

Ratio, Proportion, and Percentage

1. On Thursday, 240 adults and children attended a show. The ratio of adults to children was 5 to 1. How many children attended the show?
 - A) 40
 - B) 48
 - C) 192
 - D) 200

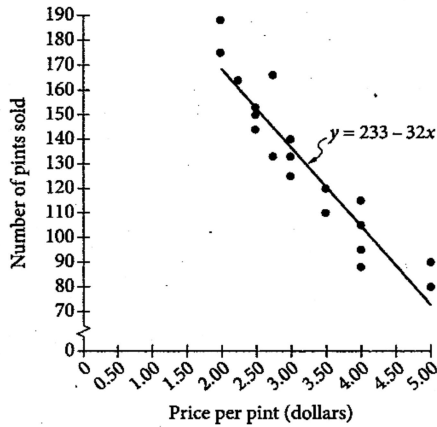
2. On an architect's drawing of the floor plan for a house, 1 inch represents 3 feet. If a room is represented on the floor plan by a rectangle that has sides of lengths 3.5 inches and 5 inches, what is the actual floor area of the room in square feet?
 - A) 17.5
 - B) 51.0
 - C) 52.5
 - D) 157.5

3. Scientists estimate that the Pacific Plate, one of Earth's tectonic plates, has moved about 1,060 kilometers in the past 10.3 million years. What was the average speed of the Pacific Plate during that time period, in centimeters per year?
 - A) 1.03
 - B) 10.3
 - C) 103
 - D) 1,030

4. County Y consists of two districts. One district has an area of 30 square miles and a population density of 370 people per square mile, and the other district has an area of 50 square miles and a population density of 290 people per square mile. What is the population density, in people per square mile, for all of County Y?
 - A) 330
 - B) 340
 - C) 350
 - D) 360

5. A furniture store buys its furniture from a wholesaler. For a particular table, the store usually charges its cost from the wholesaler plus 75%. During a sale, the store charged the wholesale cost plus 15%. If the sale price of the table was \$299, what is the usual price for the table?
 - A) \$359
 - B) \$455
 - C) \$479
 - D) \$524

Interpreting Relationships in Scatterplots, Graphs, Tables, and Equations



6. A grocery store sells pints of raspberries and sets the price per pint each week. The scatterplot above shows the price and the number of pints of raspberries sold for 19 weeks, along with the line of best fit and the equation for the line of best fit.

A. According to the line of best fit, how many pints of raspberries would the grocery store expect to sell in a week when the price of raspberries is \$4.50 per pint?

B. For how many of the 19 weeks shown was the number of pints of raspberries sold greater than the amount predicted by the line of best fit?

C. What is the best interpretation of the meaning of the slope of the line of best fit?

D. What is the best interpretation of the meaning of the y -intercept of the line of best fit?

Time (hours)	Number of bacteria
0	1×10^3
1	4×10^3
2	1.6×10^4
3	6.4×10^4

7. The table above gives the initial number (at time $t = 0$) of bacteria placed in a growth medium and the number of bacteria in the growth medium over 3 hours. Which of the following functions models the number of bacteria, $N(t)$, after t hours?

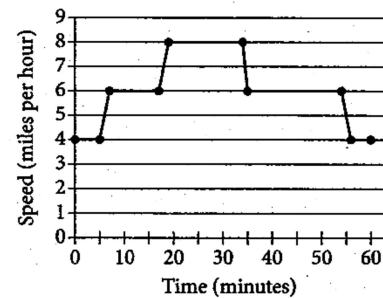
- A) $N(t) = 4,000t$
- B) $N(t) = 1,000 + 3,000t$
- C) $N(t) = 1,000(4^t)$
- D) $N(t) = 1,000(4^t)$

8. A bank has opened a new branch and, as part of a promotion, the bank branch is offering \$1,000 certificates of deposit at simple interest of 4% per year. The bank is selling certificates with terms of 1, 2, 3, or 4 years. Which of the following functions gives the total amount, A , in dollars, a customer will receive when a certificate with a term of k years is finally paid?

- A) $A = 1,000(1.04k)$
- B) $A = 1,000(1 + 0.04k)$
- C) $A = 1,000(1.04)^k$
- D) $A = 1,000(1 + 0.04^k)$

9. A bank has opened a new branch and, as part of a promotion, the bank branch is offering \$1,000 certificates of deposit at an interest rate of 4% per year, compounded semiannually. The bank is selling certificates with terms of 1, 2, 3, or 4 years. Which of the following functions gives the total amount, A , in dollars, a customer will receive when a certificate with a term of k years is finally paid?

