

Math Power

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Warm-ups

1. Given $17xy + 7 = 19xy$. What is the value of $4xy$?

2. A student's average score on 6 tests is 83. When the lowest score is dropped, the average increases to 87. What is the lowest score?

Question set [3 - 18]

Alex, Brandy, Cathy, Danielle, Eric, and Frank stand in line.

3. In how many ways can they stand in a line?

4. In how many ways can they stand in a line so that Alex and Brandy are next to each other?

5. How many ways can (Alex, Brandy) stand next to each other, so as (Cathy, Danielle)?

6. How many ways can (Alex, Brandy) stand next to each other, so as (Cathy, Danielle), (Eric, Frank)?

7. How many ways can (Alex, Brandy) stand next to each other, so as (Cathy, Danielle), but neither does Alex nor Brandy stand next to Cathy or Danielle?

8. In how many ways can they stand in a line so that Alex and Brandy are NOT next to each other?

9. How many ways can Alex, Brandy, and Cathy stand together?

10. How many ways can Alex and Brandy stand at both ends?

11. What is the probability that Alex and Brandy stand at both ends?

12. What is the probability that Alex and Brandy are both elected to a committee of 2 members?

13. What is the probability that Alex and Brandy are both elected to a committee of 3 members?

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14. What is the probability that Alex and Brandy stand next to each other?
15. What is the probability that Alex, Brandy, and Cathy stand together?
16. What is the probability that Alex, Brandy, and Cathy are not standing next each other at all?
17. In many ways can they sit around a circular table?
18. Alex, Brandy, Cathy wear the same T-shirts with the letter "U." Danielle, Eric, and Frank wear the same T-shirts with the letter "R." How many different patterns can they stand to display the letters?
19. If the average of 4 consecutive integers is 4.5, what is the product of the four integers?
20. Express $66\frac{2}{3}\%$ as fraction.

Algebra 2

21. $h = -16t^2 + vt + k$
The equation above gives the height h , in feet, of a ball t seconds after it is thrown straight up with an initial speed of v feet per second from a height of k feet. Which of the following gives v in terms of h , t , and k ?
- A) $v = h + k - 16t$ B) $v = \frac{h-k+16}{t}$
C) $v = \frac{h-k}{t} - 16t$ D) $v = \frac{h-k}{t} + 16t$

Question set [22 - 23]

Given two polynomials:

$$p(x) = 4x^2 - 7x + 1$$

$$q(x) = 3x + 5$$

22. What is the coefficient of the term x^2 of the product $p(x)q(x)$?
- A) 41 B) 1
C) -1 D) -21
23. What is the sum of all the coefficients of the product $p(x)q(x)$?
- A) 16 B) -16
C) 64 D) -64
24. What is result for $(2x+3)^2 - (2x-3)^2$?
- A) $6x$ B) $-12x$
C) $8x^2 + 18$ D) $24x$

Question set [25 - 29]

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$$f(x) = y = x^2 - 6x + 8$$

The equation above represents a parabola in the xy -plane, which has 3 equivalent forms as below:

- A) $y = x(x - 6) + 8$ B) $y + 1 = (x - 3)^2$
C) $y = (x - 2)(x - 4)$

25. Which form displays the x -intercepts (or roots) of the parabola?

26. Which form displays the line of symmetry of the parabola? Identify the line of symmetry.

27. Which form displays the minimum value of the function $f(x)$? Identify the minimum value and where it attains this value.

28. Which form displays the y -intercept of the parabola? Identify the y -intercept.

29. It is easy to find the value of $f(-2) = 24$. At what other value of x will the function attain the same value of 24? Which form can be most useful for the decision?

30. If $8x + 8y = 18$ and $x^2 - y^2 = -\frac{3}{8}$, what is the value of $2x - 2y$?

- A) $-\frac{1}{3}$ B) $-\frac{1}{6}$
C) $\frac{1}{3}$ D) $\frac{1}{6}$

31. Given the equation $y = -3(x - 5)^2 + 8$, which of the following statements is not true?

- A) The y -intercept is $(0, 8)$. B) The axis of symmetry is $x = 5$.
C) The vertex is $(5, 8)$. D) The parabola opens downward.

32. How many real values of x satisfy the equation: $9x^2 - 12x + 4 = 0$?

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

33. How many real values of x satisfy the equation: $9x^4 - 30x^2 + 25 = 0$?

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

34. The line $y = kx + 4$, where k is a constant, is graphed in the xy -plane. If the line contains the point (c, d) , where $c \neq 0$ and $d \neq 0$, what is the slope of the line in terms of c and d ?

- A) $\frac{c-4}{d}$ B) $\frac{4-d}{c}$
C) $\frac{d-4}{c}$ D) $\frac{4-c}{d}$

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35. If $\frac{5}{x} = \frac{15}{x+20}$, what is the value of $\frac{x}{5}$?
- A) 10 B) 2
C) 1 D) $\frac{1}{2}$

36. $\sqrt{2k^2+17}-x+1=0$
If $k > 0$ and $x = 8$ in the equation above,
what is the value of k ?

Question set [37 - 38]

Symbolic expressions.

