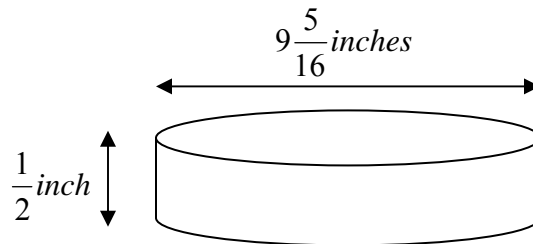


1. A population consists of the 3920 employees at Rex Hospital. A random sample of 2.5% of the employees was asked if they would take a statistics course if one were offered on site. Eight of the employees sampled said "yes." About how many of the 3920 employees would likely take a statistics course, based on the sample data?
- 8
 - 12
 - 32
 - 98
 - 320

2. A hole must be cut in the center of a metal disk (see picture) so that the radius of the hole is one-half the radius of the disk. After the hole is cut, what is the width, in inches, of the remaining disk on either side of the hole?

- $\frac{149}{16}$
- $\frac{149}{128}$
- $\frac{149}{32}$
- $\frac{149}{64}$
- $\frac{3}{2}$



3. A business runs an advertisement regularly in the local paper. The dimensions of the advertisement are 1.75 inches by 3.25 inches. In order to promote a special event, the business decides to increase the area of the advertisement by 20%. However, because of other limitations, the maximum width of the advertisement is 1.825 inches. If the larger advertisement is the maximum width, what is the smallest the other side can be in order to increase the size of the advertisement by at least 20%? (The dimensions of any advertisement are measured to the nearest $\frac{1}{32}$ inch.)
- $\frac{118}{32}$ inch
 - $\frac{119}{32}$ inch
 - $\frac{120}{32}$ inch
 - $\frac{121}{32}$ inch
 - none of the above

4. In order to provide water downstream, an operator will open the release valve on a dam. The open valve will release about 500 cubic feet of water per minute. The goal is to release about 1.2 million cubic feet of water. If the release valve is opened at 9:54 am on Monday 15 July, at which of the given times will the dam operator need to close the dam valve?
- 2 pm, 15 July
 - 2 am, 16 July
 - 6 pm, 16 July
 - 2 am, 17 July
 - 6 am, 17 July
5. Last year, a realtor sold 47 homes. The highest priced home was \$426,000 and the lowest priced home was \$74,000. The realtor's total commissions last year was \$235,000. If the commission was 5% of each sale, what was the average selling price for the 47 homes?
- \$250,000
 - \$247,368
 - \$117,500
 - \$106,383
 - \$100,000
6. Consider the equation $ax^2 + bx + c = 0$ for some non-zero a , b , and c . If the solutions to the equation $x^2 + bx + ac = 0$ are $x = m$ and $x = n$, then the solutions to the equation $ax^2 + bx + c = 0$ are
- $x = m$ and $x = n$
 - $x = am$ and $x = an$
 - $x = m/a$ and $x = n/a$
 - $x = cm/a$ and $x = cn/a$
 - $x = am/c$ and $x = an/c$
7. Which number is the sum of the solutions to the equation $3x^2 - 7x - 2 = (x - 1)^2$.
- 0
 - 1.5
 - 1.5
 - 2.5
 - 2.5

8. The algebraic expression $\frac{x^2 - 1}{x^2 + x} \div \frac{x^2 - 2x + 1}{2x^2}$ simplifies to which expression?
- a. $2x$
 - b. $-2x$
 - c. $\frac{2x}{x+1}$
 - d. $\frac{x^2}{x+1}$
 - e. $\frac{2x}{x-1}$
9. The price of stamps have increased exponentially since 1900 and can be approximated by the function $f(t) = 0.02(1.03)^t$, where t is years after 1900. Using this model, what is the predicted price of stamps in 2050?
- a. \$1.19
 - b. \$1.39
 - c. \$1.69
 - d. \$2.59
 - e. \$2.99
10. A collection of coins is made from an equal number of pennies, nickels, dimes, and quarters. What is the largest possible value of the collection which is less than \$3.00?
- a. \$2.46
 - b. \$2.57
 - c. \$2.78
 - d. \$2.87
 - e. \$2.98
11. How many integer ordered pair solutions does the system of linear inequalities $\begin{cases} y \geq x + 1 \\ x - y \geq 0 \end{cases}$ contain?
- a. None
 - b. One only
 - c. More than one but less than ten
 - d. More than 10 but less than 100
 - e. Infinitely many

For questions 12 through 15, let $a = \frac{5}{2}$, $b = \frac{1}{2}$, $c = \frac{3}{4}$, and $d = \frac{-5}{8}$.

