5.3 Practice Questions

Solve the problem and indicate the best of the answer choices given.
Numbers: All numbers used are real numbers.
Figures: A figure accompanying a problem solving question is intended to provide information useful in solving the problem. Figures are drawn as accurately as possible. Exceptions will be clearly noted. Lines shown as straight are straight, and lines that appear jagged are also straight. The positions of points, angles, regions, etc., exist in the order shown, and angle measures are greater than zero. All figures lie in a plane unless otherwise indicated.

1. The price of a coat in a certain store is $500. If the price of the coat is to be reduced by $150, by what percent is the price to be reduced?

   (A)   10%
   (B)   15%
   (C)   20%
   (D)   25%
   (E)   30%

2. On a vacation, Rose exchanged $500.00 for euros at an exchange rate of 0.80 euro per dollar and spent $\frac{3}{4}$ of the euros she received. If she exchanged the remaining euros for dollars at an exchange rate of $1.20 per euro, what was the dollar amount she received?

   (A) $60.00
   (B) $80.00
   (C) $100.00
   (D) $120.00
   (E) $140.00

x	x	x	y	y	v
v	x	x	y	w	w
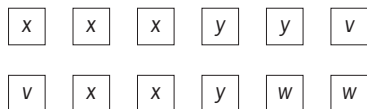
3. Each of the 12 squares shown is labeled x, y, v, or w. What is the ratio of the number of these squares labeled x or y to the number of these squares labeled v or w?

   (A)   1:2
   (B)   2:3
   (C)   4:3
   (D)   3:2
   (E)   2:1

4. $\frac{1}{3}+\frac{1}{2}-\frac{5}{6}+\frac{1}{5}+\frac{1}{4}-\frac{9}{20}=$

   (A)   0
   (B) $\frac{2}{15}$
   (C) $\frac{2}{5}$
   (D) $\frac{9}{20}$
   (E) $\frac{5}{6}$

5. Bouquets are to be made using white tulips and red tulips, and the ratio of the number of white tulips to the number of red tulips is to be the same in each bouquet. If there are 15 white tulips and 85 red tulips available for the bouquets, what is the greatest number of bouquets that can be made using all the tulips available?

   (A)   3
   (B)   5
   (C)   8
   (D)   10
   (E)   13

6. 125% of 5 =

   (A)   5.125
   (B)   5.25
   (C)   6
   (D)   6.125
   (E)   6.25

7. Today Rebecca, who is 34 years old, and her daughter, who is 8 years old, celebrate their birthdays. How many years will pass before Rebecca's age is twice her daughter's age?

    (A)   10
    (B)   14
    (C)   18
    (D)   22
    (E)   26

8. When traveling at a constant speed of 32 miles per hour, a certain motorboat consumes 24 gallons of fuel per hour. What is the fuel consumption of this boat at this speed measured in miles traveled per gallon of fuel?

    (A) $\dfrac{2}{3}$
    (B) $\dfrac{3}{4}$
    (C) $\dfrac{4}{5}$
    (D) $\dfrac{4}{3}$
    (E) $\dfrac{3}{2}$

9. A case contains c cartons. Each carton contains b boxes, and each box contains 100 paper clips. How many paper clips are contained in 2 cases?

    (A) $100bc$
    (B) $\dfrac{100b}{c}$
    (C) $200bc$
    (D) $\dfrac{200b}{c}$
    (E) $\dfrac{200}{bc}$

10. A technician makes a round-trip to and from a certain service center by the same route. If the technician completes the drive to the center and then completes 10 percent of the drive from the center, what percent of the round-trip has the technician completed?

    (A)   5%
    (B)   10%
    (C)   25%
    (D)   40%
    (E)   55%

11. Raffle tickets numbered consecutively from 101 through 350 are placed in a box. What is the probability that a ticket selected at random will have a number with a hundreds digit of 2 ?

    (A) $\dfrac{2}{5}$
    (B) $\dfrac{2}{7}$
    (C) $\dfrac{33}{88}$
    (D) $\dfrac{99}{250}$
    (E) $\dfrac{100}{249}$

12. When Leo imported a certain item, he paid a 7 percent import tax on the portion of the total value of the item in excess of $1,000. If the amount of the import tax that Leo paid was $87.50, what was the total value of the item?

    (A) $1,600
    (B) $1,850
    (C) $2,250
    (D) $2,400
    (E) $2,750

13. A collection of 16 coins, each with a face value of either 10 cents or 25 cents, has a total face value of $2.35. How many of the coins have a face value of 25 cents?

    (A)   3
    (B)   5
    (C)   7
    (D)   9
    (E)   11

14. The numbers of cars sold at a certain dealership on six of the last seven business days were 4, 7, 2, 8, 3, and 6, respectively. If the number of cars sold on the seventh business day was either 2, 4, or 5, for which of the three values does the average (arithmetic mean) number of cars sold per business day for the seven business days equal the median number of cars sold per day for the seven days?

   I.   2

   II.   4

   III.   5

(A) II only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

15. If it is assumed that 60 percent of those who receive a questionnaire by mail will respond and 300 responses are needed, what is the minimum number of questionnaires that should be mailed?

(A) 400
(B) 420
(C) 480
(D) 500
(E) 600

16. If $1 < x < y < z$, which of the following has the greatest value?

(A) $z(x + 1)$
(B) $z(y + 1)$
(C) $x(y + z)$
(D) $y(x + z)$
(E) $z(x + y)$

17. A rectangular garden is to be twice as long as it is wide. If 360 yards of fencing, including the gate, will completely enclose the garden, what will be the length of the garden, in yards?

(A) 120
(B) 140
(C) 160
(D) 180
(E) 200

18. A rectangular floor that measures 8 meters by 10 meters is to be covered with carpet squares that each measure 2 meters by 2 meters. If the carpet squares cost $12 apiece, what is the total cost for the number of carpet squares needed to cover the floor?

(A) $200
(B) $240
(C) $480
(D) $960
(E) $1,920

19. If $893 \times 78 = p$, which of the following is equal to 893×79 ?

(A) $p + 1$
(B) $p + 78$
(C) $p + 79$
(D) $p + 893$
(E) $p + 894$

20. Thabo owns exactly 140 books, and each book is either paperback fiction, paperback nonfiction, or hardcover nonfiction. If he owns 20 more paperback nonfiction books than hardcover nonfiction books, and twice as many paperback fiction books as paperback nonfiction books, how many hardcover nonfiction books does Thabo own?

(A) 10
(B) 20
(C) 30
(D) 40
(E) 50

21. If the average (arithmetic mean) of the four numbers 3, 15, 32, and $(N + 1)$ is 18, then $N =$

(A) 19
(B) 20
(C) 21
(D) 22
(E) 29

22. Abdul, Barb, and Carlos all live on the same straight road, on which their school is also located. The school is halfway between Abdul's house and Barb's house. Barb's house is halfway between the school and Carlos's house. If the school is 4 miles from Carlos's house, how many miles is Abdul's house from Carlos's house?

    (A) $1\frac{1}{3}$
    (B) 2
    (C) 4
    (D) 6
    (E) 8

23. During a certain time period, Car X traveled north along a straight road at a constant rate of 1 mile per minute and used fuel at a constant rate of 5 gallons every 2 hours. During this time period, if Car X used exactly 3.75 gallons of fuel, how many miles did Car X travel?

    (A) 36
    (B) 37.5
    (C) 40
    (D) 80
    (E) 90

24. Cheryl purchased 5 identical hollow pine doors and 6 identical solid oak doors for the house she is building. The regular price of each solid oak door was twice the regular price of each hollow pine door. However, Cheryl was given a discount of 25% off the regular price of each solid oak door. If the regular price of each hollow pine door was $40, what was the total price of all 11 doors?

    (A) $320
    (B) $540
    (C) $560
    (D) $620
    (E) $680

25. If $\left| y - \frac{1}{2} \right| < \frac{11}{2}$, which of the following could be a value of y?

    (A) -11
    (B) $-\frac{11}{2}$
    (C) $\frac{11}{2}$
    (D) 11
    (E) 22
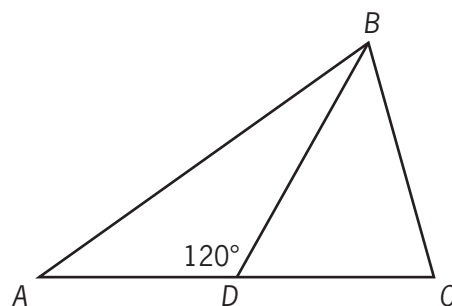
Note: Not drawn to scale.

26. In the figure shown, $AC = 2$ and $BD = DC = 1$. What is the measure of angle ABD?
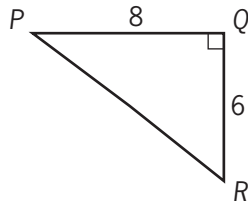
    (A) 15°
    (B) 20°
    (C) 30°
    (D) 40°
    (E) 45°

27. If $k^2 = m^2$, which of the following must be true?

    (A) $k = m$
    (B) $k = -m$
    (C) $k = |m|$
    (D) $k = -|m|$
    (E) $|k| = |m|$

28. Makoto, Nishi, and Ozuro were paid a total of $780 for waxing the floors at their school. Each was paid in proportion to the number of hours he or she worked. If Makoto worked 15 hours, Nishi worked 20 hours, and Ozuro worked 30 hours, how much was Makoto paid?

    (A) $52
    (B) $117
    (C) $130
    (D) $180
    (E) $234

29. The figure above shows a path around a triangular piece of land. Mary walked the distance of 8 miles from P to Q and then walked the distance of 6 miles from Q to R. If Ted walked directly from P to R, by what percent did the distance that Mary walked exceed the distance that Ted walked?

(A) 30%
(B) 40%
(C) 50%
(D) 60%
(E) 80%

30. At a supermarket, John spent $\frac{1}{2}$ of his money on fresh fruits and vegetables, $\frac{1}{3}$ on meat products, and $\frac{1}{10}$ on bakery products. If he spent the remaining $6 on candy, how much did John spend at the supermarket?

