THE OFFICIAL GUIDE FOR GMAT® QUANTITATIVE REVIEW

For additional information contact:
Graduate Management Admission Council
1600 Tysons Blvd., Ste. 1400
McLean, VA 22102 USA
www.gmac.com

ISBN: 0-9765709-2-0

10 9 8 7 6 5 4 3 2 1

Produced by Blanche Brann LP, Lawrenceville, NJ
Charles Forster, Designer
Mike Wilson, Production Designer

Printed in the United States of America

Problem Solving Sample Questions

Solve the problem and indicate the best of the answer choices given.
Numbers: All numbers used are real numbers.
Figures: All figures accompanying a problem solving question are intended to provide information useful in solving the problem. Figures are drawn as accurately as possible EXCEPT when a specific problem states that its figure is not drawn to scale. Straight lines may sometimes appear jagged. All figures lie in a plane unless otherwise indicated.

1. If Mario was 32 years old 8 years ago, how old was he x years ago?

   (A) $x - 40$
   (B) $x - 24$
   (C) $40 - x$
   (D) $24 - x$
   (E) $24 + x$

2. If k is an integer and 0.0010101×10^k is greater than 1,000, what is the least possible value of k?

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

3. If $(b-3)\left(4+\frac{2}{b}\right)=0$ and $b \neq 3$, then $b =$

   (A) -8
   (B) -2
   (C) $-\frac{1}{2}$
   (D) $\frac{1}{2}$
   (E) 2

4. The number $2 - 0.5$ is how many times the number $1 - 0.5$?

   (A) 2
   (B) 2.5
   (C) 3
   (D) 3.5
   (E) 4

5. In which of the following pairs are the two numbers reciprocals of each other?

   I. 3 and $\frac{1}{3}$
   II. $\frac{1}{17}$ and $\frac{-1}{17}$
   III. $\sqrt{3}$ and $\frac{\sqrt{3}}{3}$

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

6. The price of a certain television set is discounted by 10 percent, and the reduced price is then discounted by 10 percent. This series of successive discounts is equivalent to a single discount of

   (A) 20%
   (B) 19%
   (C) 18%
   (D) 11%
   (E) 10%

7. Which of the following equations is NOT equivalent to $25x^2 = y^2 - 4$?

   (A) $25x^2 + 4 = y^2$
   (B) $75x^2 = 3y^2 - 12$
   (C) $25x^2 = (y+2)(y-2)$
   (D) $5x = y - 2$
   (E) $x^2 = \frac{y^2 - 4}{25}$

8. If there are 664,579 prime numbers among the first 10 million positive integers, approximately what percent of the first 10 million positive integers are prime numbers?

(A) 0.0066%
(B) 0.066%
(C) 0.66%
(D) 6.6%
(E) 66%

9. How many multiples of 4 are there between 12 and 96, inclusive?

(A) 21
(B) 22
(C) 23
(D) 24
(E) 25

10. In Country X a returning tourist may import goods with a total value of \$500 or less tax free, but must pay an 8 percent tax on the portion of the total value in excess of \$500. What tax must be paid by a returning tourist who imports goods with a total value of \$730?

(A) \$58.40
(B) \$40.00
(C) \$24.60
(D) \$18.40
(E) \$16.00

11. Which of the following is greater than $\frac{2}{3}$?

(A) $\frac{33}{50}$
(B) $\frac{8}{11}$
(C) $\frac{3}{5}$
(D) $\frac{13}{27}$
(E) $\frac{5}{8}$

12. If 60 percent of a rectangular floor is covered by a rectangular rug that is 9 feet by 12 feet, what is the area, in square feet, of the floor?

(A) 65
(B) 108
(C) 180
(D) 270
(E) 300

13. If "basis points" are defined so that 1 percent is equal to 100 basis points, then 82.5 percent is how many basis points greater than 62.5 percent?

(A) 0.02
(B) 0.2
(C) 20
(D) 200
(E) 2,000

14. Three machines, individually, can do a certain job in 4, 5, and 6 hours, respectively. What is the greatest part of the job that can be done in one hour by two of the machines working together at their respective rates?

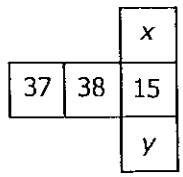
(A) $\frac{11}{30}$
(B) $\frac{9}{20}$
(C) $\frac{3}{5}$
(D) $\frac{11}{15}$
(E) $\frac{5}{6}$

15. The value of $-3-(-10)$ is how much greater than the value of $-10-(-3)$?

(A) 0
(B) 6
(C) 7
(D) 14
(E) 26

16. If X and Y are sets of integers, $X \Delta Y$ denotes the set of integers that belong to set X or set Y, but not both. If X consists of 10 integers, Y consists of 18 integers, and 6 of the integers are in both X and Y, then $X \Delta Y$ consists of how many integers?

(A) 6
(B) 16
(C) 22
(D) 30
(E) 174

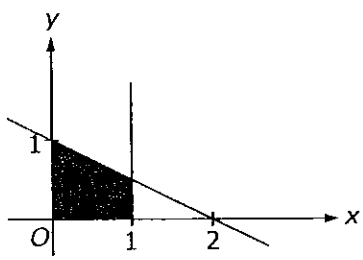


17. In the figure above, the sum of the three numbers in the horizontal row equals the product of the three numbers in the vertical column. What is the value of xy?

(A) 6
(B) 15
(C) 35
(D) 75
(E) 90

18. $\left(1+\sqrt{5}\right)\left(1-\sqrt{5}\right) =$

(A) -4
(B) 2
(C) 6
(D) $-4-2\sqrt{5}$
(E) $6-2\sqrt{5}$



19. In the rectangular coordinate system above, the shaded region is bounded by straight lines. Which of the following is NOT an equation of one of the boundary lines?

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

20. A certain population of bacteria doubles every 10 minutes. If the number of bacteria in the population initially was 10^4, what was the number in the population 1 hour later?

(A) $2(10^4)$
(B) $6(10^4)$
(C) $(2^6)(10^4)$
(D) $(10^6)(10^4)$
(E) $(10^4)^6$

21. How many minutes does it take to travel 120 miles at 400 miles per hour?

(A) 3
(B) $3\frac{1}{3}$
(C) $8\frac{2}{3}$
(D) 12
(E) 18

22. If the perimeter of a rectangular garden plot is 34 feet and its area is 60 square feet, what is the length of each of the longer sides?

(A) 5 ft
(B) 6 ft
(C) 10 ft
(D) 12 ft
(E) 15 ft

23. A certain manufacturer produces items for which the production costs consist of annual fixed costs totaling \$130,000 and variable costs averaging \$8 per item. If the manufacturer's selling price per item is \$15, how many items must the manufacturer produce and sell to earn an annual profit of \$150,000 ?

(A) 2,858
(B) 18,667
(C) 21,429
(D) 35,000
(E) 40,000

24. In a poll of 66,000 physicians, only 20 percent responded; of these, 10 percent disclosed their preference for pain reliever X. How many of the physicians who responded did not disclose a preference for pain reliever X?

(A) 1,320
(B) 5,280
(C) 6,600
(D) 10,560
(E) 11,880

25. $\frac{3}{100} + \frac{5}{1,000} + \frac{7}{100,000} =$

(A) 0.357
(B) 0.3507
(C) 0.35007
(D) 0.0357
(E) 0.03507

26. If the number n of calculators sold per week varies with the price p in dollars according to the equation $n = 300 - 20p$, what would be the total weekly revenue from the sale of \$10 calculators?

(A) \$100
(B) \$300
(C) \$1,000
(D) \$2,800
(E) \$3,000

27. Which of the following fractions is equal to the decimal 0.0625 ?

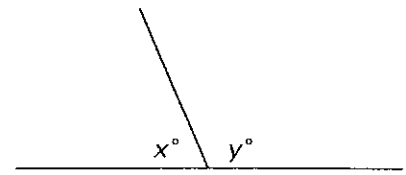
(A) $\frac{5}{8}$

(B) $\frac{3}{8}$

(C) $\frac{1}{16}$

(D) $\frac{1}{18}$

(E) $\frac{3}{80}$



28. In the figure above, if $\frac{x}{x+y} = \frac{3}{8}$, then $x =$

(A) 60
(B) 67.5
(C) 72
(D) 108
(E) 112.5

29. If positive integers x and y are not both odd, which of the following must be even?

(A) xy
(B) $x + y$
(C) $x - y$
(D) $x + y - 1$
(E) $2(x + y) - 1$

30. On 3 sales John has received commissions of \$240, \$80, and \$110, and he has 1 additional sale pending. If John is to receive an average (arithmetic mean) commission of exactly \$150 on the 4 sales, then the 4th commission must be

(A) \$164
(B) \$170
(C) \$175
(D) \$182
(E) \$185

31. The annual budget of a certain college is to be shown on a circle graph. If the size of each sector of the graph is to be proportional to the amount of the budget it represents, how many degrees of the circle should be used to represent an item that is 15 percent of the budget?

