Applications

1. The medium table; at the medium table, each person gets about $\frac{3}{7}$, or 43%, of a pizza. In other words, there are about 2.3 people per pizza. At the small table, each person gets only 40% of a pizza. At the small table, there are 2.5 people per pizza. At the large table, each person gets about $\frac{5}{12}$, or 42%, of a pizza. There are 2.4 people per pizza.

2. No. If there were only 14 people, then 9 would have been male and 5 would have been female. It means for every 9 men in the entire stadium, there were 5 females. So if there were 9,000 males, there were 5,000 females. The total of 14 is just the sum of the ratio's terms in simplest form.

3. B

4. a. The ratio of 5 to 3 is more favorable than 7 to 5. In the ratio of 5 to 3, $\frac{5}{8}$, or 62.5%, of the stocks were gains whereas with the ratio 7 to 5, 7 out of every 12, or 58.3%, of the stocks were gains.

b. The ratio of 6 to 3 is better than 9 to 5. $\frac{6}{9}$, or 66.7%, is more favorable than $\frac{9}{14}$, or 64.3%.

c. The ratio of 6 to 4 is better for investors. $\frac{6}{10} = 60\%$, whereas $\frac{10}{17} \approx 58.8\%$.

5. Maralah's Driving Distance

Gallons	Miles Driven
1	29
2	58
3	87
4	116
5	145
6	174
7	203
8	232
9	261
10	290

6. Joel's Driving Distance

Gallons	Miles Driven
1	30
2	60
3	90
4	120
5	150
6	180
7	210
8	240
9	270
10	300

7. a. 225 Calories; You can scale down the ratio 150 grams of trail mix contains 450 Calories to 75 : 225 by using a scale factor of $\frac{1}{2}$, which means that 75 grams of trail mix contains 225 Calories.

b. Approximately 333 grams; The ratio of Calories to grams is 3 to 1. An equivalent ratio is 1,000 : 333.33 . . . Or, 1,000 Calories is $\frac{2}{3}$ of 1,500 Calories, so Rico ate $\frac{2}{3}$ of 500 grams, or about 333 grams.

c. number of Calories = 3 × number of grams ($C = 3g$)

d. number of grams = number of Calories ÷ 3 $\left(g = C \div 3, \text{ or } g = \frac{C}{3}\right)$

8. a. Duane; he can make about 1.7 (5 ÷ 3) bowls per hour. Miriam can make only 1.5 bowls per hour.

b. 8 hours; $\frac{2 \text{ hours}}{3 \text{ bowls}} = \frac{8 \text{ hours}}{12 \text{ bowls}}$

c. 7.2 hours; Possible strategy: $5 \div 3 = 1\frac{2}{3}$, and $12 \div 1\frac{2}{3} = 7.2$.

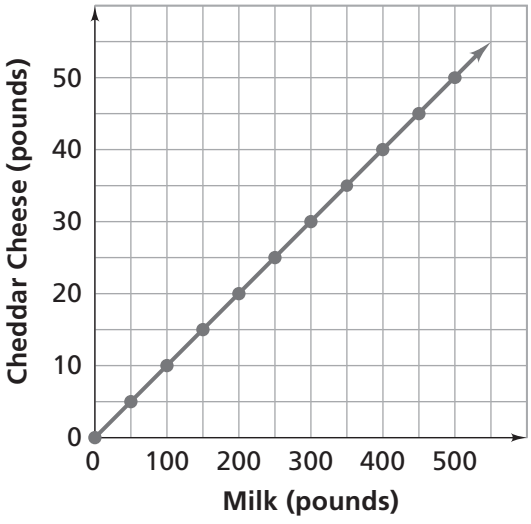
9. a.

Milk Needed to Make Cheddar Cheese

Cheese (pounds)	Milk (pounds)
5	50
10	100
15	150
20	200
25	250
30	300
35	350
40	400
45	450
50	500

b.