(A) $60
(B) $80
(C) $90
(D) $120
(E) $180

31. If $(1 - 1.25)N = 1$, then $N =$

(A) −400
(B) −140
(C) −4
(D) 4
(E) 400

32. A carpenter constructed a rectangular sandbox with a capacity of 10 cubic feet. If the carpenter were to make a similar sandbox twice as long, twice as wide, and twice as high as the first sandbox, what would be the capacity, in cubic feet, of the second sandbox?

(A) 20
(B) 40
(C) 60
(D) 80
(E) 100

33. The quotient when a certain number is divided by $\frac{2}{3}$ is $\frac{9}{2}$. What is the number?

(A) $\frac{4}{27}$

(B) $\frac{1}{3}$

(C) 3

(D) 6

(E) $\frac{27}{4}$

34. If a sphere with radius r is inscribed in a cube with edges of length e, which of the following expresses the relationship between r and e ?

(A) $r = \frac{1}{2}e$

(B) $r = e$

(C) $r = 2e$

(D) $r = \sqrt{e}$

(E) $r = \frac{1}{4}e^2$

35. If $2x + y = 7$ and $x + 2y = 5$, then $\frac{x+y}{3} =$

(A) 1

(B) $\frac{4}{3}$

(C) $\frac{17}{5}$

(D) $\frac{18}{5}$

(E) 4

36. City X has a population 4 times as great as the population of City Y, which has a population twice as great as the population of City Z. What is the ratio of the population of City X to the population of City Z ?

(A)   1:8
(B)   1:4
(C)   2:1
(D)   4:1
(E)   8:1

Tides at Bay Cove on July 13
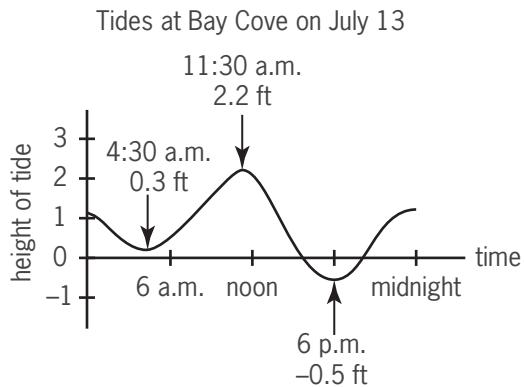
37. The graph above shows the height of the tide, in feet, above or below a baseline. Which of the following is closest to the difference, in feet, between the heights of the highest and lowest tides on July 13 at Bay Cove?

(A)   1.7
(B)   1.9
(C)   2.2
(D)   2.5
(E)   2.7

38. A manufacturer of a certain product can expect that between 0.3 percent and 0.5 percent of the units manufactured will be defective. If the retail price is $2,500 per unit and the manufacturer offers a full refund for defective units, how much money can the manufacturer expect to need to cover the refunds on 20,000 units?

(A)   Between $15,000 and $25,000
(B)   Between $30,000 and $50,000
(C)   Between $60,000 and $100,000
(D)   Between $150,000 and $250,000
(E)   Between $300,000 and $500,000
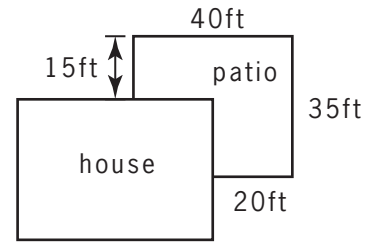
39. A flat patio was built alongside a house as shown in the figure above. If all angles are right angles, what is the area of the patio in square feet?

(A)   800
(B)   875
(C)   1,000
(D)   1,100
(E)   1,125

40. The sum of the weekly salaries of 5 employees is $3,250. If each of the 5 salaries is to increase by 10 percent, then the average (arithmetic mean) weekly salary per employee will increase by

(A) $52.50
(B) $55.00
(C) $57.50
(D) $62.50
(E) $65.00

41. A student's average (arithmetic mean) test score on 4 tests is 78. What must be the student's score on a 5th test for the student's average score on the 5 tests to be 80 ?

(A)   80
(B)   82
(C)   84
(D)   86
(E)   88

42. Last week Chris earned x dollars per hour for the first 40 hours worked plus 22 dollars per hour for each hour worked beyond 40 hours. If last week Chris earned a total of 816 dollars by working 48 hours, what is the value of x ?

   (A)   13
   (B)   14
   (C)   15
   (D)   16
   (E)   17
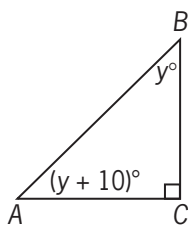
43. In the figure above, what is the ratio of the measure of angle B to the measure of angle A ?

   (A)   2 to 3
   (B)   3 to 4
   (C)   3 to 5
   (D)   4 to 5
   (E)   5 to 6

44. If n is a prime number greater than 3, what is the remainder when n^2 is divided by 12 ?

   (A)   0
   (B)   1
   (C)   2
   (D)   3
   (E)   5

45. $\dfrac{1}{1+\dfrac{1}{3}} - \dfrac{1}{1+\dfrac{1}{2}} =$

   (A) $-\dfrac{1}{3}$
   (B) $-\dfrac{1}{6}$
   (C) $-\dfrac{1}{12}$
   (D) $\dfrac{1}{12}$
   (E) $\dfrac{1}{3}$

46. The positive two-digit integers x and y have the same digits, but in reverse order. Which of the following must be a factor of $x + y$?

   (A)   6
   (B)   9
   (C)   10
   (D)   11
   (E)   14

47. In a certain sequence of 8 numbers, each number after the first is 1 more than the previous number. If the first number is –5, how many of the numbers in the sequence are positive?

   (A)   None
   (B)   One
   (C)   Two
   (D)   Three
   (E)   Four

48. A total of s oranges are to be packaged in boxes that will hold r oranges each, with no oranges left over. When n of these boxes have been completely filled, what is the number of boxes that remain to be filled?

   (A) $s - nr$
   (B) $s - \dfrac{n}{r}$
   (C) $rs - n$
   (D) $\dfrac{s}{n} - r$
   (E) $\dfrac{s}{r} - n$

49. If $0 < a < b < c$, which of the following statements must be true?

   I. $2a > b + c$
   II. $c - a > b - a$
   III. $\dfrac{c}{a} < \dfrac{b}{a}$

   (A)   I only
   (B)   II only
   (C)   III only
   (D)   I and II
   (E)   II and III

50. In the *xy*-plane, the origin *O* is the midpoint of line segment *PQ*. If the coordinates of *P* are (*r,s*), what are the coordinates of *Q* ?

    (A) (*r,s*)
    (B) (*s,–r*)
    (C) (*–s,–r*)
    (D) (*–r,s*)
    (E) (*–r,–s*)

51. Which of the following equations is NOT equivalent to $10y^2 = (x + 2)(x - 2)$?

    (A) $30y^2 = 3x^2 - 12$
    (B) $20y^2 = (2x - 4)(x + 2)$
    (C) $10y^2 + 4 = x^2$
    (D) $5y^2 = x^2 - 2$
   (E) $y^2 = \dfrac{x^2 - 4}{10}$

	Monday	Tuesday	Wednesday	Thursday
Company *A*	45	55	50	50
Company *B*	10	30	30	10
Company *C*	34	28	28	30
Company *D*	39	42	41	38
Company *E*	50	60	60	70

52. The table shows the numbers of packages shipped daily by each of five companies during a 4-day period. The standard deviation of the numbers of packages shipped daily during the period was greatest for which of the five companies?

    (A) *A*
    (B) *B*
    (C) *C*
    (D) *D*
    (E) *E*

53. Company Q plans to make a new product next year and sell each unit of this new product at a selling price of $2. The variable costs per unit in each production run are estimated to be 40% of the selling price, and the fixed costs for each production run are estimated to be $5,040. Based on these estimated costs, how many units of the new product will Company Q need to make and sell in order for their revenue to equal their total costs for each production run?

    (A) 4,200
    (B) 3,150
    (C) 2,520
    (D) 2,100
    (E) 1,800
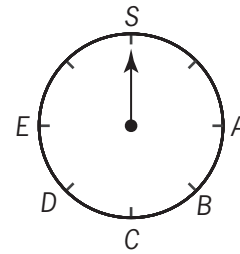
54. The dial shown above is divided into equal-sized intervals. At which of the following letters will the pointer stop if it is rotated clockwise from *S* through 1,174 intervals?
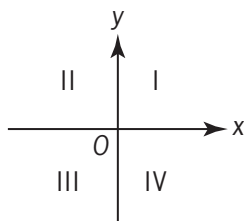
    (A) *A*
    (B) *B*
    (C) *C*
    (D) *D*
    (E) *E*

Estimated Number of Home-Schooled
Students by State, January 2001

State	Number (in thousands)
A	181
B	125
C	103
D	79
E	72

55. According to the table shown, the estimated number
of home-schooled students in State A is approximately
what percent greater than the number in State D ?

(A)   25%
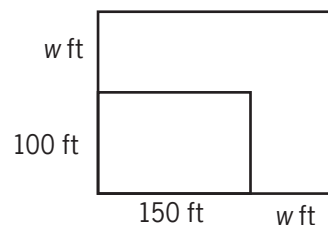(B)   55%
(C)   100%
(D)   125%
(E)   155%

56. The graph of the equation $xy = k$, where $k < 0$, lies in
which two of the quadrants shown above?

(A)   I and II
(B)   I and III
(C)   II and III
(D)   II and IV
(E)   III and IV

57. When n liters of fuel were added to a tank that was
already $\frac{1}{3}$ full, the tank was filled to $\frac{7}{9}$ of its capacity. In
terms of n, what is the capacity of the tank, in liters?

(A) $\frac{10}{9}n$

(B) $\frac{4}{3}n$

(C) $\frac{3}{2}n$

(D) $\frac{9}{4}n$

(E) $\frac{7}{3}n$

Note: Not drawn to scale.

58. The smaller rectangle in the figure above represents
the original size of a parking lot before its length
and width were each extended by w feet to make
the larger rectangular lot shown. If the area of the
enlarged lot is twice the area of the original lot, what is
the value of w ?