(A) 15°
(B) 36°
(C) 54°
(D) 90°
(E) 150°

32. During a two-week period, the price of an ounce of silver increased by 25 percent by the end of the first week and then decreased by 20 percent of this new price by the end of the second week. If the price of silver was x dollars per ounce at the beginning of the two-week period, what was the price, in dollars per ounce, by the end of the period?

(A) $0.8\,x$
(B) $0.95x$
(C) x
(D) $1.05x$
(E) $1.25x$

33. In a certain pond, 50 fish were caught, tagged, and returned to the pond. A few days later, 50 fish were caught again, of which 2 were found to have been tagged. If the percent of tagged fish in the second catch approximates the percent of tagged fish in the pond, what is the approximate number of fish in the pond?

(A) 400
(B) 625
(C) 1,250
(D) 2,500
(E) 10,000

34. $\sqrt{16+16} =$

(A) $4\sqrt{2}$
(B) $8\sqrt{2}$
(C) $16\sqrt{2}$
(D) 8
(E) 16

35. An automobile's gasoline mileage varies, depending on the speed of the automobile, between 18.0 and 22.4 miles per gallon, inclusive. What is the maximum distance, in miles, that the automobile could be driven on 15 gallons of gasoline?

(A) 336
(B) 320
(C) 303
(D) 284
(E) 270

36. The organizers of a fair projected a 25 percent increase in attendance this year over that of last year, but attendance this year actually decreased by 20 percent. What percent of the projected attendance was the actual attendance?

(A) 45%
(B) 56%
(C) 64%
(D) 75%
(E) 80%

37. What is the ratio of $\frac{3}{4}$ to the product $4\left(\frac{3}{4}\right)$?

(A) $\frac{1}{4}$
(B) $\frac{1}{3}$
(C) $\frac{4}{9}$
(D) $\frac{9}{4}$
(E) 4

38. If $3 - x = 2x - 3$, then $4x =$

(A) -24
(B) -8
(C) 0
(D) 8
(E) 24

39. If $x > 3{,}000$, then the value of $\frac{x}{2x+1}$ is closest to

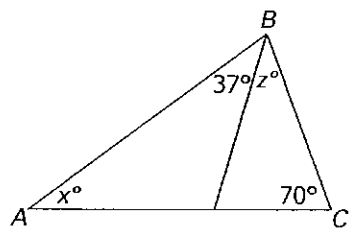
(A) $\frac{1}{6}$
(B) $\frac{1}{3}$
(C) $\frac{10}{21}$
(D) $\frac{1}{2}$
(E) $\frac{3}{2}$

40. If 18 is 15 percent of 30 percent of a certain number, what is the number?

(A) 9
(B) 36
(C) 40
(D) 81
(E) 400

41. If $x = (0.08)^2$, $y = \frac{1}{(0.08)^2}$, and $z = (1 - 0.08)^2 - 1$, which of the following is true?

(A) $x = y = z$
(B) $y < z < x$
(C) $z < x < y$
(D) $y <$ and $x = z$.
(E) $x < y$ and $x = z$.



42. In ΔABC above, what is x in terms of z?

(A) $z + 73$
(B) $z - 73$
(C) $70 - z$
(D) $z - 70$
(E) $73 - z$

43. $\frac{(3)(0.072)}{0.54} =$

(A) 0.04
(B) 0.3
(C) 0.4
(D) 0.8
(E) 4.0

44. What is the maximum number of $1\frac{1}{4}$ foot pieces of wire that can be cut from a wire that is 24 feet long?

(A) 11
(B) 18
(C) 19
(D) 20
(E) 30

$$\frac{61.24 \times (0.998)^2}{\sqrt{403}}$$

45. The expression above is approximately equal to

(A) 1
(B) 3
(C) 4
(D) 5
(E) 6

46. If the numbers $\frac{17}{24}$, $\frac{1}{2}$, $\frac{3}{8}$, $\frac{3}{4}$, and $\frac{9}{16}$ were ordered from greatest to least, the middle number of the resulting sequence would be

(A) $\frac{17}{24}$
(B) $\frac{1}{2}$
(C) $\frac{3}{8}$
(D) $\frac{3}{4}$
(E) $\frac{9}{16}$

47. Last year if 97 percent of the revenues of a company came from domestic sources and the remaining revenues, totaling $450,000, came from foreign sources, what was the total of the company's revenues?

(A) $1,350,000
(B) $1,500,000
(C) $4,500,000
(D) $15,000,000
(E) $150,000,000

48. $\frac{2 + 2\sqrt{6}}{2} =$

(A) $\sqrt{6}$
(B) $2\sqrt{6}$
(C) $1 + \sqrt{6}$
(D) $1 + 2\sqrt{6}$
(E) $2 + \sqrt{6}$

49. A certain fishing boat is chartered by 6 people who are to contribute equally to the total charter cost of $480. If each person contributes equally to a $150 down payment, how much of the charter cost will each person still owe?

(A) $80
(B) $66
(C) $55
(D) $50
(E) $45

50. Craig sells major appliances. For each appliance he sells, Craig receives a commission of $50 plus 10 percent of the selling price. During one particular week Craig sold 6 appliances for selling prices totaling $3,620. What was the total of Craig's commissions for that week?

(A) $412
(B) $526
(C) $585
(D) $605
(E) $662

51. What number when multiplied by $\frac{4}{7}$ yields $\frac{6}{7}$ as the result?

(A) $\frac{2}{7}$
(B) $\frac{2}{3}$
(C) $\frac{3}{2}$
(D) $\frac{24}{7}$
(E) $\frac{7}{2}$

52. If 3 pounds of dried apricots that cost x dollars per pound are mixed with 2 pounds of prunes that cost y dollars per pound, what is the cost, in dollars, per pound of the mixture?

(A) $\frac{3x+2y}{5}$
(B) $\frac{3x+2y}{x+y}$
(C) $\frac{3x+2y}{xy}$
(D) $5(3x+2y)$
(E) $3x+2y$

53. Which of the following must be equal to zero for all real numbers x?

I. $-\frac{1}{x}$
II. $x + (-x)$
III. x^0

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

	City A	City B	City C	City D	City E	City F
City A						
City B						
City C						
City D						
City E						
City F						

54. In the table above, what is the least number of table entries that are needed to show the mileage between each city and each of the other five cities?

(A) 15
(B) 1
(C) 5
(D) 0
(E) 6

55. If $(t-8)$ is a factor of $t^2 - kt - 48$, then $k =$

(A) 16
(B) 12
(C) 2
(D) 6
(E) 14

56. $\frac{31}{125} =$

(A) 0.248
(B) 0.252
(C) 0.284
(D) 0.312
(E) 0.320

57. Members of a social club met to address 280 newsletters. If they addressed $\frac{1}{4}$ of the newsletters during the first hour and $\frac{2}{5}$ of the remaining newsletters during the second hour, how many newsletters did they address during the second hour?

(A) 28
(B) 42
(C) 63
(D) 84
(E) 112

58. $(\sqrt{3}+2)(\sqrt{3}-2) =$

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

59. The arithmetic mean and standard deviation of a certain normal distribution are 13.5 and 1.5, respectively. What value is exactly 2 standard deviations less than the mean?

(A) 10.5
(B) 11.0
(C) 11.5
(D) 12.0
(E) 12.5

60. When N is divided by T, the quotient is S and the remainder is V. Which of the following expressions is equal to N?

(A) ST
(B) $S + V$
(C) $ST + V$
(D) $T(S + V)$
(E) $T(S - V)$

38, 69, 22, 73, 31, 47, 13, 82

61. Which of the following numbers is greater than three-fourths of the numbers but less than one-fourth of the numbers in the list above?

(A) 56
(B) 68
(C) 69
(D) 71
(E) 73

62. The cost of picture frame M is \$10.00 less than 3 times the cost of picture frame N. If the cost of frame M is \$50.00, what is the cost of frame N?

(A) \$13.33
(B) \$16.66
(C) \$20.00
(D) \$26.66
(E) \$40.00

63. If $S = \{0, 4, 5, 2, 11, 8\}$, how much greater than the median of the numbers in S is the mean of the numbers in S?

(A) 0.5
(B) 1.0
(C) 1.5
(D) 2.0
(E) 2.5

64. The value of $\sqrt[3]{-89}$ is

(A) between –9 and –10
(B) between –8 and –9
(C) between –4 and –5
(D) between –3 and –4
(E) undefined

65. Of the following, which is least?

(A) $\frac{1}{0.2}$

(B) $(0.2)^2$

(C) 0.02

(D) $\frac{0.2}{2}$

(E) 0.2

66. If $d = 2.0453$ and d^* is the decimal obtained by rounding d to the nearest hundredth, what is the value of $d^* - d$?