12. $\frac{(-a)^2 b}{(-c)^3 d} =$

- a. $\frac{3375}{4096}$
- b. $\frac{125}{64}$
- c. $\frac{-8}{3}$
- d. $\frac{320}{27}$
- e. none of the above

13. $2\sqrt{a-b^2} =$

- a. 2
- b. $2\sqrt{2}$
- c. $2\sqrt{6}$
- d. $\sqrt{10}$
- e. 3

14. $\frac{b}{2c} - a^2 =$

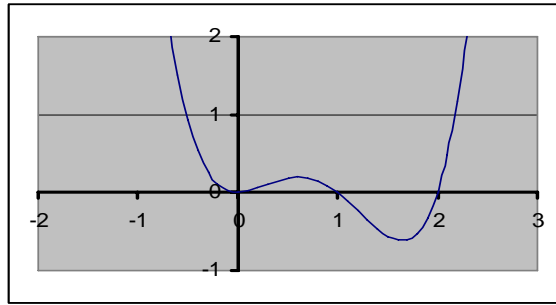
- a. $-4\frac{11}{12}$
- b. $-5\frac{11}{12}$
- c. -6
- d. $-23\frac{2}{3}$
- e. none of the above

15. $\frac{|c-a|}{2|b|-4|d|} =$

- a. $\frac{7}{6}$
- b. $-\frac{7}{6}$
- c. $-\frac{3}{4}$
- d. $-\frac{7}{2}$
- e. none of the above

16. A new Honda Civic is valued at \$14,599 and after two years is valued at \$10,421. Assuming the Honda depreciates linearly, what is the least number of years for the car's value to be under \$1000?
- 6
 - 7
 - 8
 - 9
 - 10
17. Find the equation of the line that bisects the segment with endpoints (1,2) and (7,5) and is also perpendicular to the same segment.
- $y = 7.5 - 0.5x$
 - $y = 7.5 - 2.0x$
 - $y = 11.5 - 2.0x$
 - $y = 5.5 - 0.5x$
 - $y = 1.5 + 0.5x$
18. A final grade consists of the average of six tests grades. If the first four test grades are 82 , 88 , 93 , and 87, what final two test grade average is needed to obtain a 90 final average?
- 93
 - 94
 - 95
 - 96
 - 97
19. A data set consists of 3 points (12,45) , (18,40) , and (25,36). Which one of the equations listed below has the smallest sum of the absolute value of the residuals for these data points?
- $y = 55 - 0.8x$
 - $y = 52 - 0.7x$
 - $y = 55 - 0.75x$
 - $y = 52 - 0.72x$
 - $y = 50 - 0.6x$
20. An annuity is established on 1/1/04 to accumulate \$40,000 by 1/1/14 by making equal monthly payments. If the interest rate is 12%, what minimum monthly payment is needed? Hint: $T = \frac{P (1 - (1 + \frac{r}{12})^M)}{1 - (1 + \frac{r}{12})}$, where T=accumulated value, P=monthly payment, r=interest rate, and M=number of months.
- \$174
 - \$183
 - \$192
 - \$208
 - \$333

A polynomial function $y=P(x)$ is shown below. Use this function for questions 21 and 22.



21. How many unique solutions are there to the equation $P(x) = 0$?
- none
 - one
 - two
 - three
 - four
22. Which expression is the factored form of $P(x)$, assuming A is a positive constant?
- $Ax(x-1)(x-2)$
 - $Ax(x+1)(x+2)$
 - $Ax(x-1)^2(x-2)^2$
 - $Ax^2(x+1)(x+2)$
 - $Ax^2(x-1)(x-2)$
23. Find the solution to the inequality $a(x-b) < c$ assuming a , b , and c are all negative constants.
- $x < b + c$
 - $x > b + c$
 - $x < \frac{ab + c}{a}$
 - $x > \frac{ab + c}{a}$
 - can not determine from the given information
24. Completely factor the expression $12x^4y + 2x^3y^2 - 4x^2y^3$
- Will not factor
 - $2x^2y(6x^2 + xy - 2y^2)$
 - $2x^2y(3x-2y)(2x+y)$
 - $2x^2y(6x-y)(x+2y)$
 - $2x^2y(3x+2y)(2x-y)$

25. A shirt which was regularly priced at \$48.98 has been reduced three times: 50%, then 30%, and then 25%. The final cost of the shirt is between which amounts?
- \$0 to \$8
 - \$8 to \$10
 - \$10 to \$12
 - \$12 to \$14
 - \$14 to \$16

26. Find the number of integer solutions to the inequality $|2x - 4| \leq |1 - x|$.
- none
 - one
 - two
 - three
 - four

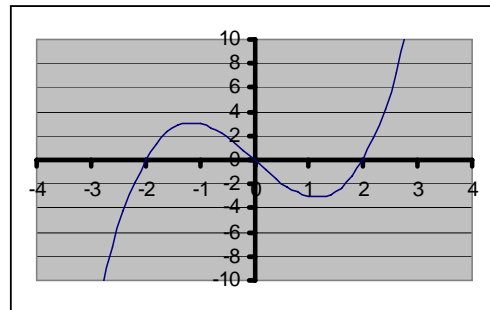
27. Simplify the expression $\frac{48(a^5b^3)^2}{(6a^4b^3c^0)^3}$.