- A) $A = 1,000(1 + 0.04k)$
- B) $A = 1,000(1 + 0.08k)$
- C) $A = 1,000(1.04)^k$
- D) $A = 1,000(1.02)^{2k}$



10. Each evening, Maria walks, jogs, and runs for a total of 60 minutes. The graph above shows Maria's speed during the 60 minutes. Which segment of the graph represents the times when Maria's speed is the greatest?

- A) The segment from (17, 6) to (19, 8)
- B) The segment from (19, 8) to (34, 8)
- C) The segment from (34, 8) to (35, 6)
- D) The segment from (35, 6) to (54, 6)

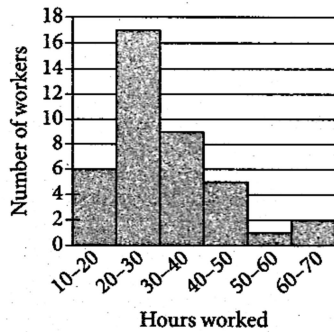
More Data and Statistics

11. A store is deciding whether to install a new security system to prevent shoplifting. The security manager of the store estimates that 10,000 customers enter the store each week, 24 of whom will attempt to shoplift. The manager estimates the results of the new security system in detecting shoplifters would be as shown in the table below.

	Alarm sounds	Alarm does not sound	Total
Customer attempts to shoplift	21	3	24
Customer does not attempt to shoplift	35	9,941	9,976
Total	56	9,944	10,000

According to the manager's estimates, if the alarm sounds for a customer, what is the probability that the customer did *not* attempt to shoplift?

- A) 0.03%
- B) 0.35%
- C) 0.56%
- D) 62.5%

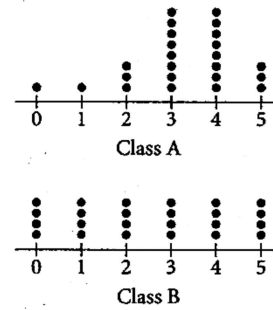


12. The histogram above summarizes the number of hours worked last week by the 40 employees of a landscaping company. In the histogram, the first bar represents all workers who worked at least 10 hours but less than 20 hours; the second represents all workers who worked at least 20 hours but less than 30 hours; and so on. Which of the following could be the median and mean number of hours worked for the 40 employees?

- A) Median = 22, Mean = 23
- B) Median = 24, Mean = 22
- C) Median = 26, Mean = 32
- D) Median = 32, Mean = 30

(Note: On the SAT, all histograms have the same type of boundary condition. That is, the values represented by a bar include the left endpoint but do not include the right endpoint.)

Scores of Two Classes in a Quiz



13. The dot plots above summarize the scores that two classes, each with 24 students, at Central High School achieved on a current events quiz. Which of the following correctly compares the standard deviation of the scores in each of the classes?

- A) The standard deviation of the scores in Class A is smaller.
- B) The standard deviation of the scores in Class B is smaller.
- C) The standard deviation of the scores in Class A and Class B is the same.
- D) The relationship cannot be determined from the information given.

14. A quality control researcher at an electronics company is testing the life of the company's batteries in a certain camera. The researcher selects 100 batteries at random from the daily output of the batteries and finds that the average life of the batteries has a 95% confidence interval of 324 to 360 camera pictures. Which of the following conclusions is the most reasonable based on the confidence interval?

- A) 95% of all the batteries produced by the company that day have a life between 324 and 360 pictures.
- B) 95% of all the batteries ever produced by the company have a life between 324 and 360 pictures.
- C) It is plausible that the true average life of batteries produced by the company that day is between 324 and 360 pictures.
- D) It is plausible that the true average life of all the batteries ever produced by the company is between 324 and 360 pictures.

15. A community center offers a Spanish course. This year, all students in the course were offered additional audio lessons they could take at home. The students who took these additional audio lessons did better in the course than students who didn't take the additional audio lessons. Which of the following is an appropriate conclusion?