(A) −0.0053
(B) −0.0003
(C) .0007
(D) .0047
(E) .0153

67. Company K's earnings were \$12 million last year. If this year's earnings are projected to be 150 percent greater than last year's earnings, what are Company K's projected earnings this year?

(A) \$13.5 million
(B) \$15 million
(C) \$18 million
(D) \$27 million
(E) \$30 million

68. If −3 is 6 more than x, what is the value of $\frac{x}{3}$?

(A) −9
(B) −6
(C) −3
(D) −1
(E) 1

69. An athlete runs R miles in H hours, then rides a bicycle Q miles in the same number of hours. Which of the following represents the athlete's average speed, in miles per hour, for these two activities combined?

(A) $\frac{R-Q}{H}$

(B) $\frac{R-Q}{2H}$

(C) $\frac{2(R+Q)}{H}$

(D) $\frac{2(R+Q)}{2H}$

(E) $\frac{R+Q}{2H}$

70. If a certain sample of data has a mean of 20.0 and a standard deviation of 3.0, which of the following values is more than 2.5 standard deviations from the mean?

(A) 12.0
(B) 13.5
(C) 17.0
(D) 23.5
(E) 26.5

County	Amount Recycled	Amount Disposed of
A	16,700	142,800
B	8,800	48,000
C	13,000	51,400
D	3,900	20,300
E	3,300	16,200

71. The table above shows the amount of waste material, in tons, recycled by each of five counties in a single year and the amount of waste material, also in tons, that was disposed of in landfills by the five counties in that year. Which county had the lowest ratio of waste material disposed of to waste material recycled in the year reported in the table?

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

72. If $a = 7$ and $b = -7$, what is the value of $2a - 2b + b^2$?

(A) -49
(B) 21
(C) 49
(D) 63
(E) 77

73. Equal amounts of water were poured into two empty jars of different capacities, which made one jar $\frac{1}{4}$ full and the other jar $\frac{1}{3}$ full. If the water in the jar with the lesser capacity is then poured into the jar with the greater capacity, what fraction of the larger jar will be filled with water?

(A) $\frac{1}{7}$
(B) $\frac{2}{7}$
(C) $\frac{1}{2}$
(D) $\frac{7}{12}$
(E) $\frac{2}{3}$

74. If Mel saved more than \$10 by purchasing a sweater at a 15 percent discount, what is the smallest amount the original price of the sweater could be, to the nearest dollar?

(A) 45
(B) 67
(C) 75
(D) 83
(E) 150

75. If $x = -1$, then $-(x^4 + x^3 + x^2 + x) =$

(A) -10
(B) -4
(C) 0
(D) 4
(E) 10

76. Today Rose is twice as old as Sam and Sam is 3 years younger than Tina. If Rose, Sam, and Tina are all alive 4 years from today, which of the following must be true on that day?

I. Rose is twice as old as Sam.
II. Sam is 3 years younger than Tina.
III. Rose is older than Tina.

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

77. If a square region has area x, what is the length of its diagonal in terms of x?

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

78. The temperature in degrees Celsius (C) can be converted to temperature in degrees Fahrenheit (F) by the formula $F = \frac{9}{5}C + 32$. What is the temperature at which $F = C$?

(A) 20°
(B) $\left(\frac{32}{5}\right)°$
(C) 0°
(D) -20°
(E) -40°

79. During a car trip, Maria stopped to rest after she traveled $\frac{1}{2}$ of the total distance to her destination. She stopped again after she traveled $\frac{1}{4}$ of the distance remaining between her first stop and her destination, and then she drove the remaining 120 miles to her destination. What was the total distance, in miles, from Maria's starting point to her destination?

(A) 280
(B) 320
(C) 360
(D) 420
(E) 480

80. If x is to be chosen at random from the set {1, 2, 3, 4} and y is to be chosen at random from the set {5, 6, 7}, what is the probability that xy will be even?

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

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

(C) $\frac{1}{2}$

(D) $\frac{2}{3}$

(E) $\frac{5}{6}$

81. Which of the following is equal to x^{18} for all positive values of x ?

(A) $x^9 + x^9$

(B) $(x^2)^9$

(C) $(x^9)^9$

(D) $(x^3)^{15}$

(E) $\frac{x^4}{x^{22}}$

82. Three business partners, Q, R, and S, agree to divide their total profit for a certain year in the ratios 2 : 5 : 8, respectively. If Q's share was \$4,000, what was the total profit of the business partners for the year?

(A) \$26,000
(B) \$30,000
(C) \$52,000
(D) \$60,000
(E) \$300,000

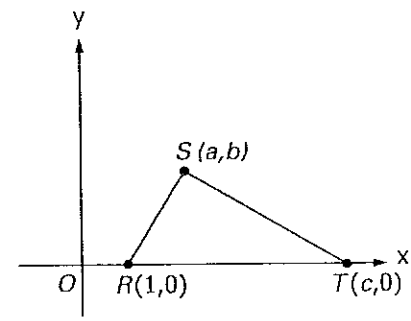
83. If $u > t$, $r > q$, $s > t$, and $t > r$, which of the following must be true?

I. $u > s$
II. $s > q$
III. $u > r$

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

84. The average (arithmetic mean) of 6 numbers is 8.5. When one number is discarded, the average of the remaining numbers becomes 7.2. What is the discarded number?

(A) 7.8
(B) 9.8
(C) 10.0
(D) 12.4
(E) 15.0



85. In the rectangular coordinate system above, the area of ΔRST is

(A) $\frac{bc}{2}$

(B) $\frac{b(c-1)}{2}$

(C) $\frac{c(b-1)}{2}$

(D) $\frac{a(c-1)}{2}$

(E) $\frac{c(a-1)}{2}$

86. Which of the following equations has a root in common with $x^2 - 6x + 5 = 0$?

(A) $x^2 + 1 = 0$
(B) $x^2 - x - 2 = 0$
(C) $x^2 - 10x - 5 = 0$
(D) $2x^2 - 2 = 0$
(E) $x^2 - 2x - 3 = 0$

87. One inlet pipe fills an empty tank in 5 hours. A second inlet pipe fills the same tank in 3 hours. If both pipes are used together, how long will it take to fill $\frac{2}{3}$ of the tank?

(A) $\frac{8}{15}$ hr
(B) $\frac{3}{4}$ hr
(C) $\frac{5}{4}$ hr
(D) $\frac{15}{8}$ hr
(E) $\frac{8}{3}$ hr

88. $\left(\frac{1}{5}\right)^2 - \left(\frac{1}{5}\right)\left(\frac{1}{4}\right) =$

(A) $-\frac{1}{20}$
(B) $-\frac{1}{100}$
(C) $\frac{1}{100}$
(D) $\frac{1}{20}$
(E) $\frac{1}{5}$

89. If the length and width of a rectangular garden plot were each increased by 20 percent, what would be the percent increase in the area of the plot?

(A) 20%
(B) 24%
(C) 36%
(D) 40%
(E) 44%

90. The population of a bacteria culture doubles every 2 minutes. Approximately how many minutes will it take for the population to grow from 1,000 to 500,000 bacteria?

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

91. For a light that has an intensity of 60 candles at its source, the intensity in candles, S, of the light at a point d feet from the source is given by the formula $S = \frac{60k}{d^2}$, where k is a constant. If the intensity of the light is 30 candles at a distance of 2 feet from the source, what is the intensity of the light at a distance of 20 feet from the source?

(A) $\frac{3}{10}$ candle
(B) $\frac{1}{2}$ candle
(C) 1 candle
(D) 2 candles
(E) 3 candles

92. If $b < 2$ and $2x - 3b = 0$, which of the following must be true?

(A) $x > -3$
(B) $x < 2$
(C) $x = 3$
(D) $x < 3$
(E) $x > 3$

93. $\dfrac{(-1.5)(1.2)-(4.5)(0.4)}{30} =$

(A) −1.2
(B) −0.12
(C) 0
(D) 0.12
(E) 1.2

94. René earns $8.50 per hour on days other than Sundays and twice that rate on Sundays. Last week she worked a total of 40 hours, including 8 hours on Sunday. What were her earnings for the week?

(A) $272
(B) $340
(C) $398
(D) $408
(E) $476

95. In a shipment of 120 machine parts, 5 percent were defective. In a shipment of 80 machine parts, 10 percent were defective. For the two shipments combined, what percent of the machine parts were defective?