(A)   25
(B)   50
(C)   75
(D)   100
(E)   200

59. $\dfrac{1}{0.75-1} =$

(A)   −4
(B)   −0.25
(C)   0.25
(D)   0.75
(E)   4

60. Kevin invested $8,000 for one year at a simple annual interest rate of 6 percent and invested $10,000 for one year at an annual interest rate of 8 percent compounded semiannually. What is the total amount of interest that Kevin earned on the two investments?

    (A) $880
    (B) $1,088
    (C) $1,253
    (D) $1,280
    (E) $1,296

61. The harvest yield from a certain apple orchard was 350 bushels of apples. If x of the trees in the orchard each yielded 10 bushels of apples, what fraction of the harvest yield was from these x trees?

    (A) $\dfrac{x}{35}$

    (B) $1 - \dfrac{x}{35}$

    (C) $10x$

    (D) $35 - x$

    (E) $350 - 10x$

62. If n is an integer, which of the following must be even?

    (A) $n + 1$
    (B) $n + 2$
    (C) $2n$
    (D) $2n + 1$
    (E) n^2

63. The sum $\dfrac{7}{8} + \dfrac{1}{9}$ is between

    (A) $\dfrac{1}{2}$ and $\dfrac{3}{4}$

    (B) $\dfrac{3}{4}$ and 1

    (C) 1 and $1\dfrac{1}{4}$

    (D) $1\dfrac{1}{4}$ and $1\dfrac{1}{2}$

    (E) $1\dfrac{1}{2}$ and 2

64. Car X averages 25.0 miles per gallon of gasoline and Car Y averages 11.9 miles per gallon. If each car is driven 12,000 miles, approximately how many more gallons of gasoline will Car Y use than Car X ?

    (A)   320
    (B)   480
    (C)   520
    (D)   730
    (E)   920

65. If y is an integer, then the least possible value of $|23 - 5y|$ is

    (A)   1
    (B)   2
    (C)   3
    (D)   4
    (E)   5

66. $\sqrt{80} + \sqrt{125} =$

    (A) $9\sqrt{5}$
    (B) $20\sqrt{5}$
    (C) $41\sqrt{5}$
    (D) $\sqrt{205}$
    (E)   100

$$y = kx + 3$$

67. In the equation above, k is a constant. If $y = 17$ when $x = 2$, what is the value of y when $x = 4$?

    (A)   34
    (B)   31
    (C)   14
    (D)   11
    (E)   7

68. Which of the following is greatest?

    (A) $10\sqrt{3}$
    (B) $9\sqrt{4}$
    (C) $8\sqrt{5}$
    (D) $7\sqrt{6}$
    (E) $6\sqrt{7}$

69. Al and Ben are drivers for SD Trucking Company. One snowy day, Ben left SD at 8:00 a.m. heading east and Al left SD at 11:00 a.m. heading west. At a particular time later that day, the dispatcher retrieved data from SD's vehicle tracking system. The data showed that, up to that time, Al had averaged 40 miles per hour and Ben had averaged 20 miles per hour. It also showed that Al and Ben had driven a combined total of 240 miles. At what time did the dispatcher retrieve data from the vehicle tracking system?

    (A) 1:00 p.m.
    (B) 2:00 p.m.
    (C) 3:00 p.m.
    (D) 5:00 p.m.
    (E) 6:00 p.m.

70. Of the land owned by a farmer, 90 percent was cleared for planting. Of the cleared land, 40 percent was planted with soybeans and 50 percent of the cleared land was planted with wheat. If the remaining 720 acres of cleared land was planted with corn, how many acres did the farmer own?

    (A) 5,832
    (B) 6,480
    (C) 7,200
    (D) 8,000
    (E) 8,889

71. At the start of an experiment, a certain population consisted of 3 animals. At the end of each month after the start of the experiment, the population size was double its size at the beginning of that month. Which of the following represents the population size at the end of 10 months?

    (A) 2^3
    (B) 3^2
    (C) $2(3^{10})$
    (D) $3(2^{10})$
    (E) $3(10^2)$

72. If $\left(\dfrac{1}{3}+\dfrac{1}{4}+\dfrac{1}{5}+\dfrac{1}{6}\right)=r\left(\dfrac{1}{9}+\dfrac{1}{12}+\dfrac{1}{15}+\dfrac{1}{18}\right)$, then $r=$

    (A) $\dfrac{1}{3}$
    (B) $\dfrac{4}{3}$
    (C) 3
    (D) 4
    (E) 12

73. If x and y are positive integers such that y is a multiple of 5 and $3x + 4y = 200$, then x must be a multiple of which of the following?

    (A) 3
    (B) 6
    (C) 7
    (D) 8
    (E) 10

74. Which of the following expressions can be written as an integer?

    I. $\left(\sqrt{82}+\sqrt{82}\right)^2$

    II. $(82)\left(\sqrt{82}\right)$

    III. $\dfrac{\left(\sqrt{82}\right)\left(\sqrt{82}\right)}{82}$

    (A) None
    (B) I only
    (C) III only
    (D) I and II
    (E) I and III

75. Four staff members at a certain company worked on a project. The amounts of time that the four staff members worked on the project were in the ratio 2 to 3 to 5 to 6. If one of the four staff members worked on the project for 30 hours, which of the following CANNOT be the total number of hours that the four staff members worked on the project?

    (A)   80
    (B)   96
    (C)   160
    (D)   192
    (E)   240

76. Pumping alone at their respective constant rates, one inlet pipe fills an empty tank to $\frac{1}{2}$ of capacity in 3 hours and a second inlet pipe fills the same empty tank to $\frac{2}{3}$ of capacity in 6 hours. How many hours will it take both pipes, pumping simultaneously at their respective constant rates, to fill the empty tank to capacity?

    (A)   3.25
    (B)   3.6
    (C)   4.2
    (D)   4.4
    (E)   5.5

77. In the xy-coordinate plane, which of the following points must lie on the line $kx + 3y = 6$ for every possible value of k ?

    (A)   (1,1)
    (B)   (0,2)
    (C)   (2,0)
    (D)   (3,6)
    (E)   (6,3)

78. If $x^2 - 2 < 0$, which of the following specifies all the possible values of x ?

    (A) $0 < x < 2$
    (B) $0 < x < \sqrt{2}$
    (C) $-\sqrt{2} < x < \sqrt{2}$
    (D) $-2 < x < 0$
    (E) $-2 < x < 2$

Book number	Pages in book	Total pages read
1	253	253
2	110	363
3	117	480
4	170	650
5	155	805
6	50	855
7	205	1,060
8	70	1,130
9	165	1,295
10	105	1,400
11	143	1,543
12	207	1,750

79. Shawana made a schedule for reading books during 4 weeks (28 days) of her summer vacation. She has checked out 12 books from the library. The number of pages in each book and the order in which she plans to read the books are shown in the table above. She will read exactly 50 pages each day. The only exception will be that she will never begin the next book on the same day that she finishes the previous one, and therefore on some days she may read fewer than 50 pages. At the end of the 28th day, how many books will Shawana have finished?

    (A)   7
    (B)   8
    (C)   9
    (D)   10
    (E)   11

80. In Western Europe, x bicycles were sold in each of the years 1990 and 1993. The bicycle producers of Western Europe had a 42 percent share of this market in 1990 and a 33 percent share in 1993. Which of the following represents the decrease in the annual number of bicycles produced and sold in Western Europe from 1990 to 1993 ?

(A) 9% of $\dfrac{x}{100}$

(B) 14% of $\dfrac{x}{100}$

(C) 75% of $\dfrac{x}{100}$

(D) 9% of x

(E) 14% of x

81. If k is a positive integer, what is the remainder when $(k + 2)(k^3 - k)$ is divided by 6 ?

(A) 0
(B) 1
(C) 2
(D) 3
(E) 4

82. Which of the following fractions is closest to $\dfrac{1}{2}$?

(A) $\dfrac{4}{7}$

(B) $\dfrac{5}{9}$

(C) $\dfrac{6}{11}$

(D) $\dfrac{7}{13}$

(E) $\dfrac{9}{16}$

83. If $p \neq 0$ and $p - \dfrac{1-p^2}{p} = \dfrac{r}{p}$, then $r =$

(A) $p + 1$
(B) $2p - 1$
(C) $p^2 + 1$
(D) $2p^2 - 1$
(E) $p^2 + p - 1$

84. If the range of the six numbers 4, 3, 14, 7, 10, and x is 12, what is the difference between the greatest possible value of x and the least possible value of x ?

(A) 0
(B) 2
(C) 12
(D) 13
(E) 15

85. What number is 108 more than two-thirds of itself?

(A) 72
(B) 144
(C) 162
(D) 216
(E) 324

86. A doctor prescribed 18 cubic centimeters of a certain drug to a patient whose body weight was 120 pounds. If the typical dosage is 2 cubic centimeters per 15 pounds of body weight, by what percent was the prescribed dosage greater than the typical dosage?

(A) 8%
(B) 9%
(C) 11%
(D) 12.5%
(E) 14.8%

87. Company P had 15 percent more employees in December than it had in January. If Company P had 460 employees in December, how many employees did it have in January?

(A) 391
(B) 400
(C) 410
(D) 423
(E) 445

88. The function f is defined by $f(x) = \sqrt{x} - 10$ for all positive numbers x. if $u = f(t)$ for some positive numbers t and u, what is t in terms of u ?

    (A) $\sqrt{\sqrt{u} + 10}$

    (B) $\left(\sqrt{u} + 10\right)^2$

    (C) $\sqrt{u^2 + 10}$

    (D) $(u + 10)^2$

    (E) $(u^2 + 10)^2$

89. A glass was filled with 10 ounces of water, and 0.01 ounce of the water evaporated each day during a 20-day period. What percent of the original amount of water evaporated during this period?