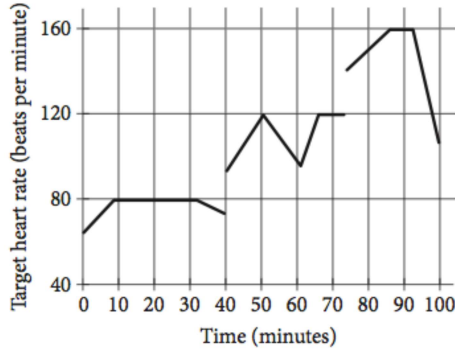
- A) Taking additional audio lessons will cause an improvement for any student who takes any foreign language course.
- B) Taking additional audio lessons will cause an improvement for any student who takes a Spanish course.
- C) Taking additional audio lessons was the cause of the improvement for the students at the community center who took the Spanish course.
- D) No conclusion about cause and effect can be made regarding students at the community center who took the additional audio lessons at home and their performance in the Spanish course.

No Calculator = none

With Calculator = all

1

John runs at different speeds as part of his training program. The graph shows his target heart rate at different times during his workout. On which interval is the target heart rate strictly increasing then strictly decreasing?



- A) Between 0 and 30 minutes
- B) Between 40 and 60 minutes
- C) Between 50 and 65 minutes
- D) Between 70 and 90 minutes

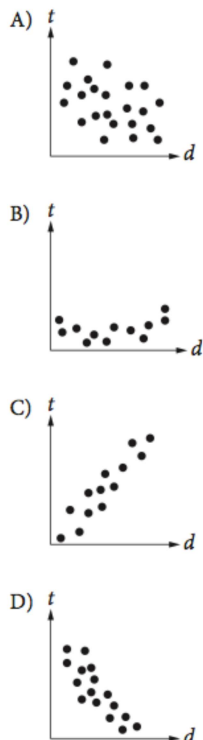
2

If $y = kx$, where k is a constant, and $y = 24$ when $x = 6$, what is the value of y when $x = 5$?

- A) 6
- B) 15
- C) 20
- D) 23

5

Which of the following graphs best shows a strong negative association between d and t ?



6

Also Used as Analysis in Science

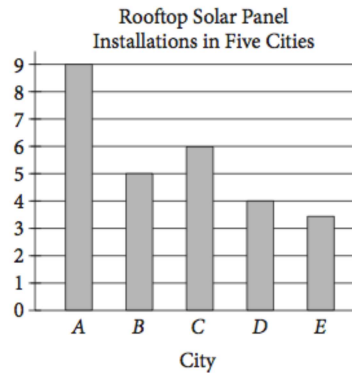
1 decagram = 10 grams
1,000 milligrams = 1 gram

A hospital stores one type of medicine in 2-decagram containers. Based on the information given in the box above, how many 1-milligram doses are there in one 2-decagram container?

- A) 0.002
- B) 200
- C) 2,000
- D) 20,000

7

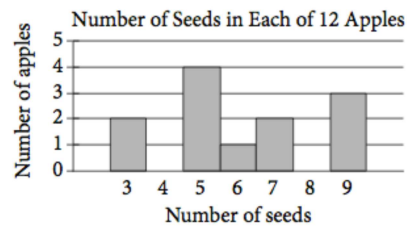
Also Used as Analysis in History/Social Studies



The number of rooftops with solar panel installations in 5 cities is shown in the graph above. If the total number of installations is 27,500, what is an appropriate label for the vertical axis of the graph?

- A) Number of installations (in tens)
- B) Number of installations (in hundreds)
- C) Number of installations (in thousands)
- D) Number of installations (in tens of thousands)

12



Based on the histogram above, of the following, which is closest to the average (arithmetic mean) number of seeds per apple?

- A) 4
- B) 5
- C) 6
- D) 7

13

		Course			Total
		Algebra I	Geometry	Algebra II	
Gender	Female	35	53	62	150
	Male	44	59	57	160
	Total	79	112	119	310

A group of tenth-grade students responded to a survey that asked which math course they were currently enrolled in. The survey data were broken down as shown in the table above. Which of the following categories accounts for approximately 19 percent of all the survey respondents?

- A) Females taking Geometry
- B) Females taking Algebra II
- C) Males taking Geometry
- D) Males taking Algebra I

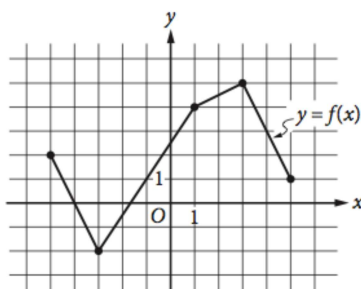
14 Also Used as Analysis in Science

Lengths of Fish (in inches)						
8	9	9	9	10	10	11
11	12	12	12	12	13	13
13	14	14	15	15	16	24

The table above lists the lengths, to the nearest inch, of a random sample of 21 brown bullhead fish. The outlier measurement of 24 inches is an error. Of the mean, median, and range of the values listed, which will change the most if the 24-inch measurement is removed from the data?