(A) 6.5%
(B) 7.0%
(C) 7.5%
(D) 8.0%
(E) 8.5%

96. If $8^{2x+3} = 2^{3x+6}$, then $x =$

(A) −3
(B) −1
(C) 0
(D) 1
(E) 3

97. Of the following, the closest approximation to $\sqrt{\dfrac{5.98(601.5)}{15.79}}$ is

(A) 5
(B) 15
(C) 20
(D) 25
(E) 225

98. Which of the following CANNOT be the greatest common divisor of two positive integers x and y?

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

99. If a, b, and c are nonzero numbers and $a + b = c$, which of the following is equal to 1 ?

(A) $\dfrac{a-b}{c}$
(B) $\dfrac{a-c}{b}$
(C) $\dfrac{b-c}{a}$
(D) $\dfrac{b-a}{c}$
(E) $\dfrac{c-b}{a}$

100. Last year Carlos saved 10 percent of his annual earnings. This year he earned 5 percent more than last year and he saved 12 percent of his annual earnings. The amount saved this year was what percent of the amount saved last year?

(A) 122%
(B) 124%
(C) 126%
(D) 128%
(E) 130%

101. A corporation that had $115.19 billion in profits for the year paid out $230.10 million in employee benefits. Approximately what percent of the profits were the employee benefits? (1 billion = 10^9)

(A) 50%
(B) 20%
(C) 5%
(D) 2%
(E) 0.2%

Questions 102–103 refer to the following definition.

For any positive integer n, $n > 1$, the "length" of n is the number of positive primes (not necessarily distinct) whose product is n. For example, the length of 50 is 3 since $50 = (2)(5)(5)$.

102. Which of the following integers has length 3?

(A) 3
(B) 15
(C) 60
(D) 64
(E) 105

103. What is the greatest possible length of a positive integer less than 1,000 ?

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

104. If $x + y = 8z$, then which of the following represents the average (arithmetic mean) of x, y, and z, in terms of z ?

(A) $2z + 1$
(B) $3z$
(C) $5z$
(D) $\frac{z}{3}$
(E) $\frac{3z}{2}$

105. On the number line, if $r < s$, if p is halfway between r and s, and if t is halfway between p and r, then $\frac{s-t}{t-r} =$

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

106. If x and y are different integers and $x^2 = xy$, which of the following must be true?

I. $x = 0$
II. $y = 0$
III. $x = -y$

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

107. If $\frac{3}{x} = 2$ and $\frac{y}{4} = 3$, then $\frac{3+y}{x+4} =$

(A) $\frac{10}{9}$
(B) $\frac{3}{2}$
(C) $\frac{20}{11}$
(D) $\frac{30}{11}$
(E) 5

108. Which of the following fractions has the greatest value?

(A) $\frac{6}{(2^2)(5^2)}$
(B) $\frac{1}{(2^3)(5^2)}$
(C) $\frac{28}{(2^2)(5^3)}$
(D) $\frac{62}{(2^3)(5^3)}$
(E) $\frac{122}{(2^4)(5^3)}$

109. Which of the following CANNOT yield an integer when divided by 10?

(A) The sum of two odd integers
(B) An integer less than 10
(C) The product of two primes
(D) The sum of three consecutive integers
(E) An odd integer

110. A certain clock marks every hour by striking a number of times equal to the hour, and the time required for a stroke is exactly equal to the time interval between strokes. At 6:00 the time lapse between the beginning of the first stroke and the end of the last stroke is 22 seconds. At 12:00, how many seconds elapse between the beginning of the first stroke and the end of the last stroke?

(A) 72
(B) 50
(C) 48
(D) 46
(E) 44

111. If $k \neq 0$ and $k - \frac{3-2k^2}{k} = \frac{x}{k}$, then $x =$

(A) $-3 - k^2$
(B) $k^2 - 3$
(C) $3k^2 - 3$
(D) $k - 3 - 2k^2$
(E) $k - 3 + 2k^2$

112. $\frac{\frac{1}{2}+\frac{1}{3}}{\frac{1}{4}} =$

(A) $\frac{1}{12}$
(B) $\frac{5}{24}$
(C) $\frac{2}{3}$
(D) $\frac{9}{4}$
(E) $\frac{10}{3}$

113. For all numbers s and t, the operation * is defined by $s * t = (s-1)(t+1)$. If $(-2) * x = -12$, then $x =$

(A) 2
(B) 3
(C) 5
(D) 6
(E) 11

114. Salesperson A's compensation for any week is \$360 plus 6 percent of the portion of A's total sales above \$1,000 for that week. Salesperson B's compensation for any week is 8 percent of B's total sales for that week. For what amount of total weekly sales would both salespeople earn the same compensation?

(A) \$21,000
(B) \$18,000
(C) \$15,000
(D) \$4,500
(E) \$4,000

115. The sum of the ages of Doris and Fred is y years. If Doris is 12 years older than Fred, how many years old will Fred be y years from now, in terms of y?

(A) $y - 6$
(B) $2y - 6$
(C) $\frac{y}{2} - 6$
(D) $\frac{3y}{2} - 6$
(E) $\frac{5y}{2} - 6$

116. If a basketball team scores an average (arithmetic mean) of x points per game for n games and then scores y points in its next game, what is the team's average score for the $n + 1$ games?

(A) $\frac{nx+y}{n+1}$
(B) $x + \frac{y}{n+1}$
(C) $x + \frac{y}{n}$
(D) $\frac{n(x+y)}{n+1}$
(E) $\frac{x+ny}{n+1}$

117. Of the following numbers, which one is third greatest?

(A) $2\sqrt{2} - 1$
(B) $\sqrt{2} + 1$
(C) $1 - \sqrt{2}$
(D) $\sqrt{2} - 1$
(E) $\sqrt{2}$

118. At a certain pizzeria, $\frac{1}{8}$ of the pizzas sold in one week were mushroom and $\frac{1}{3}$ of the remaining pizzas sold were pepperoni. If n of the pizzas sold were pepperoni, how many were mushroom?

(A) $\frac{3}{8}n$
(B) $\frac{3}{7}n$
(C) $\frac{7}{16}n$
(D) $\frac{7}{8}n$
(E) $3n$

119. Two trains, X and Y, started simultaneously from opposite ends of a 100-mile route and traveled toward each other on parallel tracks. Train X, traveling at a constant rate, completed the 100-mile trip in 5 hours; train Y, traveling at a constant rate, completed the 100 mile trip in 3 hours. How many miles had train X traveled when it met train Y?

(A) 37.5
(B) 40.0
(C) 60.0
(D) 62.5
(E) 77.5

120. One week a certain truck rental lot had a total of 20 trucks, all of which were on the lot Monday morning. If 50 percent of the trucks that were rented out during the week were returned to the lot on or before Saturday morning of that week, and if there were at least 12 trucks on the lot that Saturday morning, what is the greatest number of different trucks that could have been rented out during the week?

(A) 18
(B) 16
(C) 12
(D) 8
(E) 4

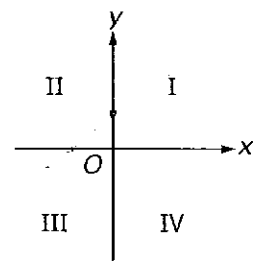
121. What is the value of $2x^2 - 2.4x - 1.7$ for $x = 0.7$?

(A) -0.72
(B) -1.42
(C) -1.98
(D) -2.40
(E) -2.89

122. If s, u, and v are positive integers and $2s = 2u + 2v$, which of the following must be true?

I. $s = u$
II. $u \neq v$
III. $s > v$

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



123. In the rectangular coordinate system shown above, which quadrant, if any, contains no point (x, y) that satisfies the inequality $2x - 3y \leq -6$?

(A) None
(B) I
(C) II
(D) III
(E) IV

124. The cost to rent a small bus for a trip is x dollars, which is to be shared equally among the people taking the trip. If 10 people take the trip rather than 16, how many more dollars, in terms of x, will it cost per person?

(A) $\frac{x}{6}$

(B) $\frac{x}{10}$

(C) $\frac{x}{16}$

(D) $\frac{3x}{40}$

(E) $\frac{3x}{80}$

125. If x is an integer and $y = 3x + 2$, which of the following CANNOT be a divisor of y?

(A) 4
(B) 5
(C) 6
(D) 7
(E) 8

126. A certain electronic component is sold in boxes of 54 for \$16.20 and in boxes of 27 for \$13.20. A customer who needed only 54 components for a project had to buy 2 boxes of 27 because boxes of 54 were unavailable. Approximately how much more did the customer pay for each component due to the unavailability of the larger boxes?

(A) \$0.33
(B) \$0.19
(C) \$0.11
(D) \$0.06
(E) \$0.03

127. As a salesperson, Phyllis can choose one of two methods of annual payment: either an annual salary of \$35,000 with no commission or an annual salary of \$10,000 plus a 20 percent commission on her total annual sales. What must her total annual sales be to give her the same annual pay with either method?