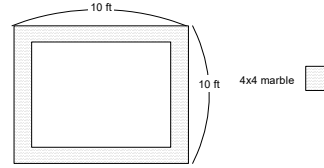
37. If the area of a circle is A , which of the following expresses its circumference?
- A) $\sqrt{2A\pi}$ B) $2A\sqrt{\pi}$
C) $2\pi\sqrt{A}$ D) $2\sqrt{A\pi}$
38. If the circumference of a circle is C , which of the following expresses its area?
- A) $\frac{4\pi}{C^2}$ B) $\frac{C^2}{4\pi}$
C) $\frac{C}{4\pi}$ D) $\frac{4\pi^2}{C}$
39. If $(ax+2)(bx+7)=15x^2+cx+14$ for all values of x , and $a+b = 8$, what are the possible values for c ?
40. $\sqrt{2k^2+17} - x = 0$
If $k > 0$ and $x = 7$ in the above equation,
what is the value of k ?

Warm-ups

41. Find a possible value of k ($\neq 0$) so that the graph of
 $f(x)=kx^2-4x+k$
tangent to the x -axis.
42. If $\frac{\sqrt{5}}{m+1} = \frac{m-1}{\sqrt{20}}$, find the value of m .
(Express your answer in square root.)
43. Factor the following:
 $5p^2 - 35pq$
44. If x is an integer, which of the following could NOT equal x^3 ?
- A) -8
B) 0
C) 1
D) 16
45. A cab driver uses $15\frac{1}{3}$ gallons of gas in driving 230 miles. How many miles can a gallon of gas last?
46. Three consecutive integers are listed in increasing order. If their sum is 201, what is the second integer in the list?

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47. What is the average of 9713, 9717, 9711, and 9715?
(Do you have any way except for dividing the sum by 4?)
51. The basement of John's home is a square with 10 ft by 10 ft. He plans to tile border part of the basement by 4 in. by 4 in. marble tiles. How many pieces of marble tiles will be used? (Hint: 1 ft. = 12 in.)



48. The average of 6 consecutive even integer is 35. What is the largest of them?

49. There are two candy boxes, one holds warhead and the other holds airhead. Each kind has 3 different fruit flavors. The following table shows the number of candy in each flavor.

	Orange	Strawberry	Apple
Warhead	4	6	2
Airhead	2	5	7

Pick a warhead and an Airhead, what is the probability of getting both of them in strawberry flavor?

50. Bob is paid two times his normal hourly rate for each hour worked over 40 hours in a week. Last week he earned \$504 for 48 hours of work. What is his hourly wage?
52. The Martin Fruit Co. charges 2% commission for selling fruit. What is the commission for selling 500 crates of oranges at \$16.30 per crate?
53. A rectangular door has a width of 8 ft and a length of 10 ft. Later on, it is reduced 20% in both length and width. What is the percent of change in area?
54. Pamela owns 36% of the stock of a corporation and sells $\frac{2}{3}$ of her stock at a 10% profit. What percent of this stock does she own after this transaction?
55. Louise bought a dress for D dollars, which represented a 20% discount of the original price. What was the discount (in terms of D) for the dress?

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56. All bikes are 20% off on sale. Bill bought one, but the cashier mistakenly increased the price by 20% instead. As a result, he was charged for \$360. How much should be refunded?
57. One cup of condensed milk weighs 12 ounces. How many (whole) cans of 8-ounce of condensed milk are needed for a recipe requiring 7 cups of the condensed milk?
58. If a car can travel 55 miles on 3 gallons of gas, how much gas is needed for a 495-mile trip?
59. A car can travel 264 miles on 12 gallons of gasoline. How far will it go on 15 gallons?
60. Garden seeds are on sale at \$10.40 for 13 packets. How much will 91 packets cost?
61. In air, the speed of sound S , in meters per second, is a linear function of the air temperature T , in degrees Celsius, and is given by $S(T) = 0.6T + 331.4$. Which of the following statements is the best interpretation of the number 331.4 in this context?
- A) The speed of sound, in meters per second, at 0°C
- B) The speed of sound, in meters per second, at 0.6°C
- C) The increase in the speed of sound, in meters per second, that corresponds to an increase of 1°C
- D) The increase in the speed of sound, in meters per second, that corresponds to an increase of 0.6°C
62. $h = 3a + 28.6$
- A pediatrician uses the model above to estimate the height h of a boy, in inches, in terms of the boy's age a , in years, between the ages of 2 and 5. Based on the model, what is the estimated increase, in inches, of a boy's height each year?

Interpretation of Coefficients

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63. The average number of students per classroom at Central High School from 2000 to 2010 can be modeled by the equation $y = 0.56x + 27.2$, where x represents the number of years since 2000, and y represents the average number of students per classroom. Which of the following best describes the meaning of the number 0.56 in the equation?
- A) The total number of students at the school in 2000
 - B) The average number of students per classroom in 2000
 - C) The estimated increase in the average number of students per classroom each year
 - D) The estimated difference between the average number of students per classroom in 2010 and in 2000

64. The normal systolic blood pressure P , in millimeters of mercury, for an adult male x years old can be modeled by the equation

$$P = \frac{2x+220}{3}$$

According to the model, for every increase of 1 year of age, by how many millimeters of mercury will the normal systolic blood pressure for an adult male increase?