- A) Mean
- B) Median
- C) Range
- D) They will all change by the same amount.

17



The complete graph of the function f is shown in the xy -plane above. For what value of x is the value of $f(x)$ at its minimum?

- A) -5
- B) -3
- C) -2
- D) 3

20

Alma bought a laptop computer at a store that gave a 20 percent discount off its original price. The total amount she paid to the cashier was p dollars, including an 8 percent sales tax on the discounted price. Which of the following represents the original price of the computer in terms of p ?

- A) $0.88p$
- B) $\frac{p}{0.88}$
- C) $(0.8)(1.08)p$
- D) $\frac{p}{(0.8)(1.08)}$

21 Also Used as Analysis in Science

Dreams Recalled during One Week

	None	1 to 4	5 or more	Total
Group X	15	28	57	100
Group Y	21	11	68	100
Total	36	39	125	200

The data in the table above were produced by a sleep researcher studying the number of dreams people recall when asked to record their dreams for one week. Group X consisted of 100 people who observed early bedtimes, and Group Y consisted of 100 people who observed later bedtimes. If a person is chosen at random from those who recalled at least 1 dream, what is the probability that the person belonged to Group Y ?

- A) $\frac{68}{100}$
- B) $\frac{79}{100}$
- C) $\frac{79}{164}$
- D) $\frac{164}{200}$

Questions 22 and 23 refer to the following information.

Annual Budgets for Different Programs in Kansas, 2007 to 2010

Program	Year			
	2007	2008	2009	2010
Agriculture/natural resources	373,904	358,708	485,807	488,106
Education	2,164,607	2,413,984	2,274,514	3,008,036
General government	14,347,325	12,554,845	10,392,107	14,716,155
Highways and transportation	1,468,482	1,665,636	1,539,480	1,773,893
Human resources	4,051,050	4,099,067	4,618,444	5,921,379
Public safety	263,463	398,326	355,935	464,233

The table above lists the annual budget, in thousands of dollars, for each of six different state programs in Kansas from 2007 to 2010.

22 Also Used as Analysis in History/Social Studies

Which of the following best approximates the average rate of change in the annual budget for agriculture/natural resources in Kansas from 2008 to 2010?

- A) \$50,000,000 per year
- B) \$65,000,000 per year
- C) \$75,000,000 per year
- D) \$130,000,000 per year

23 Also Used as Analysis in History/Social Studies

Of the following, which program's ratio of its 2007 budget to its 2010 budget is closest to the human resources program's ratio of its 2007 budget to its 2010 budget?

- A) Agriculture/natural resources
- B) Education
- C) Highways and transportation
- D) Public safety

26 Also Used as Analysis in Science

Katarina is a botanist studying the production of pears by two types of pear trees. She noticed that Type A trees produced 20 percent more pears than Type B trees did. Based on Katarina's observation, if the Type A trees produced 144 pears, how many pears did the Type B trees produce?

- A) 115
- B) 120
- C) 124
- D) 173

27 Also Used as Analysis in Science

A square field measures 10 meters by 10 meters. Ten students each mark off a randomly selected region of the field; each region is square and has side lengths of 1 meter, and no two regions overlap. The students count the earthworms contained in the soil to a depth of 5 centimeters beneath the ground's surface in each region. The results are shown in the table below.

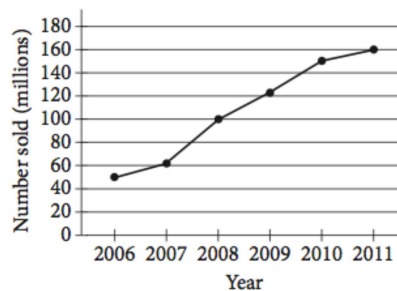
Region	Number of earthworms	Region	Number of earthworms
A	107	F	141
B	147	G	150
C	146	H	154
D	135	I	176
E	149	J	166

Which of the following is a reasonable approximation of the number of earthworms to a depth of 5 centimeters beneath the ground's surface in the entire field?