(A) \$100,000
(B) \$120,000
(C) \$125,000
(D) \$130,000
(E) \$132,000

128. If $\frac{x+y}{xy} = 1$, then $y =$

(A) $\frac{x}{x-1}$

(B) $\frac{x}{x+1}$

(C) $\frac{x-1}{x}$

(D) $\frac{x+1}{x}$

(E) x

129. Last year Department Store X had a sales total for December that was 4 times the average (arithmetic mean) of the monthly sales totals for January through November. The sales total for December was what fraction of the sales total for the year?

(A) $\frac{1}{4}$

(B) $\frac{4}{15}$

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

(D) $\frac{4}{11}$

(E) $\frac{4}{5}$

130. Working alone, printers X, Y, and Z can do a certain printing job, consisting of a large number of pages, in 12, 15, and 18 hours, respectively. What is the ratio of the time it takes printer X to do the job, working alone at its rate, to the time it takes printers Y and Z to do the job, working together at their individual rates?

(A) $\frac{4}{11}$

(B) $\frac{1}{2}$

(C) $\frac{15}{22}$

(D) $\frac{22}{15}$

(E) $\frac{11}{4}$

131. A rabbit on a controlled diet is fed daily 300 grams of a mixture of two foods, food X and food Y. Food X contains 10 percent protein and food Y contains 15 percent protein. If the rabbit's diet provides exactly 38 grams of protein daily, how many grams of food X are in the mixture?

(A) 100
(B) 140
(C) 150
(D) 160
(E) 200

132. A company that ships boxes to a total of 12 distribution centers uses color coding to identify each center. If either a single color or a pair of two different colors is chosen to represent each center and if each center is uniquely represented by that choice of one or two colors, what is the minimum number of colors needed for the coding? (Assume that the order of the colors in a pair does not matter.)

(A) 4
(B) 5
(C) 6
(D) 12
(E) 24

133. If $x \neq 2$, then $\frac{3x^2(x-2)-x+2}{x-2} =$

(A) $3x^2 - x + 2$
(B) $3x^2 + 1$
(C) $3x^2$
(D) $3x^2 - 1$
(E) $3x^2 - 2$

134. If $d > 0$ and $0 < 1 - \frac{c}{d} < 1$, which of the following must be true?

I. $c > 0$

II. $\frac{c}{d} < 1$

III. $c^2 + d^2 > 1$

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

135. $\frac{\frac{1}{2}}{\frac{1}{4}+\frac{1}{6}} =$

(A) $\frac{6}{5}$

(B) $\frac{5}{6}$

(C) $\frac{5}{24}$

(D) $\frac{1}{5}$

(E) $\frac{1}{12}$

136. A train travels from New York City to Chicago, a distance of approximately 840 miles, at an average rate of 60 miles per hour and arrives in Chicago at 6:00 in the evening, Chicago time. At what hour in the morning, New York City time, did the train depart for Chicago? (Note: Chicago time is one hour earlier than New York City time.)

(A) 4:00
(B) 5:00
(C) 6:00
(D) 7:00
(E) 8:00

137. Last year Manfred received 26 paychecks. Each of his first 6 paychecks was \$750; each of his remaining paychecks was \$30 more than each of his first 6 paychecks. To the nearest dollar, what was the average (arithmetic mean) amount of his paychecks for the year?

(A) \$752
(B) \$755
(C) \$765
(D) \$773
(E) \$775

138. If 25 percent of p is equal to 10 percent of q, and $pq \neq 0$, then p is what percent of q?

(A) 2.5%
(B) 15%
(C) 20%
(D) 35%
(E) 40%

139. If the length of an edge of cube X is twice the length of an edge of cube Y, what is the ratio of the volume of cube Y to the volume of cube X?

(A) $\frac{1}{2}$
(B) $\frac{1}{4}$
(C) $\frac{1}{6}$
(D) $\frac{1}{8}$
(E) $\frac{1}{27}$

140. Machines A and B always operate independently and at their respective constant rates. When working alone, machine A can fill a production lot in 5 hours, and machine B can fill the same lot in x hours. When the two machines operate simultaneously to fill the production lot, it takes them 2 hours to complete the job. What is the value of x?

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

141. An artist wishes to paint a circular region on a square poster that is 2 feet on a side. If the area of the circular region is to be $\frac{1}{2}$ the area of the poster, what must be the radius of the circular region in feet?

(A) $\frac{1}{\pi}$
(B) $\sqrt{\frac{2}{\pi}}$
(C) 1
(D) $\frac{2}{\sqrt{\pi}}$
(E) $\frac{\pi}{2}$

142. If a is a positive integer, and if the units' digit of a^2 is 9 and the units' digit of $(a + 1)^2$ is 4, what is the units' digit of $(a + 2)^2$?

(A) 1
(B) 3
(C) 5
(D) 6
(E) 14

143. A \$500 investment and a \$1,500 investment have a combined yearly return of 8.5 percent of the total of the two investments. If the \$500 investment has a yearly return of 7 percent, what percent yearly return does the \$1,500 investment have?

(A) 9%
(B) 10%
(C) $10\frac{5}{8}\%$
(D) 11%
(E) 12%

144. For any integer n greater than 1, $\lfloor n$ denotes the product of all the integers from 1 to n, inclusive. How many prime numbers are there between $\lfloor 6 + 2$ and $\lfloor 6 + 6$, inclusive?

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

145. If $\left(7^{\frac{3}{4}}\right)^n = 7$, what is the value of n ?

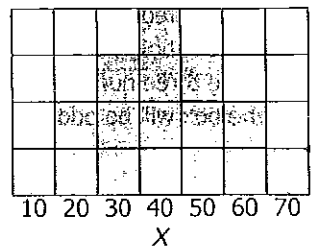
(A) $\frac{1}{3}$
(B) $\frac{2}{3}$
(C) $\frac{4}{3}$
(D) $\frac{5}{3}$
(E) s

146. Which of the following is equal to the average (arithmetic mean) of $(x + 2)^2$ and $(x - 2)^2$?

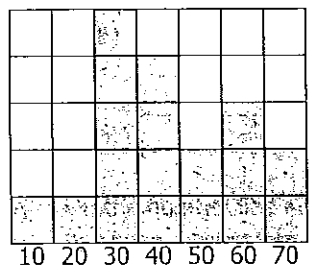
(A) x^2
(B) $x^2 + 2$
(C) $x^2 + 4$
(D) $x^2 + 2x$
(E) $x^2 + 4x$

147. If $x^4 + y^4 = 100$ then the greatest possible value of x is between

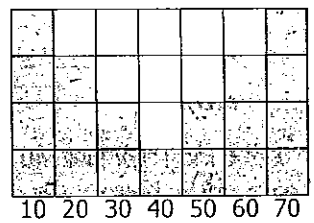
(A) 0 and 3
(B) 3 and 6
(C) 6 and 9
(D) 9 and 12
(E) 12 and 15



X



Y



Z

148 If the variables, X, Y, and Z take on only the values 10, 20, 30, 40, 50, 60, or 70 with frequencies indicated by the shaded regions above, for which of the frequency distributions is the mean equal to the median?

(A) X only
(B) Y only
(C) Z only
(D) X and Y
(E) X and Z

149. For how many integers n is $2^n = n^2$?

(A) None
(B) One
(C) Two
(D) Three
(E) More than three

150. If r and s are integers and $rs + r$ is odd, which of the following must be even?

(A) r
(B) s
(C) $r + s$
(D) $rs - r$
(E) $r^2 + s$

151. A box contains 100 balls, numbered from 1 to 100. If three balls are selected at random and with replacement from the box, what is the probability that the sum of the three numbers on the balls selected from the box will be odd?

(A) $\frac{1}{4}$

(B) $\frac{3}{8}$

(C) $\frac{1}{2}$

(D) $\frac{5}{8}$

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

152. If $0 < x < 1$, which of the following inequalities must be true?

I. $x^5 < x^3$
II. $x^4 + x^5 < x^3 + x^2$
III. $x^4 - x^5 < x^2 - x^3$

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

153. If $(2^x)(2^y) = 8$ and $(9^x)(3^y) = 81$, then $(x, y) =$

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

154. If $a = 1$ and $\frac{a-b}{c} = 1$, which of the following is NOT a possible value of b?

(A) –2
(B) –1
(C) 0
(D) 1
(E) 2

155. If $\frac{x}{y} = \frac{2}{3}$, then $\frac{x-y}{x} =$

(A) $-\frac{1}{2}$

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

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

(D) $\frac{1}{2}$

(E) $\frac{5}{2}$

156. The contents of a certain box consist of 14 apples and 23 oranges. How many oranges must be removed from the box so that 70 percent of the pieces of fruit in the box will be apples?

(A) 3
(B) 6
(C) 14
(D) 17
(E) 20

157. Last year, a certain public transportation system sold an average (arithmetic mean) of 41,000 tickets per day on weekdays (Monday through Friday) and an average of 18,000 tickets per day on Saturday and Sunday. Which of the following is closest to the total number of tickets sold last year?