    (A) 0.002%
    (B) 0.02%
    (C) 0.2%
    (D) 2%
    (E) 20%

90. If m and p are positive integers and $m^2 + p^2 < 100$, what is the greatest possible value of mp ?

    (A) 36
    (B) 42
    (C) 48
    (D) 49
    (E) 51

91. If $\dfrac{x}{y} = \dfrac{c}{d}$ and $\dfrac{d}{c} = \dfrac{b}{a}$, which of the following must be true?

    I. $\dfrac{y}{x} = \dfrac{b}{a}$

    II. $\dfrac{x}{a} = \dfrac{y}{b}$

    III. $\dfrac{y}{a} = \dfrac{x}{b}$

    (A) I only
    (B) II only
    (C) I and II only
    (D) I and III only
    (E) I, II, and III

92. If k is an integer and $(0.0025)(0.025)(0.00025) \times 10^k$ is an integer, what is the least possible value of k ?

    (A) −12
    (B) −6
    (C) 0
    (D) 6
    (E) 12

93. If $a(a + 2) = 24$ and $b(b + 2) = 24$, where $a \ne b$, then $a + b =$

    (A) −48
    (B) −2
    (C) 2
    (D) 46
    (E) 48

94. In a recent election, Ms. Robbins received 8,000 votes cast by independent voters, that is, voters not registered with a specific political party. She also received 10 percent of the votes cast by those voters registered with a political party. If N is the total number of votes cast in the election and 40 percent of the votes cast were cast by independent voters, which of the following represents the number of votes that Ms. Robbins received?

    (A) $0.06N + 3,200$
    (B) $0.1N + 7,200$
    (C) $0.4N + 7,200$
    (D) $0.1N + 8,000$
    (E) $0.06N + 8,000$
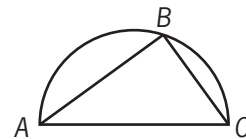
95. In the figure shown, the triangle is inscribed in the semicircle. If the length of line segment AB is 8 and the length of line segment BC is 6, what is the length of arc ABC ?

    (A) 15π
    (B) 12π
    (C) 10π
    (D) 7π
    (E) 5π

96. A manufacturer makes and sells 2 products, P and Q. The revenue from the sale of each unit of P is $20.00 and the revenue from the sale of each unit of Q is $17.00. Last year the manufacturer sold twice as many units of Q as P. What was the manufacturer's average (arithmetic mean) revenue per unit sold of these 2 products last year?

   (A) $28.50
   (B) $27.00
   (C) $19.00
   (D) $18.50
   (E) $18.00

97. On a certain day, orangeade was made by mixing a certain amount of orange juice with an equal amount of water. On the next day, orangeade was made by mixing the same amount of orange juice with twice the amount of water. On both days, all the orangeade that was made was sold. If the revenue from selling the orangeade was the same for both days and if the orangeade was sold at $0.60 per glass on the first day, what was the price per glass on the second day?

   (A) $0.15
   (B) $0.20
   (C) $0.30
   (D) $0.40
   (E) $0.45

98. A worker carries jugs of liquid soap from a production line to a packing area, carrying 4 jugs per trip. If the jugs are packed into cartons that hold 7 jugs each, how many jugs are needed to fill the last partially filled carton after the worker has made 17 trips?

   (A) 1
   (B) 2
   (C) 4
   (D) 5
   (E) 6
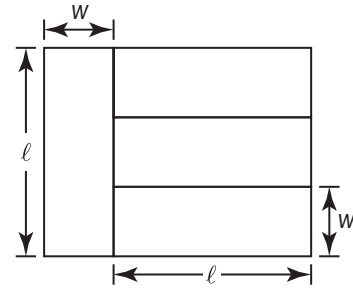
99. The figure shown above represents a modern painting that consists of four differently colored rectangles, each of which has length ℓ and width w. If the area of the painting is 4,800 square inches, what is the width, in inches, of each of the four rectangles?

   (A) 15
   (B) 20
   (C) 25
   (D) 30
   (E) 40

100. A certain fruit stand sold apples for $0.70 each and bananas for $0.50 each. If a customer purchased both apples and bananas from the stand for a total of $6.30, what total number of apples and bananas did the customer purchase?

   (A) 10
   (B) 11
   (C) 12
   (D) 13
   (E) 14

101. In the *xy*-plane, what is the slope of the line with equation $3x + 7y = 9$?

   (A) $-\dfrac{7}{3}$

   (B) $-\dfrac{3}{7}$

   (C) $\dfrac{3}{7}$

   (D) 3

   (E) 7

102. Working simultaneously and independently at an identical constant rate, four machines of a certain type can produce a total of x units of product P in 6 days. How many of these machines, working simultaneously and independently at this constant rate, can produce a total of $3x$ units of product P in 4 days?

    (A)   24
    (B)   18
    (C)   16
    (D)   12
    (E)   8

103. At a certain school, the ratio of the number of second graders to the number of fourth graders is 8 to 5, and the ratio of the number of first graders to the number of second graders is 3 to 4. If the ratio of the number of third graders to the number of fourth graders is 3 to 2, what is the ratio of the number of first graders to the number of third graders?

    (A)   16 to 15
    (B)   9 to 5
    (C)   5 to 16
    (D)   5 to 4
    (E)   4 to 5

104. The symbol Δ denotes one of the four arithmetic operations: addition, subtraction, multiplication, or division. If $6 \Delta 3 \leq 3$, which of the following must be true?

    I. $2 \Delta 2 = 0$
    II. $2 \Delta 2 = 1$
    III. $4 \Delta 2 = 2$

    (A)   I only
    (B)   II only
    (C)   III only
    (D)   I and II only
    (E)   I, II, and III

105. The average distance between the Sun and a certain planet is approximately 2.3×10^{14} inches. Which of the following is closest to the average distance between the Sun and the planet, in kilometers? (1 kilometer is approximately 3.9×10^4 inches.)

    (A) 7.1×10^8
    (B) 5.9×10^9
    (C) 1.6×10^{10}
    (D) 1.6×10^{11}
    (E) 5.9×10^{11}

106. If $mn \neq 0$ and 25 percent of n equals $37\frac{1}{2}$ percent of m, what is the value of $\frac{12n}{m}$?

    (A)   18
    (B) $\frac{32}{3}$
    (C)   8
    (D)   3
    (E) $\frac{9}{8}$

107. In the coordinate plane, a circle has center (2,–3) and passes through the point (5,0). What is the area of the circle?

    (A) 3π
    (B) $3\sqrt{2}\pi$
    (C) $3\sqrt{3}\pi$
    (D) 9π
    (E) 18π

108. Last year Joe grew 1 inch and Sally grew 200 percent more than Joe grew. How many inches did Sally grow last year?

    (A)   0
    (B)   1
    (C)   2
    (D)   3
    (E)   4

109. The cost C, in dollars, to remove p percent of a certain pollutant from a pond is estimated by using the formula $C = \dfrac{100,000P}{100-P}$. According to this estimate, how much more would it cost to remove 90 percent of the pollutant from the pond than it would cost to remove 80 percent of the pollutant?

    (A) $500,000
    (B) $100,000
    (C) $50,000
    (D) $10,000
    (E) $5,000

110. If $xy \neq 0$ and $x^2y^2 - xy = 6$, which of the following could be y in terms of x ?

    I. $\dfrac{1}{2x}$

    II. $-\dfrac{2}{x}$

    III. $\dfrac{3}{x}$

    (A) I only
    (B) II only
    (C) I and II
    (D) I and III
    (E) II and III

111. At a certain instant in time, the number of cars, N, traveling on a portion of a certain highway can be estimated by the formula

$$N = \frac{20Ld}{600 + s^2}$$

    where L is the number of lanes in the same direction, d is the length of the portion of the highway, in feet, and s is the average speed of the cars, in miles per hour. Based on the formula, what is the estimated number of cars traveling on a $\dfrac{1}{2}$-mile portion of the highway if the highway has 2 lanes in the same direction and the average speed of the cars is 40 miles per hour? (5,280 feet = 1 mile)

    (A) 155
    (B)   96
    (C)   80
    (D)   48
    (E)   24

112. $\sqrt{4.8 \times 10^9}$ is closest in value to

    (A)   2,200
    (B)   70,000
    (C)   220,000
    (D) 7,000,000
    (E) 22,000,000

113. Three printing presses, R, S, and T, working together at their respective constant rates, can do a certain printing job in 4 hours. S and T, working together at their respective constant rates, can do the same job in 5 hours. How many hours would it take R, working alone at its constant rate, to do the same job?

    (A)   8
    (B) 10
    (C) 12
    (D) 15
    (E) 20

114. For a party, three solid cheese balls with diameters of 2 inches, 4 inches, and 6 inches, respectively, were combined to form a single cheese ball. What was the approximate diameter, in inches, of the new cheese ball? (The volume of a sphere is $\dfrac{4}{3}\pi r^3$, where r is the radius.)

    (A) 12
    (B) 16
    (C) $\sqrt[3]{16}$
    (D) $3\sqrt[3]{8}$
    (E) $2\sqrt[3]{36}$

115. The sum of all the integers k such that $-26 < k < 24$ is

   (A)   0
    (B)   -2
    (C) -25
    (D) -49
    (E) -51
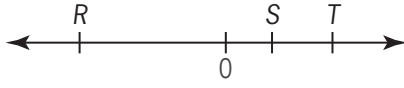
116. The number line shown contains three points R, S, and T, whose coordinates have absolute values r, s, and t, respectively. Which of the following equals the average (arithmetic mean) of the coordinates of the points R, S, and T?

    (A) s
    (B) $s + t - r$
    (C) $\dfrac{r - s - t}{3}$
    (D) $\dfrac{r + s + t}{3}$
    (E) $\dfrac{s + t - r}{3}$

117. Mark and Ann together were allocated n boxes of cookies to sell for a club project. Mark sold 10 boxes less than n and Ann sold 2 boxes less than n. If Mark and Ann have each sold at least one box of cookies, but together they have sold less than n boxes, what is the value of n?

    (A) 11
    (B) 12
    (C) 13
    (D) 14
    (E) 15

118. A certain high school has 5,000 students. Of these students, x are taking music, y are taking art, and z are taking both music and art. How many students are taking neither music nor art?

    (A) $5,000 - z$
    (B) $5,000 - x - y$
    (C) $5,000 - x + z$
    (D) $5,000 - x - y - z$
    (E) $5,000 - x - y + z$

119. Yesterday's closing prices of 2,420 different stocks listed on a certain stock exchange were all different from today's closing prices. The number of stocks that closed at a higher price today than yesterday was 20 percent greater than the number that closed at a lower price. How many of the stocks closed at a higher price today than yesterday?

