeters and a height of 15 centimeters

27. $3^3 \times 5^2 \times 7$

28. The wheels on Kai's bike are 27 inches in diameter. His little sister, Masako, has a bike with wheels that are 20 inches in diameter. Kai and Masako are on a bike ride.

a. How far does Kai go in one complete turn of his wheels?

b. How far does Masako go in one complete turn of her wheels?

c. How far does Kai go in 500 turns of his wheels?

d. How far does Masako go in 500 turns of her wheels?

e. How many times do Kai's wheels have to turn to cover 100 feet?

f. How many times do Masako's wheels have to turn to cover 100 feet? To cover 1 mile?

29. Bicycles that were popular in the 1890s were called "penny farthing" bicycles. These bikes had front wheels with diameters as great as 5 feet! Suppose the front wheel of these bicycles have a diameter of 5 feet.

a. What is the radius of the front wheel?

b. How far will one bike travel in 100 turns of the front wheel?

c. How many times will the front wheel turn in a 3-mile trip?

d. Compare the number of times the wheels of Masako's bike turn in a 1-mile trip [see part (f) of Exercise 28] with the number of times the front wheel of this penny-farthing bike turns in a 3-mile trip. Why are the numbers related this way?

Write a formula for the given quantity.

30. the area A of a rectangle with length ℓ and width w

31. the area A of a parallelogram with base b and height h

32. the perimeter P of a rectangle with base b and height h

33. the mean m of two numbers p and q

34. the area A of a circle with radius r

35. the sum S of the measures of angles in a polygon of n sides

36. the nth odd number, O (1 is the first odd number, 3 is the second odd number, and so on.)

37. the area A of a triangle with base b and height h

Complete the table of values for the given equation.

38. $y = x + \frac{1}{2}$

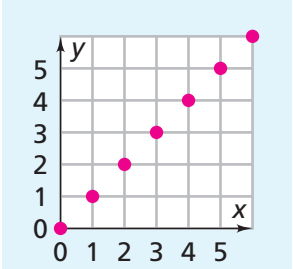
x	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{2}{5}$	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{4}$	5
y	■	■	■	■	■	■	■	■

39. $y = \left(\frac{1}{2}\right)x$

x	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{2}{5}$	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{4}$	5
y	■	■	■	■	■	■	■	■

Describe the relationship between x and y in words.

40.



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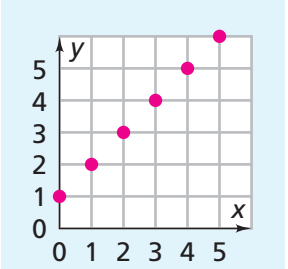

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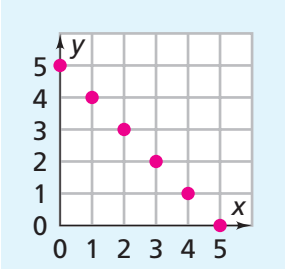


Extensions

43. a. You can calculate the average speed of a car trip if you know the distance and time traveled. Copy and complete the table below.

Car Trips

Distance (mi)	Time (hr)	Average Speed (mi/h)
145	2	■
110	2	■
165	2.5	■
300	5.25	■
446	6.75	■
528	8	■
862	9.5	■
723	10	■

b. Write a formula for calculating the average speed s for any given distance d and time t.

For Exercises 44–47, solve each problem by estimating and checking.

44. The equation $p = 50 + 10n$ gives the admission price p to Wild World for a group of n people. A club's budget has \$500 set aside for a visit to the park. How many club members can go?

45. The equation $b = 100 - 6r$ gives the number of bonus points b left on a Wild World bonus card after r rides.

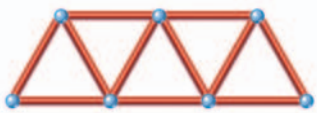
a. Rosi has 34 points left. How many rides has she been on?

b. Dwight has 16 points left. How many rides has he been on?

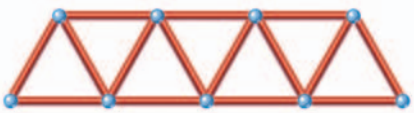
46. The equation $d = 2.5t$ describes the distance in meters d covered by a canoe-racing team in t seconds. How long does it take the team to go 125 meters? How long does it take them to go 400 meters?

47. The equation $d = 400 - 2.5t$ describes the distance in meters d of a canoe-racing team from the finish line t seconds after a race starts. When is the team 175 meters from the finish line? When is it 100 meters from the finish line?

48. Armen builds models from rods. When he builds bridges, he makes the sides using patterns of triangles like the ones below. The total number of rods depends on the number of rods along the bottom.



Rods along bottom = 3
Total number of rods = 11



Rods along bottom = 4
Total number of rods = 15

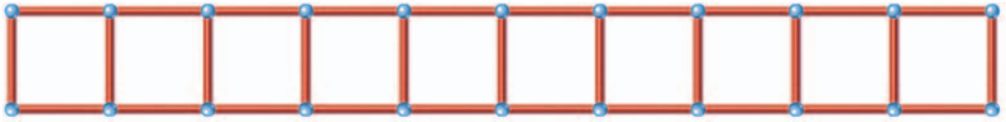
a. Copy and complete the table.

Rod Bridges

Rods Along the Bottom	1	2	3	4	5	6	7	8	9	10
Total Number of Rods	3	7	11	■	■	■	■	■	■	■

b. Write an equation relating the total number of rods t to the number of rods along the bottom b. Explain how the formula you write relates to the way Armen puts the rods together.

c. What do you know about the properties of triangles and rectangles that makes the design above better than the one below?



49. The students in Problem 3.3 decide to visit Wild World Amusement Park on the tour. They include the cost of this and the van in their revenue and expenses. How does this affect the equation for profit?