- A) 150
- B) 1,500
- C) 15,000
- D) 150,000

33 Also Used as Analysis in History/Social Studies

Number of Portable Media Players Sold Worldwide Each Year from 2006 to 2011



According to the line graph above, the number of portable media players sold in 2008 is what fraction of the number sold in 2011?

34

A local television station sells time slots for programs in 30-minute intervals. If the station operates 24 hours per day, every day of the week, what is the total number of 30-minute time slots the station can sell for Tuesday and Wednesday?

No Calculator = none

With Calculator = all

2

A quality control manager at a factory selects 7 lightbulbs at random for inspection out of every 400 lightbulbs produced. At this rate, how many lightbulbs will be inspected if the factory produces 20,000 lightbulbs?

- A) 300
- B) 350
- C) 400
- D) 450

Questions 4 and 5 refer to the following information.

The amount of money a performer earns is directly proportional to the number of people attending the performance. The performer earns \$120 at a performance where 8 people attend.

4 Also Used as Analysis in History/Social Studies

How much money will the performer earn when 20 people attend a performance?

- A) \$960
- B) \$480
- C) \$300
- D) \$240

5 Also Used as Analysis in History/Social Studies

The performer uses 43% of the money earned to pay the costs involved in putting on each performance. The rest of the money earned is the performer's profit. What is the profit the performer makes at a performance where 8 people attend?

- A) \$51.60
- B) \$57.00
- C) \$68.40
- D) \$77.00

11 Also Used as Analysis in History/Social Studies

Number of hours Tony plans to read the novel per day	3
Number of parts in the novel	8
Number of chapters in the novel	239
Number of words Tony reads per minute	250
Number of pages in the novel	1,078
Number of words in the novel	349,168

Tony is planning to read a novel. The table above shows information about the novel, Tony's reading speed, and the amount of time he plans to spend reading the novel each day. If Tony reads at the rates given in the table, which of the following is closest to the number of days it would take Tony to read the entire novel?

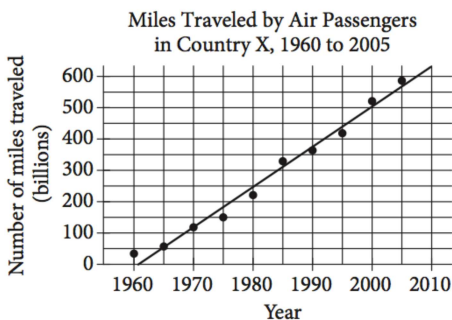
- A) 6
- B) 8
- C) 23
- D) 324

13 Also Used as Analysis in History/Social Studies

A researcher conducted a survey to determine whether people in a certain large town prefer watching sports on television to attending the sporting event. The researcher asked 117 people who visited a local restaurant on a Saturday, and 7 people refused to respond. Which of the following factors makes it least likely that a reliable conclusion can be drawn about the sports-watching preferences of all people in the town?

- A) Sample size
- B) Population size
- C) The number of people who refused to respond
- D) Where the survey was given

14 Also Used as Analysis in Science



According to the line of best fit in the scatterplot above, which of the following best approximates the year in which the number of miles traveled by air passengers in Country X was estimated to be 550 billion?

- A) 1997
- B) 2000
- C) 2003
- D) 2008

15 Also Used as Analysis in Science

The distance traveled by Earth in one orbit around the Sun is about 580,000,000 miles. Earth makes one complete orbit around the Sun in one year. Of the following, which is closest to the average speed of Earth, in miles per hour, as it orbits the Sun?

- A) 66,000
- B) 93,000
- C) 210,000
- D) 420,000

16 Also Used as Analysis in History/Social Studies

Results on the Bar Exam of Law School Graduates

	Passed bar exam	Did not pass bar exam
Took review course	18	82
Did not take review course	7	93

The table above summarizes the results of 200 law school graduates who took the bar exam. If one of the surveyed graduates who passed the bar exam is chosen at random for an interview, what is the probability that the person chosen did not take the review course?

- A) $\frac{18}{25}$
- B) $\frac{7}{25}$
- C) $\frac{25}{200}$
- D) $\frac{7}{200}$

17 Also Used as Analysis in Science

The atomic weight of an unknown element, in atomic mass units (amu), is approximately 20% less than that of calcium. The atomic weight of calcium is 40 amu. Which of the following best approximates the atomic weight, in amu, of the unknown element?