    (A) 484
    (B) 726
    (C) 1,100
    (D) 1,320
    (E) 1,694

120. Each person who attended a company meeting was either a stockholder in the company, an employee of the company, or both. If 62 percent of those who attended the meeting were stockholders and 47 percent were employees, what percent were stockholders who were <u>not</u> employees?

    (A) 34%
    (B) 38%
    (C) 45%
    (D) 53%
    (E) 62%

121. A gym class can be divided into 8 teams with an equal number of players on each team or into 12 teams with an equal number of players on each team. What is the lowest possible number of students in the class?

    (A) 20
    (B) 24
    (C) 36
    (D) 48
    (E) 96

Accounts	Amount Budgeted	Amount Spent
Payroll	$110,000	$117,000
Taxes	40,000	42,000
Insurance	2,500	2,340

122. The table shows the amount budgeted and the amount spent for each of three accounts in a certain company. For which of these accounts did the amount spent differ from the amount budgeted by more than 6 percent of the amount budgeted?

    (A)   Payroll only
    (B)   Taxes only
    (C)   Insurance only
   (D)   Payroll and Insurance
    (E)   Taxes and Insurance
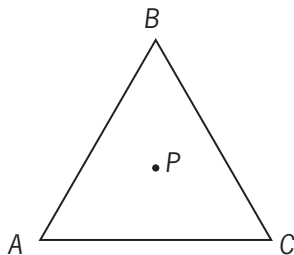
123. In the figure above, triangle ABC is equilateral, and point P is equidistant from vertices A, B, and C. If triangle ABC is rotated clockwise about point P, what is the minimum number of degrees the triangle must be rotated so that point B will be in the position where point A is now?

    (A)   60
    (B)   120
    (C)   180
    (D)   240
    (E)   270

124. At least $\frac{2}{3}$ of the 40 members of a committee must vote in favor of a resolution for it to pass. What is the greatest number of members who could vote against the resolution and still have it pass?

    (A)   19
    (B)   17
    (C)   16
    (D)   14
    (E)   13
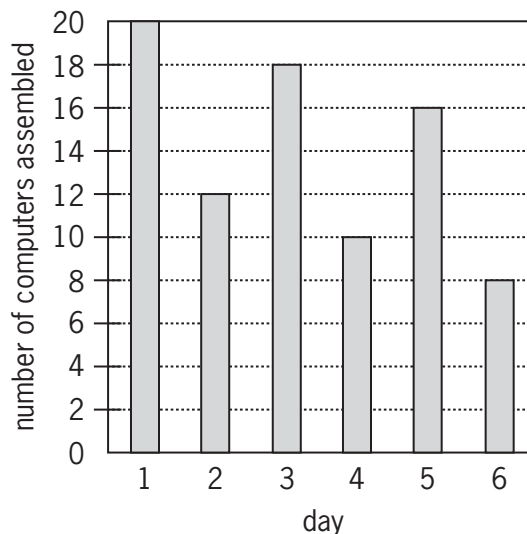
125. The graph shows the number of computers assembled during each of 6 consecutive days. From what day to the next day was the percent change in the number of computers assembled the greatest in magnitude?

    (A)   From Day 1 to Day 2
    (B)   From Day 2 to Day 3
    (C)   From Day 3 to Day 4
    (D)   From Day 4 to Day 5
    (E)   From Day 5 to Day 6

126. If $n = 20! + 17$, then n is divisible by which of the following?

    I.   15

    II.   17

    III.   19

(A)   None

(B)   I only

(C)   II only

(D)   I and II

(E)   II and III

127. The product of two negative numbers is 160. If the lesser of the two numbers is 4 less than twice the greater, what is the greater number?

(A)   −20

(B)   −16

(C)   −10

(D)   −8

(E)   −4

128. According to a certain estimate, the depth $N(t)$, in centimeters, of the water in a certain tank at t hours past 2:00 in the morning is given by $N(t) = -20(t - 5)^2 + 500$ for $0 \le t \le 10$. According to this estimate, at what time in the morning does the depth of the water in the tank reach its maximum?

(A)   5:30

(B)   7:00

(C)   7:30

(D)   8:00

(E)   9:00

129. After driving to a riverfront parking lot, Bob plans to run south along the river, turn around, and return to the parking lot, running north along the same path. After running 3.25 miles south, he decides to run for only 50 minutes more. If Bob runs at a constant rate of 8 minutes per mile, how many miles farther south can he run and still be able to return to the parking lot in 50 minutes?

(A)   1.5

(B)   2.25

(C)   3.0

(D)   3.25

(E)   4.75

130. Alex deposited x dollars into a new account that earned 8 percent annual interest, compounded annually. One year later Alex deposited an additional x dollars into the account. If there were no other transactions and if the account contained w dollars at the end of two years, which of the following expresses x in terms of w?

(A) $\dfrac{w}{1+1.08}$

(B) $\dfrac{w}{1.08+1.16}$

(C) $\dfrac{w}{1.16+1.24}$

(D) $\dfrac{w}{1.08+(1.08)^2}$

(E) $\dfrac{w}{(1.08)^2+(1.08)^3}$

131. M is the sum of the reciprocals of the consecutive integers from 201 to 300, inclusive. Which of the following is true?

(A) $\dfrac{1}{3} < M < \dfrac{1}{2}$

(B) $\dfrac{1}{5} < M < \dfrac{1}{3}$

(C) $\dfrac{1}{7} < M < \dfrac{1}{5}$

(D) $\dfrac{1}{9} < M < \dfrac{1}{7}$

(E) $\dfrac{1}{12} < M < \dfrac{1}{9}$

132. Working simultaneously at their respective constant rates, Machines A and B produce 800 nails in x hours. Working alone at its constant rate, Machine A produces 800 nails in y hours. In terms of x and y, how many hours does it take Machine B, working alone at its constant rate, to produce 800 nails?

(A) $\dfrac{x}{x+y}$

(B) $\dfrac{y}{x+y}$

(C) $\dfrac{xy}{x+y}$

(D) $\dfrac{xy}{x-y}$

(E) $\dfrac{xy}{y-x}$

133. In the Johnsons' monthly budget, the dollar amounts allocated to household expenses, food, and miscellaneous items are in the ratio 5:2:1, respectively. If the total amount allocated to these three categories is $1,800, what is the amount allocated to food?

   (A) $900
   (B) $720
   (C) $675
   (D) $450
   (E) $225

	Number of Marbles in Each of Three Bags	Percent of Marbles in Each Bag That Are Blue (to the nearest tenth)
Bag P	37	10.8%
Bag Q	x	66.7%
Bag R	32	50.0%

134. If $\frac{1}{3}$ of the total number of marbles in the three bags listed in the table above are blue, how many marbles are there in bag Q ?

   (A)   5
   (B)   9
   (C)   12
   (D)   23
   (E)   46

135. $\dfrac{(0.0036)(2.8)}{(0.04)(0.1)(0.003)} =$

   (A)   840.0
   (B)   84.0
   (C)   8.4
   (D)   0.84
   (E)   0.084

136. If n is an integer greater than 6, which of the following must be divisible by 3 ?

   (A) $n(n + 1)(n - 4)$
   (B) $n(n + 2)(n - 1)$
   (C) $n(n + 3)(n - 5)$
   (D) $n(n + 4)(n - 2)$
   (E) $n(n + 5)(n - 6)$

| Age Category (in years)	Number of Employees
Less than 20	29
20–29	58
30–39	36
40–49	21
50–59	10
60–69	5
70 and over	2

137. The table above gives the age categories of the 161 employees at Company X and the number of employees in each category. According to the table, if m is the median age, in years, of the employees at Company X, then m must satisfy which of the following?

   (A) $20 \le m \le 29$
   (B) $25 \le m \le 34$
   (C) $30 \le m \le 39$
   (D) $35 \le m \le 44$
   (E) $40 \le m \le 49$

138. If x and y are positive numbers such that $x + y = 1$, which of the following could be the value of $100x + 200y$?

   I.   80
   II.   140
   III. 199

   (A)   II only
   (B)   III only
   (C)   I and II
   (D)   I and III
   (E)   II and III

139. If X is the hundredths digit in the decimal 0.1X and if Y is the thousandths digit in the decimal 0.02Y, where X and Y are nonzero digits, which of the following is closest to the greatest possible value of $\dfrac{0.1X}{0.02Y}$?

(A)   4
(B)   5
(C)   6
(D)   9
(E)   10

140. Clarissa will create her summer reading list by randomly choosing 4 books from the 10 books approved for summer reading. She will list the books in the order in which they are chosen. How many different lists are possible?

(A)   6
(B)   40
(C)   210
(D)   5,040
(E)   151,200

141. If n is a positive integer and the product of all the integers from 1 to n, inclusive, is divisible by 990, what is the least possible value of n ?

(A)   8
(B)   9
(C)   10
(D)   11
(E)   12

142. The probability that event M will <u>not</u> occur is 0.8 and the probability that event R will <u>not</u> occur is 0.6. If events M and R cannot both occur, which of the following is the probability that either event M or event R will occur?

(A) $\dfrac{1}{5}$

(B) $\dfrac{2}{5}$

(C) $\dfrac{3}{5}$

(D) $\dfrac{4}{5}$

(E) $\dfrac{12}{25}$

143. The total cost for Company X to produce a batch of tools is $10,000 plus $3 per tool. Each tool sells for $8. The gross profit earned from producing and selling these tools is the total income from sales minus the total production cost. If a batch of 20,000 tools is produced and sold, then Company X's gross profit per tool is

(A) $3.00
(B) $3.75
(C) $4.50
(D) $5.00
(E) $5.50

144. If Q is an odd number and the median of Q consecutive integers is 120, what is the largest of these integers?

(A) $\dfrac{Q-1}{2}+120$

(B) $\dfrac{Q}{2}+119$

(C) $\dfrac{Q}{2}+120$

(D) $\dfrac{Q+119}{2}$

(E) $\dfrac{Q+120}{2}$

145. A ladder of a fire truck is elevated to an angle of 60° and extended to a length of 70 feet. If the base of the ladder is 7 feet above the ground, how many feet above the ground does the ladder reach?