- $\frac{8}{a^2}$
- $\frac{4}{9b}$
- $\frac{a^2b^3}{168}$
- $\frac{4}{9a^2b^3}$
- None of the above

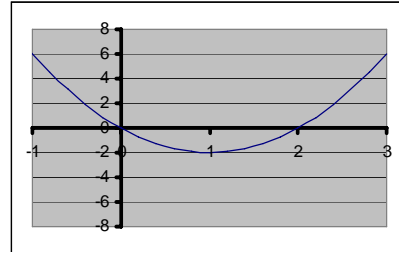
28. Given the function $y = f(x)$ to the right, which of the following are satisfied?

- $f(a) = -f(-a)$ for all $x=a$
- $f(x) < f(x+h)$ for all $h>0$
- $f(-2)=f(0)=f(2)$

- i only
- ii only
- iii only
- i and iii only
- i, ii, and iii

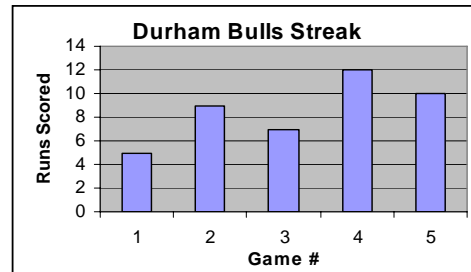


Use the graph of $y = g(x)$ to the right to answer questions 29 and 30.



29. The range of $y=g(x)$ is described by which interval, where t represents the output variable?
- $t \leq 0, t \geq 2$
 - $t \leq -2$
 - all real t
 - $t \geq 0$
 - $t \geq -2$
30. Which is the symbolic representation of the equation of $g(x)$.
- $g(x) = 2(x-1)^2 + 2$
 - $g(x) = 2(x+1)^2 - 2$
 - $g(x) = 2(x-1)^2 - 2$
 - $g(x) = 2(x+1)^2 + 2$
 - none of the above

Use the histogram to the right to answer questions 31 and 32. It displays the number of runs scored per game in a 5-consecutive home game streak by the Durham Bulls.



31. During these five games, what percent of the total runs scored were after game 3?
- 48%
 - 49%
 - 50%
 - 51%
 - 52%
32. If a linear model is used to represent runs scored per game during the five games, what integer is closest to the slope of the model?
- 1
 - 2
 - 3
 - 4
 - none of the above

33. Twenty-three coins consisting of only quarters, dimes, and nickels are valued at \$2.55. If a different collection is made so that the new number of quarters is changed to the old number of nickels, the new number of dimes is changed to the old number of quarters, and the new number of nickels is changed to the old number of dimes, then the value would change to \$3.40. Find the original number of dimes.
- 4
 - 6
 - 8
 - 10
 - 12

Questions 66 through 70 are short answer. Answers may be integers or algebraic expressions.

66. If $4a + 8b = 8b^2 - 2a^2$ and $2b \neq -a$, then find the exact value of $(a - 2b)$.

67. The counting numbers are written in the pattern shown below. Find the last number in the 30th row.

$$\begin{array}{ccccccc}
 & & & & & & 1 \\
 & & & & & 2 & 3 & 4 \\
 & & & 5 & 6 & 7 & 8 & 9 \\
 10 & 11 & \dots & & & & &
 \end{array}$$

68. A bus company can be chartered by a group for trips from Raleigh to New York. The base fee for a 16 person or less group size is \$672.00. For each additional person over 16, the per person fee is reduced by \$1.50 for all persons on the trip. What number of people would maximize the revenue for the bus company?
69. If a , b , c , and d are non-zero numbers such that c and d are solutions of the equation $x^2 + ax + b = 0$ and a and b are solutions to the equation $x^2 + cx + d = 0$, then find the value of $a + b + c + d$.
70. If a is the solution for x to the equation $mx + n = 0$ and b is the solution for x to the equation $nx - m = 0$, then write $\frac{a}{b}$ as a simplified expression in terms of m and n .