(A) 1 million
(B) 1.25 million
(C) 10 million
(D) 12.5 million
(E) 125 million

District	Number of Votes	Percent of Votes for Candidate P	Percent of Votes for Candidate Q
1	800	60	40
2	1,000	50	50
3	1,500	50	50
4	1,800	40	60
5	1,200	30	70

158. The table above shows the results of a recent school board election in which the candidate with the higher total number of votes from the five districts was declared the winner. Which district had the greatest number of votes for the winner?

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

159 A group of store managers must assemble 280 displays for an upcoming sale. If they assemble 25 percent of the displays during the first hour and 40 percent of the remaining displays during the second hour, how many of the displays will not have been assembled by the end of the second hour?

(A) 70
(B) 98
(C) 126
(D) 168
(E) 182

1	2	3	4	5	6	7
-2	-4	-6	-8	-10	-12	-14
3	6	9	12	15	18	21
-4	-8	-12	-16	-20	-24	-28
5	10	15	20	25	30	35
-6	-12	-18	-24	-30	-36	-42
7	14	21	28	35	42	49

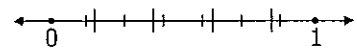
160 What is the sum of the integers in the table above?

(A) 28
(B) 112
(C) 336
(D) 448
(E) 784

3, k, 2, 8, m, 3

161. The arithmetic mean of the list of numbers above is 4. If k and m are integers and $k \neq m$, what is the median of the list?

(A) 2
(B) 2.5
(C) 3
(D) 3.5
(E) 4



162. On the number line above, the segment from 0 to 1 has been divided into fifths, as indicated by the large tick marks, and also into sevenths, as indicated by the small tick marks. What is the least possible distance between any two of the tick marks?

(A) $\frac{1}{70}$
(B) $\frac{1}{35}$
(C) $\frac{2}{35}$
(D) $\frac{1}{12}$
(E) $\frac{1}{7}$

163. $\frac{(8^2)(3^3)(2^4)}{96^2} =$

(A) 3
(B) 6
(C) 2
(D) 12
(E) 18

164. When 10 is divided by the positive integer n, the remainder is $n-4$. Which of the following could be the value of n?

(A) 3
(B) 4
(C) 7
(D) 8
(E) 12

165. If $\frac{1}{2}$ of the money in a certain trust fund was invested in stocks, $\frac{1}{4}$ in bonds, $\frac{1}{5}$ in a mutual fund, and the remaining \$10,000 in a government certificate, what was the total amount of the trust fund?

(A) \$100,000
(B) \$150,000
(C) \$200,000
(D) \$500,000
(E) \$2,000,000

166. If m is an integer such that $(-2)^{2m} = 2^{9-m}$, then $m =$

(A) 1
(B) 2
(C) 3
(D) 4
(E) 6

167. In a mayoral election, Candidate X received $\frac{1}{3}$ more votes than Candidate Y, and Candidate Y received $\frac{1}{4}$ fewer votes than Candidate Z. If Candidate Z received 24,000 votes, how many votes did Candidate X receive?

(A) 18,000
(B) 22,000
(C) 24,000
(D) 26,000
(E) 32,000

168. An airline passenger is planning a trip that involves three connecting flights that leave from Airports A, B, and C, respectively. The first flight leaves Airport A every hour, beginning at 8:00 a.m., and arrives at Airport B $2\frac{1}{2}$ hours later. The second flight leaves Airport B every 20 minutes, beginning at 8:00 a.m., and arrives at Airport C $1\frac{1}{6}$ hours later. The third flight leaves Airport C every hour, beginning at 8:45 a.m. What is the least total amount of time the passenger must spend between flights if all flights keep to their schedules?

(A) 25 min
(B) 1 hr 5 min
(C) 1 hr 15 min
(D) 2 hr 20 min
(E) 3 hr 40 min

169. If n is a positive integer and n^2 is divisible by 72, then the largest positive integer that must divide n is

(A) 6
(B) 12
(C) 24
(D) 36
(E) 48

170. If n is a positive integer and $k + 2 = 3^n$, which of the following could NOT be a value of k?

(A) 1
(B) 4
(C) 7
(D) 25
(E) 79

171. A certain grocery purchased x pounds of produce for p dollars per pound. If y pounds of the produce had to be discarded due to spoilage and the grocery sold the rest for s dollars per pound, which of the following represents the gross profit on the sale of the produce?

(A) $(x - y)\, s - xp$
(B) $(x - y)\, p - ys$
(C) $(s - p)\, y - xp$
(D) $xp - ys$
(E) $(x - y)\, (s - p)$

172. If x, y, and z are positive integers such that x is a factor of y, and x is a multiple of z, which of the following is NOT necessarily an integer?

(A) $\frac{x + z}{z}$

(B) $\frac{y + z}{x}$

(C) $\frac{x + y}{z}$

(D) $\frac{xy}{z}$

(E) $\frac{yz}{x}$

173. If $\frac{a}{b} = \frac{2}{3}$, which of the following is NOT true?

(A) $\frac{a+b}{b} = \frac{5}{3}$

(B) $\frac{b}{b-a}$

(C) $\frac{a-b}{b} = \frac{1}{3}$

(D) $\frac{2a}{3b} = \frac{4}{9}$

(E) $\frac{3b}{a} = \frac{11}{2}$

$$\begin{array}{r} \square\triangle \\ \times\ \triangle\square \\ \hline \end{array}$$

174 The product of the two-digit numbers above is the three-digit number $\square \diamond \square$, where $\square$, $\triangle$, and $\diamond$, are three different nonzero digits. If $\square \times \triangle < 10$, what is the two-digit number $\square\,\triangle$?

(A) 11
(B) 12
(C) 13
(D) 21
(E) 31

175. A square countertop has a square tile inlay in the center, leaving an untiled strip of uniform width around the tile. If the ratio of the tiled area to the untiled area is 25 to 39, which of the following could be the width, in inches, of the strip?

I. 1
II. 3
III. 4

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

176. $\frac{2\frac{3}{5} - 1\frac{2}{3}}{\frac{2}{3} - \frac{3}{5}} =$

(A) 16
(B) 14
(C) 3
(D) 1
(E) −1

Problem Solving Answer Key

1. C
2. E
3. C
4. C
5. D
6. B
7. D
8. D
9. B
10. D
11. B
12. C
13. E
14. B
15. D
16. B
17. A
18. A
19. D
20. C
21. E
22. D
23. E
24. E
25. E
26. C
27. C
28. B
29. A
30. B
31. C
32. C
33. C
34. A
35. A
36. C
37. A
38. D
39. D
40. E
41. C
42. E
43. C
44. C
45. B
46. E
47. D
48. C
49. C
50. E
51. C
52. A
53. B
54. A
55. C
56. A
57. D
58. C
59. A
60. C
61. D
62. C
63. A
64. C
65. C
66. D
67. E
68. C
69. E
70. A
71. C
72. E
73. C
74. B
75. C
76. B
77. B
78. E
79. B
80. D
81. B
82. B
83. E
84. E
85. B
86. D
87. C
88. B
89. E
90. E
91. A
92. D
93. B
94. D
95. B
96. B
97. B
98. E
99. E
100. C
101. E
102. E
103. B
104. B
105. D
106. A
107. D
108. D
109. E
110. D
111. C
112. E
113. B
114. C
115. D
116. A
117. E
118. B
119. A
120. B
121. D
122. D
123. E
124. E
125. C
126. B
127. C
128. A
129. B
130. D
131. B
132. B
133. D
134. C
135. A
136. B
137. D
138. E
139. D
140. A
141. B
142. A
143. A
144. A
145. C
146. C
147. B
148. E
149. C
150. B
151. C
152. E
153. A
154. D
155. A
156. D
157. D
158. D
159. C
160. B
161. C
162. B
163. A
164. C
165. C
166. C
167. C
168. B
169. B
170. B
171. A
172. B
173. C
174. D
175. E
176. B

Data Sufficiency Sample Questions

A Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
B Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
C BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
D EACH statement ALONE is sufficient.
E Statements (1) and (2) TOGETHER are NOT sufficient.

1. John and David each received a salary increase. Which one received the greater dollar increase?

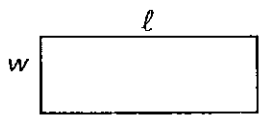
   (1) John's salary increased 8 percent.
   (2) David's salary increased 5 percent.

2. What is the value of $\frac{r}{2}+\frac{s}{2}$?

   (1) $\frac{r+s}{2}=5$
   (2) $r+s=10$

3. If n is an integer, then n is divisible by how many positive integers?

   (1) n is the product of two different prime numbers.
   (2) n and 2^3 are each divisible by the same number of positive integers.