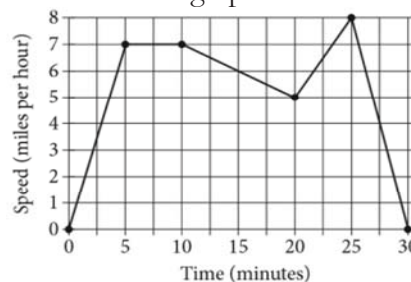
65. $C = \frac{5}{9}(F-32)$

The equation above shows how a temperature F , measured in degrees Fahrenheit, relates to a temperature C , measured in degrees Celsius. Based on the equation, what is the temperature change in Celsius on a change of 1° Fahrenheit?

66. $C = \frac{5}{9}(F-32)$

The equation above shows how a temperature F , measured in degrees Fahrenheit, relates to a temperature C , measured in degrees Celsius. Based on the equation, what is the temperature change in Fahrenheit on a change of 1° Celsius?

67. Theresa's Running Speed and Time



Theresa ran on a treadmill for thirty minutes, and her time and speed are shown on the graph above. According to the graph, which of the following statements is NOT true concerning Theresa's run?

- A) Theresa ran at a constant speed for five minutes.
- B) Theresa's speed was increasing for a longer period of time than it was decreasing.
- C) Theresa's speed decreased at a constant rate during the last five minutes.
- D) Theresa's speed reached its maximum during the last ten minutes.

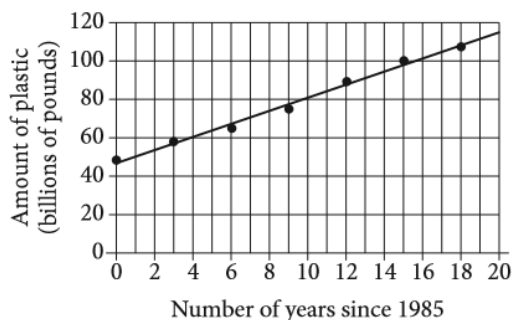
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68. A market researcher selected 200 people at random from a group of people who indicated that they liked a certain book. The 200 people were shown a movie based on the book and then asked whether they liked or disliked the movie. Of those surveyed, 95% said they disliked the movie. Which of the following inferences can appropriately be drawn from this survey result?
- A) At least 95% of people who go see movies will dislike this movie.
 - B) At least 95% of people who read books will dislike this movie.
 - C) Most people who dislike this book will like this movie.
 - D) Most people who like this book will dislike this movie.
69. Which of the following is the best interpretation of the number 3.39 in the context of the problem?
- A) The amount of plastic, in billions of pounds, produced in the United States during the year 1985
 - B) The number of years it took the United States to produce 1 billion pounds of plastic
 - C) The average annual plastic production, in billions of pounds, in the United States from 1985 to 2003
 - D) The average annual increase, in billions of pounds, of plastic produced per year in the United States from 1985 to 2003

Question set [69 - 70]

Between 1985 and 2003, data were collected every three years on the amount of plastic produced annually in the United States, in billions of pounds. The graph below shows the data and a line of best fit. The equation of the line of best fit is $y = 3.39x + 46.89$, where x is the number of years since 1985 and y is the amount of plastic produced annually, in billions of pounds.

US Production of Plastic



70. Which of the following is closest to the percent increase in the billions of pounds of plastic produced in the United States from 2000 to 2003?
- A) 10%
 - B) 44%
 - C) 77%
 - D) 110%

71. Kathy is a repair technician for a phone company. Each week, she receives a batch of phones that need repairs. The number of phones that she has left to fix at the end of each day can be estimated with the equation $P = 108 - 23d$, where P is the number of phones left and d is the number of days she has worked that week. What is the meaning of the value 108 in this equation?
- A) Kathy will complete the repairs within 108 days.
B) Kathy starts each week with 108 phones to fix.
C) Kathy repairs phones at a rate of 108 per hour.
D) Kathy repairs phones at a rate of 108 per day.
72. $a = 18t + 15$
Jane made an initial deposit to a savings account. Each week thereafter she deposited a fixed amount to the account. The equation above models the amount a , in dollars, that Jane has deposited after t weekly deposits. According to the model, how many dollars was Jane's initial deposit?
73. In order to determine if treatment X is successful in improving eyesight, a research study was conducted. From a large population of people with poor eyesight, 300 participants were selected at random. Half of the participants were randomly assigned to receive treatment X, and the other half did not receive treatment X. The resulting data showed that participants who received treatment X had significantly improved eyesight as compared to those who did not receive treatment X. Based on the design and results of the study, which of the following is an appropriate conclusion?
- A) Treatment X is likely to improve the eyesight of people who have poor eyesight.
B) Treatment X improves eyesight better than all other available treatments.
C) Treatment X will improve the eyesight of anyone who takes it.
D) Treatment X will cause a substantial improvement in eyesight.