Milk Needed to Make Cheddar Cheese



c. $\frac{1}{10}\,m = c$, or $m = 10c$

d. $\frac{1}{10}$ for the equation $\frac{1}{10}\,m = c$
10 for the equation $m = 10c$

e. Possible answers: The graph visually shows the relationship between amounts of milk and cheese. The table allows one to look up how much milk is needed to yield any given amount of cheese. The equation allows for quick calculation of the amount of milk needed for any amount of cheese.

10. a. $.75

b. ii. around 70 songs, but less than 70; since 35 songs is $26.25 ≈ $25, 70 songs would be around $50; however, since $26.25 > $25, it would be a little less than 70 songs.

c.

Prices of Songs

Number of Songs, *n*	35	4	50	1	70	20
Cost, *C*	$26.25	$3	$37.50	$.75	$52.50	$15

d. Javier is correct. You can test who is correct by substituting the original number of songs ($n = 35$) into both equations. Find which equation gives the correct cost in dollars. Lucius's equation produces a cost of approximately $19.69, which is incorrect. Javier's equation gives $26.25, which is correct.
Note: In this case, it is assumed that one of the two equations is correct, however, students should get in the habit of thinking about what information the equation gives instead of just checking one value.

11. a. Courtney's, Julio's, and Kimi's methods are correct. Answers will vary on which method is most convincing. Elliot's method is incorrect because he compares the prices of forty 2-packs (80 erasers) and one 40-pack (40 erasers).

b. As alternative methods, students might scale to a different value similar to methods 3 and 4, or they might set up their proportion to the rate of cost to erasers. Students might also reason using different representations—for example graphing their solutions or setting up a table.

12. a. \$1.50 per dozen apples, or about \$.13 per apple
$C = 1.5d$

b. \$.16 per bottle
$C = 0.16b$

c. \$.12 per ounce of mozzarella cheese
$C = 0.12m$

13. a. The 8-pack is the better deal; each glue stick is about \$.50.

b. The single roll is the better deal; each roll in the 12-pack is about \$.20.

c. The 100-pack is the better deal; 100 single pencils for \$.05 a piece would cost \$5.00, which is more than the 100-pack price.

d. Buying the 50-pack of paper clips is cheaper; two 25-packs (50 total) would cost $\$.45 \times 2 = \$.90$, which is more than the \$.89 it costs to buy a 50-pack.

Connections

14. a. $\frac{6}{14} = \frac{9}{21} = \frac{12}{28}$

b. $\frac{6}{27} = \frac{8}{36} = \frac{14}{63}$

c. $\frac{4}{20} = \frac{5}{25} = \frac{6}{30}$

d. $\frac{6}{8} = \frac{15}{20} = \frac{24}{32}$

15. a. $\frac{2}{5}$ of the square is shaded, and $\frac{3}{5}$ of the square is unshaded. 40% of the square is shaded, and 60% is unshaded. The ratio of the shaded region to the unshaded region is 2 to 3.

b. $\frac{1}{9}$ of the square is shaded, and $\frac{8}{9}$ is unshaded. Approximately 11% of the square is shaded, and approximately 89% is unshaded. The ratio of shaded to unshaded is 1 to 8.

16. H

17. A

18. $\frac{4}{9} \times 3 = 1\frac{1}{3}$

19. $40 \times 2.25 = 90$

20. $1{,}800 \div 15 = 120$

21. $180 \div 12 = 15$

22. Possible answer: $\frac{5}{2} \times \frac{21}{5} = 10.5$

23. Possible answers: $2.1 \times 0.9 = 1.89$; or $5.5 \times 0.25 = 1.375$

24. a. Yes; the scale factor between the large room and small room is 0.75. The ratio is 4 : 3.

b. 192 : 108, or in simplified form, 16 : 9

c. The room for one student gives more space per student, as it gives 108 square feet per person. The two-person room gives $192 \div 2 = 96$ square feet per person.

25. Percents were calculated for boys, girls, and all students in each category. Each percent was found by considering the portion of the time spent on a certain activity out of the whole (100%) 48 hours in a weekend. Then the percents were stacked on top of each other in the same order to show the whole 100%.