(A)   35
(B)   42
(C) $35\sqrt{3}$
(D) $7+35\sqrt{3}$
(E) $7+42\sqrt{3}$
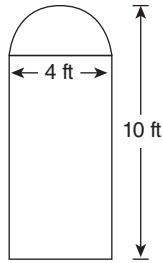
146. The window in the figure above consists of a rectangle and a semicircle with dimensions as shown. What is the area, in square feet, of the window?

   (A) $40 + 8\pi$
   (B) $40 + 2\pi$
   (C) $32 + 8\pi$
   (D) $32 + 4\pi$
   (E) $32 + 2\pi$

147. If there are fewer than 8 zeros between the decimal point and the first nonzero digit in the decimal expansion of $\left(\dfrac{t}{1,000}\right)^4$, which of the following numbers could be the value of t?

   I.   3
   II.   5
   III. 9

   (A)   None
   (B)   I only
   (C)   II only
   (D)   III only
   (E)   II and III

148. A three-digit code for certain locks uses the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 according to the following constraints. The first digit cannot be 0 or 1, the second digit must be 0 or 1, and the second and third digits cannot both be 0 in the same code. How many different codes are possible?

   (A)   144
   (B)   152
   (C)   160
   (D)   168
   (E)   176

149. Jackie has two solutions that are 2 percent sulfuric acid and 12 percent sulfuric acid by volume, respectively. If these solutions are mixed in appropriate quantities to produce 60 liters of a solution that is 5 percent sulfuric acid, approximately how many liters of the 2 percent solution will be required?

   (A)   18
   (B)   20
   (C)   24
   (D)   36
   (E)   42

150. If Jake loses 8 pounds, he will weigh twice as much as his sister. Together they now weigh 278 pounds. What is Jake's present weight, in pounds?

   (A)   131
   (B)   135
   (C)   139
   (D)   147
   (E)   188

151. For each student in a certain class, a teacher adjusted the student's test score using the formula $y = 0.8x + 20$, where x is the student's original test score and y is the student's adjusted test score. If the standard deviation of the original test scores of the students in the class was 20, what was the standard deviation of the adjusted test scores of the students in the class?

   (A)   12
   (B)   16
   (C)   28
   (D)   36
   (E)   40

152. Last year 26 members of a certain club traveled to England, 26 members traveled to France, and 32 members traveled to Italy. Last year no members of the club traveled to both England and France, 6 members traveled to both England and Italy, and 11 members traveled to both France and Italy. How many members of the club traveled to at least one of these three countries last year?

   (A)   52
   (B)   67
   (C)   71
   (D)   73
   (E)   79

153. A store reported total sales of $385 million for February of this year. If the total sales for the same month last year was $320 million, approximately what was the percent increase in sales?
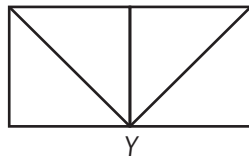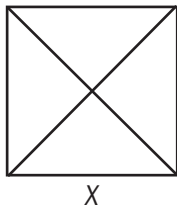
(A)   2%
(B)   17%
(C)   20%
(D)   65%
(E)   83%

154. When positive integer x is divided by positive integer y, the remainder is 9. If $\dfrac{x}{y} = 96.12$, what is the value of y?

(A)   96
(B)   75
(C)   48
(D)   25
(E)   12

155. If $x(2x + 1) = 0$ and $\left(x + \dfrac{1}{2}\right)(2x - 3) = 0$, then $x =$

(A)   −3
(B) $-\dfrac{1}{2}$
(C)   0
(D) $\dfrac{1}{2}$
(E) $\dfrac{3}{2}$

X   Y

156. Figures X and Y above show how eight identical triangular pieces of cardboard were used to form a square and a rectangle, respectively. What is the ratio of the perimeter of X to the perimeter of Y?

(A) $2 : 3$
(B) $\sqrt{2} : 2$
(C) $2\sqrt{2} : 3$
(D) $1 : 1$
(E) $\sqrt{2} : 1$

157. A certain experimental mathematics program was tried out in 2 classes in each of 32 elementary schools and involved 37 teachers. Each of the classes had 1 teacher and each of the teachers taught at least 1, but not more than 3, of the classes. If the number of teachers who taught 3 classes is n, then the least and greatest possible values of n, respectively, are

(A)   0 and 13
(B)   0 and 14
(C)   1 and 10
(D)   1 and 9
(E)   2 and 8

158. For the positive numbers, n, $n + 1$, $n + 2$, $n + 4$, and $n + 8$, the mean is how much greater than the median?

(A)   0
(B)   1
(C) $n + 1$
(D) $n + 2$
(E) $n + 3$

159. The interior of a rectangular carton is designed by a certain manufacturer to have a volume of x cubic feet and a ratio of length to width to height of 3:2:2. In terms of x, which of the following equals the height of the carton, in feet?

(A) $\sqrt[3]{x}$
(B) $\sqrt[3]{\dfrac{2x}{3}}$
(C) $\sqrt[3]{\dfrac{3x}{2}}$
(D) $\dfrac{2}{3}\sqrt[3]{x}$
(E) $\dfrac{3}{2}\sqrt[3]{x}$

160. The present ratio of students to teachers at a certain school is 30 to 1. If the student enrollment were to increase by 50 students and the number of teachers were to increase by 5, the ratio of students to teachers would then be 25 to 1. What is the present number of teachers?

(A)   5
(B)   8
(C)   10
(D)   12
(E)   15

161. What is the smallest integer n for which $25^n > 5^{12}$?

(A)   6
(B)   7
(C)   8
(D)   9
(E)   10

162. Sixty percent of the members of a study group are women, and 45 percent of those women are lawyers. If one member of the study group is to be selected at random, what is the probability that the member selected is a woman lawyer?

(A)   0.10
(B)   0.15
(C)   0.27
(D)   0.33
(E)   0.45

163. Each year for 4 years, a farmer increased the number of trees in a certain orchard by $\frac{1}{4}$ of the number of trees in the orchard the preceding year. If all of the trees thrived and there were 6,250 trees in the orchard at the end of the 4-year period, how many trees were in the orchard at the beginning of the 4-year period?

(A)   1,250
(B)   1,563
(C)   2,250
(D)   2,560
(E)   2,752

Number of Shipments of Manufactured Homes in the United States, 1990–2000
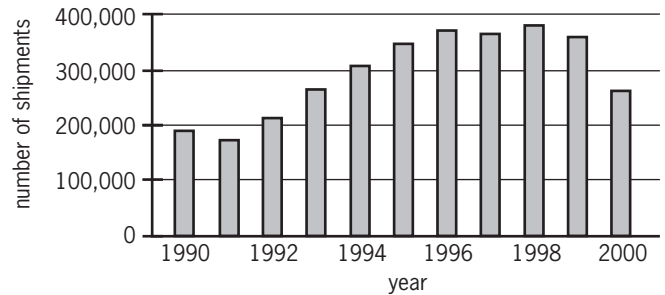
164. According to the chart shown, which of the following is closest to the median annual number of shipments of manufactured homes in the United States for the years from 1990 to 2000, inclusive?

(A)   250,000
(B)   280,000
(C)   310,000
(D)   325,000
(E)   340,000

165. For the positive integers a, b, and k, $a^k \| b$ means that a^k is a divisor of b, but a^{k+1} is not a divisor of b. If k is a positive integer and $2^k \| 72$, then k is equal to

(A)   2
(B)   3
(C)   4
(D)   8
(E)   18

166. A certain characteristic in a large population has a distribution that is symmetric about the mean m. If 68 percent of the distribution lies within one standard deviation d of the mean, what percent of the distribution is less than $m + d$?

(A)   16%
(B)   32%
(C)   48%
(D)   84%
(E)   92%

167. Four extra-large sandwiches of exactly the same size were ordered for m students, where $m > 4$. Three of the sandwiches were evenly divided among the students. Since 4 students did not want any of the fourth sandwich, it was evenly divided among the remaining students. If Carol ate one piece from each of the four sandwiches, the amount of sandwich that she ate would be what fraction of a whole extra-large sandwich?

(A) $\dfrac{m+4}{m(m-4)}$

(B) $\dfrac{2m-4}{m(m-4)}$

(C) $\dfrac{4m-4}{m(m-4)}$

(D) $\dfrac{4m-8}{m(m-4)}$

(E) $\dfrac{4m-12}{m(m-4)}$

168. Which of the following equations has $1 + \sqrt{2}$ as one of its roots?

(A) $x^2 + 2x - 1 = 0$
(B) $x^2 - 2x + 1 = 0$
(C) $x^2 + 2x + 1 = 0$
(D) $x^2 - 2x - 1 = 0$
(E) $x^2 - x - 1 = 0$

169. In Country C, the unemployment rate among construction workers dropped from 16 percent on September 1, 1992, to 9 percent on September 1, 1996. If the number of construction workers was 20 percent greater on September 1, 1996, than on September 1, 1992, what was the approximate percent change in the number of unemployed construction workers over this period?

(A) 50% decrease
(B) 30% decrease
(C) 15% decrease
(D) 30% increase
(E) 55% increase

170. In a box of 12 pens, a total of 3 are defective. If a customer buys 2 pens selected at random from the box, what is the probability that neither pen will be defective?

(A) $\dfrac{1}{6}$

(B) $\dfrac{2}{9}$

(C) $\dfrac{6}{11}$

(D) $\dfrac{9}{16}$

(E) $\dfrac{3}{4}$

171. At a certain fruit stand, the price of each apple is 40 cents and the price of each orange is 60 cents. Mary selects a total of 10 apples and oranges from the fruit stand, and the average (arithmetic mean) price of the 10 pieces of fruit is 56 cents. How many oranges must Mary put back so that the average price of the pieces of fruit that she keeps is 52 cents?

(A) 1
(B) 2
(C) 3
(D) 4
(E) 5

172. A pharmaceutical company received $3 million in royalties on the first $20 million in sales of the generic equivalent of one of its products and then $9 million in royalties on the next $108 million in sales. By approximately what percent did the ratio of royalties to sales decrease from the first $20 million in sales to the next $108 million in sales?