- A) 8
- B) 20
- C) 32
- D) 48

18 Also Used as Analysis in History/Social Studies

A survey was taken of the value of homes in a county, and it was found that the mean home value was \$165,000 and the median home value was \$125,000. Which of the following situations could explain the difference between the mean and median home values in the county?

- A) The homes have values that are close to each other.
- B) There are a few homes that are valued much less than the rest.
- C) There are a few homes that are valued much more than the rest.
- D) Many of the homes have values between \$125,000 and \$165,000.

Questions 19 and 20 refer to the following information.

A sociologist chose 300 students at random from each of two schools and asked each student how many siblings he or she has. The results are shown in the table below.

Students' Sibling Survey

Number of siblings	Lincoln School	Washington School
0	120	140
1	80	110
2	60	30
3	30	10
4	10	10

There are a total of 2,400 students at Lincoln School and 3,300 students at Washington School.

19

What is the median number of siblings for all the students surveyed?

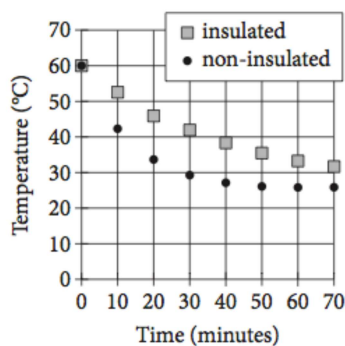
- A) 0
- B) 1
- C) 2
- D) 3

20

Based on the survey data, which of the following most accurately compares the expected total number of students with 4 siblings at the two schools?

- A) The total number of students with 4 siblings is expected to be equal at the two schools.
- B) The total number of students with 4 siblings at Lincoln School is expected to be 30 more than at Washington School.
- C) The total number of students with 4 siblings at Washington School is expected to be 30 more than at Lincoln School.
- D) The total number of students with 4 siblings at Washington School is expected to be 900 more than at Lincoln School.

27 Also Used as Analysis in Science



Two samples of water of equal mass are heated to 60 degrees Celsius (°C). One sample is poured into an insulated container, and the other sample is poured into a non-insulated container. The samples are then left for 70 minutes to cool in a room having a temperature of 25°C. The graph above shows the temperature of each sample at 10-minute intervals. Which of the following statements correctly compares the average rates at which the temperatures of the two samples change?

- A) In every 10-minute interval, the magnitude of the rate of change of temperature of the insulated sample is greater than that of the non-insulated sample.
- B) In every 10-minute interval, the magnitude of the rate of change of temperature of the non-insulated sample is greater than that of the insulated sample.
- C) In the intervals from 0 to 10 minutes and from 10 to 20 minutes, the rates of change of temperature of the insulated sample are of greater magnitude, whereas in the intervals from 40 to 50 minutes and from 50 to 60 minutes, the rates of change of temperature of the non-insulated sample are of greater magnitude.
- D) In the intervals from 0 to 10 minutes and from 10 to 20 minutes, the rates of change of temperature of the non-insulated sample are of greater magnitude, whereas in the intervals from 40 to 50 minutes and from 50 to 60 minutes, the rates of change of temperature of the insulated sample are of greater magnitude.

31 Also Used as Analysis in Science

A coastal geologist estimates that a certain country's beaches are eroding at a rate of 1.5 feet per year. According to the geologist's estimate, how long will it take, in years, for the country's beaches to erode by 21 feet?

32

If h hours and 30 minutes is equal to 450 minutes, what is the value of h ?

Questions 37 and 38 refer to the following information.

A botanist is cultivating a rare species of plant in a controlled environment and currently has 3000 of these plants. The population of this species that the botanist expects to grow next year, $N_{\text{next year}}$, can be estimated from the number of plants this year, $N_{\text{this year}}$, by the equation below.

$$N_{\text{next year}} = N_{\text{this year}} + 0.2 \left(N_{\text{this year}} \right) \left(1 - \frac{N_{\text{this year}}}{K} \right)$$

The constant K in this formula is the number of plants the environment is able to support.

37

According to the formula, what will be the number of plants two years from now if $K = 4000$? (Round your answer to the nearest whole number.)

38

The botanist would like to increase the number of plants that the environment can support so that the population of the species will increase more rapidly. If the botanist's goal is that the number of plants will increase from 3000 this year to 3360 next year, how many plants must the modified environment support?