4. If ℓ and w represent the length and width, respectively, of the rectangle above, what is the perimeter?

   (1) $2\ell+w=40$
   (2) $\ell+w=25$

5. A retailer purchased a television set for x percent less than its list price, and then sold it for y percent less than its list price. What was the list price of the television set?

   (1) $x = 15$
   (2) $x - y = 5$

6. If x and y are positive, what is the value of x?

   (1) $x = 3.927y$
   (2) $y = 2.279$

7. If n is a member of the set {33, 36, 38, 39, 41, 42}, what is the value of n?

   (1) n is even.
   (2) n is a multiple of 3.

8. Committee member W wants to schedule a one-hour meeting on Thursday for himself and three other committee members, X, Y, and Z. Is there a one-hour period on Thursday that is open for all four members?

   (1) On Thursday W and X have an open period from 9:00 a.m. to 12:00 noon.
   (2) On Thursday Y has an open period from 10:00 a.m. to 1:00 p.m. and Z has an open period from 8:00 a.m. to 11:00 a.m.

9. If $x + 2y + 1 = y - x$, what is the value of x?

   (1) $y^2 = 9$
   (2) $y = 3$

10. Of the 230 single-family homes built in City X last year, how many were occupied at the end of the year?

    (1) Of all single-family homes in City X, 90 percent were occupied at the end of last year.
    (2) A total of 7,200 single-family homes in City X were occupied at the end of last year.

11. What is the ratio of x to y?

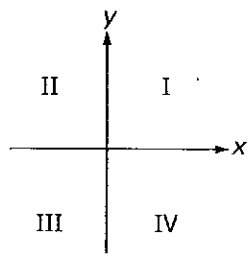
    (1) x is 4 more than twice y.
    (2) The ratio of $0.5x$ to $2y$ is 3 to 5.

12. What were the gross revenues from ticket sales for a certain film during the second week in which it was shown?

(1) Gross revenues during the second week were \$1.5 million less than during the first week.
(2) Gross revenues during the third week were \$2.0 million less than during the first week.

13. If r and s are integers, is $r + s$ divisible by 3 ?

(1) s is divisible by 3.
(2) r is divisible by 3.



14. Point (x, y) lies in which quadrant of the rectangular coordinate system shown above?

(1) $x + y < 0$
(2) $x = 4$ and $y = -7$.

15. What is the value of x ?

(1) $x + 1 = 2 - 3x$
(2) $\frac{1}{2x} = 2$

16. Is the prime number p equal to 37 ?

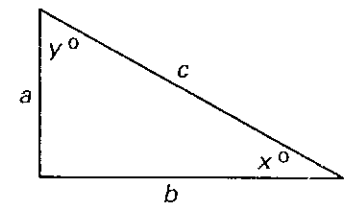
(1) $p = n^2 + 1$, where n is an integer.
(2) p^2 is greater than 200.

17. What was the amount of money donated to a certain charity?

(1) Of the amount donated, 40 percent came from corporate donations.
(2) Of the amount donated, \$1.5 million came from noncorporate donations.

18. What is the value of the positive integer n ?

(1) $n^4 < 25$
(2) $n \neq n^2$



19. In the triangle above, does $a^2 + b^2 = c^2$?

(1) $x + y = 90$
(2) $x = y$

20. If x, y, and z are three integers, are they consecutive integers?

(1) $z - x = 2$
(2) $x < y < z$

21. The symbol ∇ represents one of the following operations: addition, subtraction, multiplication, or division. What is the value of $3 \nabla 2$?

(1) $0 \nabla 1 = 1$
(2) $1 \nabla 0 = 1$

22. A sum of \$200,000 from a certain estate was divided among a spouse and three children. How much of the estate did the youngest child receive?

(1) The spouse received $\frac{1}{2}$ of the sum from the estate, and the oldest child received $\frac{1}{4}$ of the remainder.
(2) Each of the two younger children received \$12,500 more than the oldest child and \$62,500 less than the spouse.

23. What is the value of x?

(1) $-(x + y) = x - y$
(2) $x + y = 2$

24. A certain 4-liter solution of vinegar and water consists of x liters of vinegar and y liters of water. How many liters of vinegar does the solution contain?

(1) $\frac{x}{4} = \frac{3}{8}$
(2) $\frac{y}{4} = \frac{5}{8}$

25. If x and y are integers, what is the value of y?

(1) $xy = 27$
(2) $x = y^2$

26. How many newspapers were sold at a certain newsstand today?

(1) A total of 100 newspapers were sold at the newsstand yesterday, 10 fewer than twice the number sold today.
(2) The number of newspapers sold at the newsstand yesterday was 45 more than the number sold today.

27. What is Ricky's age now?

(1) Ricky is now twice as old as he was exactly 8 years ago.
(2) Ricky's sister Teresa is now 3 times as old as Ricky was exactly 8 years ago.

28. If both x and y are nonzero numbers, what is the value of $\frac{y}{x}$?

(1) $x = 6$
(2) $y^2 = x^2$

29. John took a test that had 60 questions numbered from 1 to 60. How many of the questions did he answer correctly?

(1) The number of questions he answered correctly in the first half of the test was 7 more than the number he answered correctly in the second half of the test.
(2) He answered $\frac{5}{6}$ of the odd-numbered questions correctly and $\frac{4}{5}$ of the even-numbered questions correctly.

30. If $x = 0.rstu$, where r, s, t, and u each represent a nonzero digit of x, what is the value of x?

(1) $r = 3s = 2t = 6u$
(2) The product of r and u is equal to the product of s and t.

31. An empty rectangular swimming pool has uniform depth. How long will it take to fill the pool with water?

(1) Water will be pumped in at the rate of 240 gallons per hour (1 cubic foot = 7.5 gallons).
(2) The pool is 60 feet long and 25 feet wide.

32. Is the value of n closer to 50 than to 75?

(1) $75 - n > n - 50$
(2) $n > 60$

33. If n is an integer, is $\frac{100 - n}{n}$ an integer?

(1) $n > 4$
(2) $n^2 = 25$

34. If p, q, x, y, and z are different positive integers, which of the five integers is the median?

(1) $p + x < q$
(2) $y < z$

35. If $w + z = 28$, what is the value of wz?

(1) w and z are positive integers.
(2) w and z are consecutive odd integers.

36. Elena receives a salary plus a commission that is equal to a fixed percentage of her sales revenue. What was the total of Elena's salary and commission last month?

(1) Elena's monthly salary is $1,000.
(2) Elena's commission is 5 percent of her sales revenue.

37. What is the value of $a - b$?

(1) $a = b + 4$
(2) $(a - b)^2 = 16$

38. Machine X runs at a constant rate and produces a lot consisting of 100 cans in 2 hours. How much less time would it take to produce the lot of cans if both machines X and Y were run simultaneously?

(1) Both machines X and Y produce the same number of cans per hour.
(2) It takes machine X twice as long to produce the lot of cans as it takes machines X and Y running simultaneously to produce the lot.

39. Can the positive integer p be expressed as the product of two integers, each of which is greater than 1 ?

(1) $31 < p < 37$
(2) p is odd.

40. Is $x < y$?

(1) $z < y$
(2) $z < x$

41. If S is a set of four numbers w, x, y, and z, is the range of the numbers in S greater than 2 ?

(1) $w - z > 2$
(2) z is the least number in S.

42. If y is greater than 110 percent of x, is y greater than 75 ?

(1) $x > 75$
(2) $y - x = 10$

43. Is $x < 0$?

(1) $-2x > 0$
(2) $x^3 < 0$

44. If Q is an integer between 10 and 100, what is the value of Q ?

(1) One of Q's digits is 3 more than the other, and the sum of its digits is 9.
(2) $Q < 50$

45. If p and q are positive integers and $pq = 24$, what is the value of p ?

(1) $\frac{q}{6}$ is an integer.
(2) $\frac{p}{2}$ is an integer.

46. What is the value of $x^2 - y^2$?

(1) $x - y = y + 2$
(2) $x - y = \frac{1}{x + y}$

47. Hoses X and Y simultaneously fill an empty swimming pool that has a capacity of 50,000 liters. If the flow in each hose is independent of the flow in the other hose, how many hours will it take to fill the pool?

(1) Hose X alone would take 28 hours to fill the pool.
(2) Hose Y alone would take 36 hours to fill the pool.

48. How many integers n are there such that $r < n < s$?

(1) $s - r = 5$
(2) r and s are not integers.

49. If the total price of n equally priced shares of a certain stock was \$12,000, what was the price per share of the stock?

(1) If the price per share of the stock had been \$1 more, the total price of the n shares would have been \$300 more.
(2) If the price per share of the stock had been \$2 less, the total price of the n shares would have been 5 percent less.