(A)   8%
(B)   15%
(C)   45%
(D)   52%
(E)   56%

Times at Which the Door
Opened from 8:00 to 10:00

8:00	8:06	8:30	9:05
8:03	8:10	8:31	9:11
8:04	8:18	8:54	9:29
8:04	8:19	8:57	9:31

173. The light in a restroom operates with a 15-minute timer that is reset every time the door opens as a person goes in or out of the room. Thus, after someone enters or exits the room, the light remains on for only 15 minutes unless the door opens again and resets the timer for another 15 minutes. If the times listed above are the times at which the door opened from 8:00 to 10:00, approximately how many minutes during this two-hour period was the light off?

(A)   10
(B)   25
(C)   35
(D)   40
(E)   70

174. The parallelogram shown has four sides of equal length. What is the ratio of the length of the shorter diagonal to the length of the longer diagonal?
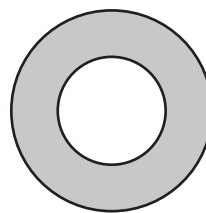
(A) $\dfrac{1}{2}$

(B) $\dfrac{1}{\sqrt{2}}$

(C) $\dfrac{1}{2\sqrt{2}}$

(D) $\dfrac{1}{\sqrt{3}}$

(E) $\dfrac{1}{2\sqrt{3}}$

175. If p is the product of the integers from 1 to 30, inclusive, what is the greatest integer k for which 3^k is a factor of p?

(A)   10
(B)   12
(C)   14
(D)   16
(E)   18

176. If $n = 3^8 - 2^8$, which of the following is NOT a factor of n?

(A)   97
(B)   65
(C)   35
(D)   13
(E)   5

177. In the figure shown, if the area of the shaded region is 3 times the area of the smaller circular region, then the circumference of the larger circle is how many times the circumference of the smaller circle?

(A)   4
(B)   3
(C)   2
(D) $\sqrt{3}$
(E) $\sqrt{2}$

178. Club X has more than 10 but fewer than 40 members. Sometimes the members sit at tables with 3 members at one table and 4 members at each of the other tables, and sometimes they sit at tables with 3 members at one table and 5 members at each of the other tables. If they sit at tables with 6 members at each table except one and fewer than 6 members at that one table, how many members will be at the table that has fewer than 6 members?

   (A)   1
   (B)   2
   (C)   3
   (D)   4
   (E)   5

179. In order to complete a reading assignment on time, Terry planned to read 90 pages per day. However, she read only 75 pages per day at first, leaving 690 pages to be read during the last 6 days before the assignment was to be completed. How many days in all did Terry have to complete the assignment on time?

   (A)   15
   (B)   16
   (C)   25
   (D)   40
   (E)   46

180. If $s > 0$ and $\sqrt{\dfrac{r}{s}} = s$, what is r in terms of s ?

   (A) $\dfrac{1}{s}$
   (B) $\sqrt{s}$
   (C) $s\sqrt{s}$
   (D) s^3
   (E) $s^2 - s$

181. If $3 < x < 100$, for how many values of x is $\dfrac{x}{3}$ the square of a prime number?

   (A)   Two
   (B)   Three
   (C)   Four
   (D)   Five
   (E)   Nine

182. A researcher plans to identify each participant in a certain medical experiment with a code consisting of either a single letter or a pair of distinct letters written in alphabetical order. What is the least number of letters that can be used if there are 12 participants, and each participant is to receive a different code?

   (A)   4
   (B)   5
   (C)   6
   (D)   7
   (E)   8
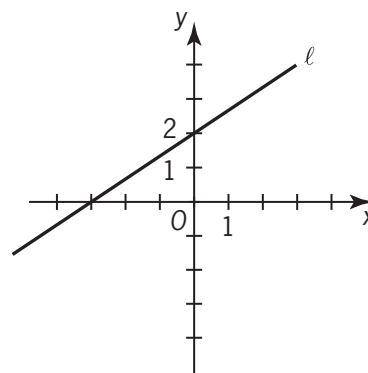
183. The graph of which of the following equations is a straight line that is parallel to line ℓ in the figure above?

   (A) $3y - 2x = 0$
   (B) $3y + 2x = 0$
   (C) $3y + 2x = 6$
   (D) $2y - 3x = 6$
   (E) $2y + 3x = -6$

184. An object thrown directly upward is at a height of h feet after t seconds, where $h = -16(t - 3)^2 + 150$. At what height, in feet, is the object 2 seconds after it reaches its maximum height?

   (A)   6
   (B)   86
   (C)   134
   (D)   150
   (E)   166

185. Which of the following is equivalent to the pair of inequalities $x + 6 > 10$ and $x - 3 \leq 5$?

   (A) $2 \leq x < 16$
   (B) $2 \leq x < 4$
   (C) $2 < x \leq 8$
   (D) $4 < x \leq 8$
   (E) $4 \leq x < 16$

186. David has d books, which is 3 times as many as Jeff and $\dfrac{1}{2}$ as many as Paula. How many books do the three of them have altogether, in terms of d ?

   (A) $\dfrac{5}{6}d$
   (B) $\dfrac{7}{3}d$
   (C) $\dfrac{10}{3}d$
   (D) $\dfrac{7}{2}d$
   (E) $\dfrac{9}{2}d$

187. There are 8 teams in a certain league and each team plays each of the other teams exactly once. If each game is played by 2 teams, what is the total number of games played?

   (A)   15
   (B)   16
   (C)   28
   (D)   56
   (E)   64

188. At his regular hourly rate, Don had estimated the labor cost of a repair job as $336 and he was paid that amount. However, the job took 4 hours longer than he had estimated and, consequently, he earned $2 per hour less than his regular hourly rate. What was the time Don had estimated for the job, in hours?

   (A)   28
   (B)   24
   (C)   16
   (D)   14
   (E)   12

189. If $\dfrac{p}{q} < 1$, and p and q are positive integers, which of the following must be greater than 1 ?

   (A) $\sqrt{\dfrac{p}{q}}$
   (B) $\dfrac{p}{q^2}$
   (C) $\dfrac{p}{2q}$
   (D) $\dfrac{q}{p^2}$
   (E) $\dfrac{q}{p}$

190. To mail a package, the rate is x cents for the first pound and y cents for each additional pound, where $x > y$. Two packages weighing 3 pounds and 5 pounds, respectively, can be mailed separately or combined as one package. Which method is cheaper, and how much money is saved?

   (A)   Combined, with a savings of $x - y$ cents
   (B)   Combined, with a savings of $y - x$ cents
   (C)   Combined, with a savings of x cents
   (D)   Separately, with a savings of $x - y$ cents
   (E)   Separately, with a savings of y cents

191. If money is invested at r percent interest, compounded annually, the amount of the investment will double in approximately $\dfrac{70}{r}$ years. If Pat's parents invested $5,000 in a long-term bond that pays 8 percent interest, compounded annually, what will be the approximate total amount of the investment 18 years later, when Pat is ready for college?

   (A) $20,000
   (B) $15,000
   (C) $12,000
   (D) $10,000
   (E) $9,000

192. On a recent trip, Cindy drove her car 290 miles, rounded to the nearest 10 miles, and used 12 gallons of gasoline, rounded to the nearest gallon. The actual number of miles per gallon that Cindy's car got on this trip must have been between

    (A) $\dfrac{290}{12.5}$ and $\dfrac{290}{11.5}$

    (B) $\dfrac{295}{12}$ and $\dfrac{285}{11.5}$

    (C) $\dfrac{285}{12}$ and $\dfrac{295}{12}$

    (D) $\dfrac{285}{12.5}$ and $\dfrac{295}{11.5}$

    (E) $\dfrac{295}{12.5}$ and $\dfrac{285}{11.5}$

193. Which of the following inequalities is an algebraic expression for the shaded part of the number line above?

    (A) $|x| \le 3$
    (B) $|x| \le 5$
    (C) $|x - 2| \le 3$
    (D) $|x - 1| \le 4$
    (E) $|x + 1| \le 4$

194. In a small snack shop, the average (arithmetic mean) revenue was $400 per day over a 10-day period. During this period, if the average daily revenue was $360 for the first 6 days, what was the average daily revenue for the last 4 days?

    (A) $420
    (B) $440
    (C) $450
    (D) $460
    (E) $480

195. If y is the smallest positive integer such that 3,150 multiplied by y is the square of an integer, then y must be

    (A) 2
    (B) 5
    (C) 6
    (D) 7
    (E) 14

196. If [x] is the greatest integer less than or equal to x, what is the value of $[-1.6] + [3.4] + [2.7]$?

    (A) 3
    (B) 4
    (C) 5
    (D) 6
    (E) 7

197. In the first week of the year, Nancy saved $1. In each of the next 51 weeks, she saved $1 more than she had saved in the previous week. What was the total amount that Nancy saved during the 52 weeks?

    (A) $1,326
    (B) $1,352
    (C) $1,378
    (D) $2,652
    (E) $2,756

198. In a certain sequence, the term x_n is given by the formula $x_n = 2x_{n-1} - \dfrac{1}{2}(x_{n-2})$ for all $n \ge 2$. If $x_0 = 3$ and $x_1 = 2$, what is the value of x_3 ?

    (A) 2.5
    (B) 3.125
    (C) 4
    (D) 5
    (E) 6.75

199. During a trip, Francine traveled x percent of the total distance at an average speed of 40 miles per hour and the rest of the distance at an average speed of 60 miles per hour. In terms of x, what was Francine's average speed for the entire trip?

(A) $\dfrac{180 - x}{2}$

(B) $\dfrac{x + 60}{4}$

(C) $\dfrac{300 - x}{5}$

(D) $\dfrac{600}{115 - x}$

(E) $\dfrac{12,000}{x + 200}$

200. If $n = (33)^{43} + (43)^{33}$, what is the units digit of n?

(A) 0
(B) 2
(C) 4
(D) 6
(E) 8

201. Team A and Team B are competing against each other in a game of tug-of-war. Team A, consisting of 3 males and 3 females, decides to line up male, female, male, female, male, female. The lineup that Team A chooses will be one of how many different possible lineups?

(A) 9
(B) 12
(C) 15
(D) 36
(E) 720

202. A border of uniform width is placed around a rectangular photograph that measures 8 inches by 10 inches. If the area of the border is 144 square inches, what is the width of the border, in inches?