26. The table makes it easy to compare exact hours spent on each activity. The bar graph is a quick, visual way of comparing the percentage of time spent in each category by each group. You can see from the graph that both boys and girls spend the most amount of time sleeping. Also, comparing the heights of corresponding bars is a quick way to compare the percentage of time spent in each category between boys and girls.

Extensions

27. a. (See Figure 1.)

b. $n = 240 \div V, n = \frac{240}{V}$, $V = 240 \div n$, or $V = \frac{240}{n}$

28. a. Yes; in each sample, the ratio is 7 : 3.

b. Yes; in each sample, the ratio is 7 : 10.

c. 280 grams of iron and 120 grams of oxygen. The fraction of oxygen to rust is $\frac{3}{10}$. The fraction of iron to rust is $\frac{7}{10}$.

29. a. Answers may vary. Sample answer: You first need to change life span, which is measured by years, to be measured by days. This can be done by multiplying the number of years for life span by 365 (or you can convert the number of gestation days into years). You can then compare the magnitude of the multiplicative increase by converting the ratio into a decimal (See Figure 2). **Note:** Students may also use strategies such as fractions or percentages to make this comparison. For any of these strategies, the life span does not have to be converted to days to make a comparison.

b. The greatest life span–to–gestation time ratio is the chipmunk, which has a ratio of 2,190 to 31, or 70.6. The least life span–to–gestation time ratio is the giraffe, which has a ratio of 3,650 : 425, or 8.6.

Figure 1

Containers Needed by Volume

Volume of Container (liters)	10	4	2	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{10}$
Number of Containers Needed	24	60	120	240	480	960	2,400

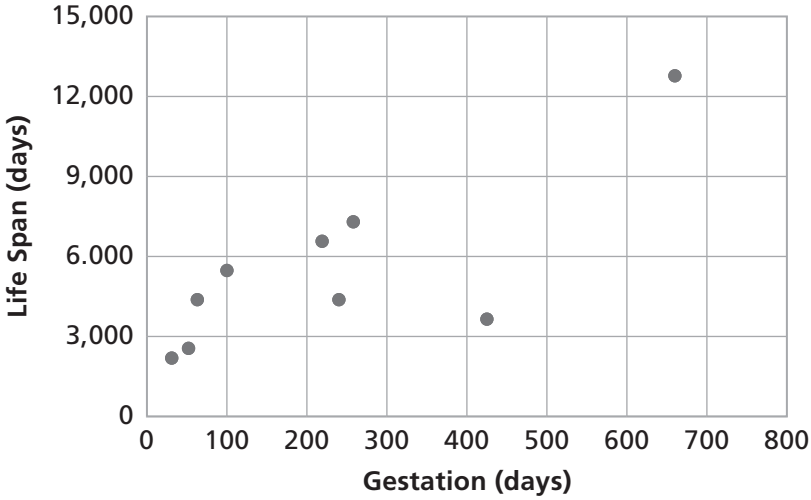
Figure 2

Gestations and Life Spans of Selected Mammals

Animal	Gestation (days)	Life Span (years)	Life Span (days)	Ratio of Life Span to Gestation (days)
Chipmunk	31	6	2,190	2,190 : 31, or 70.6
Cat	63	12	4,380	4,380 : 63, or 69.5
Fox	52	7	2,555	2,555 : 52, or 49.1
Lion	100	15	5,475	5,475 : 100, or 54.75
Black Bear	219	18	6,570	6,570 : 219, or 30
Gorilla	258	20	7,300	7,300 : 258, or 28.3
Moose	240	12	4,380	4,380 : 240, or 18.25
Giraffe	425	10	3,650	3,650 : 425, or 8.6
Elephant (African)	660	35	12,775	12,775 : 660, or 19.4

c. Most of the coordinates follow the pattern that as gestation increases, life span increases. This is true except for two of the mammals, the moose and giraffe. From the pattern, there does appear to be a roughly proportional relationship between the gestation and the life span.

Gestations and Life Spans of Selected Mammals



d. **i.** The points would go up from the left to the right, to illustrate that as *x* (gestation) increases, *y* (life span) increases.

ii. The points would go down from left to right; so as *x*, or gestation, increases, *y* (life span) decreases.