(A) 3
(B) 4
(C) 6
(D) 8
(E) 9

203. If $d = \dfrac{1}{2^3 \times 5^7}$ is expressed as a terminating decimal, how many nonzero digits will d have?

(A) One
(B) Two
(C) Three
(D) Seven
(E) Ten

204. For any positive integer n, the sum of the first n positive integers equals $\dfrac{n(n+1)}{2}$. What is the sum of all the even integers between 99 and 301 ?

(A) 10,100
(B) 20,200
(C) 22,650
(D) 40,200
(E) 45,150

205. How many prime numbers between 1 and 100 are factors of 7,150 ?

(A) One
(B) Two
(C) Three
(D) Four
(E) Five

206. A sequence of numbers a_1, a_2, a_3, . . . is defined as follows: $a_1 = 3$, $a_2 = 5$, and every term in the sequence after a_2 is the product of all terms in the sequence preceding it, e.g., $a_3 = (a_1)(a_2)$ and $a_4 = (a_1)(a_2)(a_3)$. If $a_n = t$ and $n > 2$, what is the value of a_{n+2} in terms of t?

(A) $4t$
(B) t^2
(C) t^3
(D) t^4
(E) t^8

207. Last year the price per share of Stock X increased by k percent and the earnings per share of Stock X increased by m percent, where k is greater than m. By what percent did the ratio of price per share to earnings per share increase, in terms of k and m ?

(A) $\dfrac{k}{m}\%$

(B) $(k - m)\%$

(C) $\dfrac{100(k - m)}{100 + k}\%$

(D) $\dfrac{100(k - m)}{100 + m}\%$

(E) $\dfrac{100(k - m)}{100 + k + m}\%$

208. Of the 300 subjects who participated in an experiment using virtual-reality therapy to reduce their fear of heights, 40 percent experienced sweaty palms, 30 percent experienced vomiting, and 75 percent experienced dizziness. If all of the subjects experienced at least one of these effects and 35 percent of the subjects experienced exactly two of these effects, how many of the subjects experienced only one of these effects?

(A) 105
(B) 125
(C) 130
(D) 180
(E) 195

209. If $m^{-1} = -\dfrac{1}{3}$, then m^{-2} is equal to

(A) −9
(B) −3
(C) $-\dfrac{1}{9}$
(D) $\dfrac{1}{9}$
(E) 9

210. A photography dealer ordered 60 Model X cameras to be sold for $250 each, which represents a 20 percent markup over the dealer's initial cost for each camera. Of the cameras ordered, 6 were never sold and were returned to the manufacturer for a refund of 50 percent of the dealer's initial cost. What was the dealer's approximate profit or loss as a percent of the dealer's initial cost for the 60 cameras?

(A)   7% loss
(B)   13% loss
(C)   7% profit
(D)   13% profit
(E)   15% profit

211. Seven pieces of rope have an average (arithmetic mean) length of 68 centimeters and a median length of 84 centimeters. If the length of the longest piece of rope is 14 centimeters more than 4 times the length of the shortest piece of rope, what is the maximum possible length, in centimeters, of the longest piece of rope?

(A)   82
(B)   118
(C)   120
(D)   134
(E)   152

212. What is the difference between the sixth and the fifth terms of the sequence 2, 4, 7, … whose nth term is $n + 2^{n-1}$?

(A)   2
(B)   3
(C)   6
(D)   16
(E)   17

213. From the consecutive integers −10 to 10, inclusive, 20 integers are randomly chosen with repetitions allowed. What is the least possible value of the product of the 20 integers?

(A) $(-10)^{20}$
(B) $(-10)^{10}$
(C)   0
(D) $-(10)^{19}$
(E) $-(10)^{20}$

214. The letters D, G, I, I, and T can be used to form 5-letter strings such as DIGIT or DGIIT. Using these letters, how many 5-letter strings can be formed in which the two occurrences of the letter I are separated by at least one other letter?

   (A)   12
   (B)   18
   (C)   24
   (D)   36
   (E)   48

215. Last Sunday a certain store sold copies of Newspaper A for $1.00 each and copies of Newspaper B for $1.25 each, and the store sold no other newspapers that day. If r percent of the store's revenue from newspaper sales was from Newspaper A and if p percent of the newspapers that the store sold were copies of Newspaper A, which of the following expresses r in terms of p ?
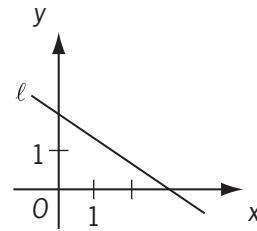
   (A) $\dfrac{100p}{125 - p}$

   (B) $\dfrac{150p}{250 - p}$

   (C) $\dfrac{300p}{375 - p}$

   (D) $\dfrac{400p}{500 - p}$

   (E) $\dfrac{500p}{625 - p}$

216. $\dfrac{0.99999999}{1.0001} - \dfrac{0.99999991}{1.0003} =$

   (A) 10^{-8}
   (B) $3(10^{-8})$
   (C) $3(10^{-4})$
   (D) $2(10^{-4})$
   (E) 10^{-4}

217. For the past n days, the average (arithmetic mean) daily production at a company was 50 units. If today's production of 90 units raises the average to 55 units per day, what is the value of n ?

   (A)   30
   (B)   18
   (C)   10
   (D)   9
   (E)   7

218. In the coordinate system above, which of the following is the equation of line ℓ ?

   (A) $2x - 3y = 6$
   (B) $2x + 3y = 6$
   (C) $3x + 2y = 6$
   (D) $2x - 3y = -6$
   (E) $3x - 2y = -6$

219. If a two-digit positive integer has its digits reversed, the resulting integer differs from the original by 27. By how much do the two digits differ?

   (A)   3
   (B)   4
   (C)   5
   (D)   6
   (E)   7

220. In an electric circuit, two resistors with resistances x and y are connected in parallel. In this case, if r is the combined resistance of these two resistors, then the reciprocal of r is equal to the sum of the reciprocals of x and y. What is r in terms of x and y?

   (A) xy

   (B) $x + y$

   (C) $\dfrac{1}{x+y}$

   (D) $\dfrac{xy}{x+y}$

   (E) $\dfrac{x+y}{xy}$

221. Xavier, Yvonne, and Zelda each try independently to solve a problem. If their individual probabilities for success are $\dfrac{1}{4}$, $\dfrac{1}{2}$, and $\dfrac{5}{8}$, respectively, what is the probability that Xavier and Yvonne, but not Zelda, will solve the problem?
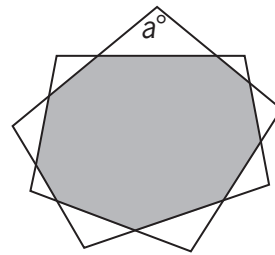
   (A) $\dfrac{11}{8}$

   (B) $\dfrac{7}{8}$

   (C) $\dfrac{9}{64}$

   (D) $\dfrac{5}{64}$

   (E) $\dfrac{3}{64}$

222. If $\dfrac{1}{x} - \dfrac{1}{x+1} = \dfrac{1}{x+4}$, then x could be

   (A) 0

   (B) −1

   (C) −2

   (D) −3

   (E) −4

223. $\left(\dfrac{1}{2}\right)^{-3}\left(\dfrac{1}{4}\right)^{-2}\left(\dfrac{1}{16}\right)^{-1}$

   (A) $\left(\dfrac{1}{2}\right)^{-48}$

   (B) $\left(\dfrac{1}{2}\right)^{-11}$

   (C) $\left(\dfrac{1}{2}\right)^{-6}$

   (D) $\left(\dfrac{1}{8}\right)^{-11}$

   (E) $\left(\dfrac{1}{8}\right)^{-6}$

224. The figure shown above consists of a shaded 9-sided polygon and 9 unshaded isosceles triangles. For each isosceles triangle, the longest side is a side of the shaded polygon and the two sides of equal length are extensions of the two adjacent sides of the shaded polygon. What is the value of a?

   (A) 100

   (B) 105

   (C) 110

   (D) 115

   (E) 120

225. List T consists of 30 positive decimals, none of which is an integer, and the sum of the 30 decimals is S. The estimated sum of the 30 decimals, E, is defined as follows. Each decimal in T whose tenths digit is even is rounded up to the nearest integer, and each decimal in T whose tenths digit is odd is rounded down to the nearest integer; E is the sum of the resulting integers. If $\frac{1}{3}$ of the decimals in T have a tenths digit that is even, which of the following is a possible value of $E - S$?

    I.   −16
    II.   6
    III.   10

    (A)   I only
    (B)   I and II only
    (C)   I and III only
    (D)   II and III only
    (E)   I, II, and III

226. If $5 - \dfrac{6}{x} = x$, then x has how many possible values?

    (A)   None
    (B)   One
    (C)   Two
    (D)   A finite number greater than two
    (E)   An infinite number

227. Seed mixture X is 40 percent ryegrass and 60 percent bluegrass by weight; seed mixture Y is 25 percent ryegrass and 75 percent fescue. If a mixture of X and Y contains 30 percent ryegrass, what percent of the weight of the mixture is X ?

    (A)   10%
    (B) $33\frac{1}{3}$%
    (C)   40%
    (D)   50%
    (E) $66\frac{2}{3}$%

228. How many of the integers that satisfy the inequality $\dfrac{(x+2)(x+3)}{x-2} \geq 0$ are less than 5 ?

    (A)   1
    (B)   2
    (C)   3
    (D)   4
    (E)   5

229. Of the 150 houses in a certain development, 60 percent have air-conditioning, 50 percent have a sunporch, and 30 percent have a swimming pool. If 5 of the houses have all three of these amenities and 5 have none of them, how many of the houses have exactly two of these amenities?

    (A)   10
    (B)   45
    (C)   50
    (D)   55
    (E)   65

230. The value of $\dfrac{2^{-14} + 2^{-15} + 2^{-16} + 2^{-17}}{5}$ is how many times the value of $2^{(-17)}$?

    (A) $\dfrac{3}{2}$
    (B) $\dfrac{5}{2}$
    (C)   3
    (D)   4
    (E)   5