50. What is the ratio of $x : y : z$?

(1) $z = 1$ and $xy = 32$
(2) $\frac{x}{y} = 2$ and $\frac{z}{y} = \frac{1}{4}$

51. Is $xy > 5$?

(1) $1 \leq x \leq 3$ and $2 \leq y \leq 4$
(2) $x + y = 5$

52. In year X, 8.7 percent of the men in the labor force were unemployed in June compared with 8.4 percent in May. If the number of men in the labor force was the same for both months, how many men were unemployed in June of that year?

(1) In May of year X, the number of unemployed men in the labor force was 3.36 million.
(2) In year X, 120,000 more men in the labor force were unemployed in June than in May.

53. If $x \neq 0$, what is the value of $\left(\frac{x^p}{x^q}\right)^4$?

(1) $p = q$
(2) $x = 3$

54. On Monday morning a certain machine ran continuously at a uniform rate to fill a production order. At what time did it completely fill the order that morning?

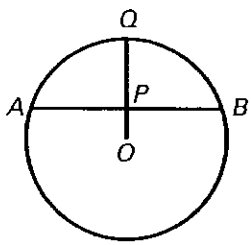
(1) The machine began filling the order at 9:30 a.m.
(2) The machine had filled $\frac{1}{2}$ of the order by 10:30 a.m. and $\frac{5}{6}$ of the order by 11:10 a.m.

55. If $xy < 3$, is $x < 1$?

(1) $y > 3$
(2) $x < 3$

56. If $\frac{m}{n} = \frac{5}{3}$, what is the value of $m + n$?

(1) $m > 0$
(2) $2m + n = 26$



57. What is the radius of the circle above with center O ?

(1) The ratio of OP to PQ is 1 to 2.
(2) P is the midpoint of chord AB.

58. What is the number of 360-degree rotations that a bicycle wheel made while rolling 100 meters in a straight line without slipping?

(1) The diameter of the bicycle wheel, including the tire, was 0.5 meter.
(2) The wheel made twenty 360-degree rotations per minute.

59. The perimeter of a rectangular garden is 360 feet. What is the length of the garden?

(1) The length of the garden is twice the width.
(2) The difference between the length and width of the garden is 60 feet.

60. If $2x(5n) = t$, what is the value of t ?

(1) $x = n + 3$
(2) $2x = 32$

61. In the equation $x^2 + bx + 12 = 0$, x is a variable and b is a constant. What is the value of b ?

(1) $x - 3$ is a factor of $x^2 + bx + 12$.
(2) 4 is a root of the equation $x^2 + bx + 12 = 0$.

62. A Town T has 20,000 residents, 60 percent of whom are female. What percent of the residents were born in Town T ?

(1) The number of female residents who were born in Town T is twice the number of male residents who were not born in Town T.
(2) The number of female residents who were not born in Town T is twice the number of female residents who were born in Town T.

63. If y is an integer, is y^3 divisible by 9 ?

(1) y is divisible by 4.
(2) y is divisible by 6.

64. In ΔXYZ, what is the length of YZ?

(1) The length of XY is 3.
(2) The length of XZ is 5.

65. What was the ratio of the number of cars to the number of trucks produced by Company X last year?

(1) Last year, if the number of cars produced by Company X had been 8 percent greater, the number of cars produced would have been 150 percent of the number of trucks produced by Company X.
(2) Last year Company X produced 565,000 cars and 406,800 trucks.

66. Is $xy < 6$?

(1) $x < 3$ and $y < 2$.
(2) $\frac{1}{2} < x < \frac{2}{3}$ and $y^2 < 64$.

67. If x, y, and z are positive numbers, is $x > y > z$?

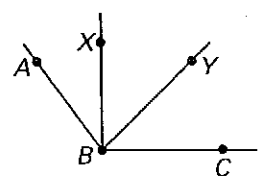
(1) $xz > yz$
(2) $yx > yz$

68. An infinite sequence of positive integers is called an "alpha sequence" if the number of even integers in the sequence is finite. If S is an infinite sequence of positive integers, is S an alpha sequence?

(1) The first ten integers in S are even.
(2) An infinite number of integers in S are odd.

69. How long did it take Betty to drive nonstop on a trip from her home to Denver, Colorado?

(1) If Betty's average speed for the trip had been $1\frac{1}{2}$ times as fast, the trip would have taken 2 hours.
(2) Betty's average speed for the trip was 50 miles per hour.



70. In the figure above, what is the measure of $\angle ABC$?

(1) BX bisects $\angle ABY$ and BY bisects $\angle XBC$.
(2) The measure of $\angle ABX$ is 40°

71. If x, y, and z are numbers, is $z = 18$?

(1) The average (arithmetic mean) of x, y, and z is 6.
(2) $x = -y$

72. After winning 50 percent of the first 20 games it played, Team A won all of the remaining games it played. What was the total number of games that Team A won?

(1) Team A played 25 games altogether.
(2) Team A won 60 percent of all the games it played.

73. Is x between 0 and 1?

(1) x^2 is less than x.
(2) x^3 is positive.

74. A jar contains 30 marbles, of which 20 are red and 10 are blue. If 9 of the marbles are removed, how many of the marbles left in the jar are red?

(1) Of the marbles removed, the ratio of the number of red ones to the number of blue ones is 2:1.
(2) Of the first 6 marbles removed, 4 are red.

75. Is p^2 an odd integer?

(1) p is an odd integer.
(2) $\sqrt{p}$ is an odd integer.

76. If $-10 < k < 10$, is $k > 0$?

(1) $\frac{1}{k} > 0$
(2) $k^2 > 0$

77. What is the value of xy?

(1) $x + y = 10$
(2) $x - y = 6$

78. Is x^2 greater than x ?

(1) x^2 is greater than 1.
(2) x is greater than -1.

79. Is $y = 6$?

(1) $y^2 = 36$
(2) $y^2 - 7y + 6 = 0$

80. If $xy > 0$, does $(x - 1)(y - 1) = 1$?

(1) $x + y = xy$
(2) $x = y$

81. The only contents of a parcel are 25 photographs and 30 negatives. What is the total weight, in ounces, of the parcel's contents?

(1) The weight of each photograph is 3 times the weight of each negative.
(2) The total weight of 1 of the photographs and 2 of the negatives is $\frac{1}{3}$ ounce.

82. If m and n are consecutive positive integers, is m greater than n?

(1) $m - 1$ and $n + 1$ are consecutive positive integers.
(2) m is an even integer.

83. If k and n are integers, is n divisible by 7?

(1) $n - 3 = 2k$
(2) $2k - 4$ is divisible by 7.

84. Is the perimeter of square S greater than the perimeter of equilateral triangle T?

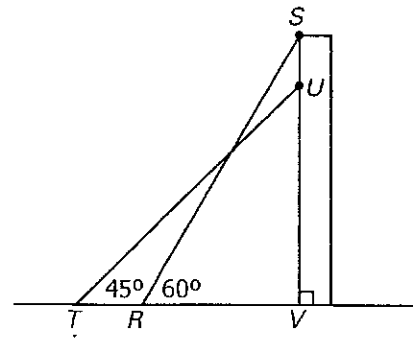
(1) The ratio of the length of a side of S to the length of a side of T is 4:5.
(2) The sum of the lengths of a side of S and a side of T is 18.

85. If $x + y + z > 0$, is $z > 1$?

(1) $z > x + y + 1$
(2) $x + y + 1 < 0$

86. Can the positive integer n be written as the sum of two different positive prime numbers?

(1) n is greater than 3.
(2) n is odd.



87. In the figure above, segments RS and TU represent two positions of the same ladder leaning against the side SV of a wall. The length of TV is how much greater than the length of RV?

(1) The length of TU is 10 meters.
(2) The length of RV is 5 meters.

88. Is the integer x divisible by 36?

(1) x is divisible by 12.
(2) x is divisible by 9.

Cancelation Fees	
Days Prior to Departure	Percent of Package Price
46 or more	10%
45-31	35%
30-16	50%
15-5	65%
4 or fewer	100%

89. The table above shows the cancellation fee schedule that a travel agency uses to determine the fee charged to a tourist who cancels a trip prior to departure. If a tourist canceled a trip with a package price of \$1,700 and a departure date of September 4, on what day was the trip canceled?

(1) The cancellation fee was \$595.
(2) If the trip had been canceled one day later, the cancellation fee would have been \$255 more.

90. What is the value of $\frac{x}{yz}$?

(1) $x = \frac{y}{2}$ and $z = \frac{2x}{5}$
(2) $\frac{x}{z} = \frac{5}{2}$ and $\frac{1}{y} = \frac{1}{10}$

91. If P and Q are each circular regions, what is the radius of the larger of these regions?

(1) The area of P plus the area of Q is equal to 90π.
(2) The larger circular region has a radius that is 3 times the radius of the smaller circular region.

92. If x and y are positive, what is the value of x?

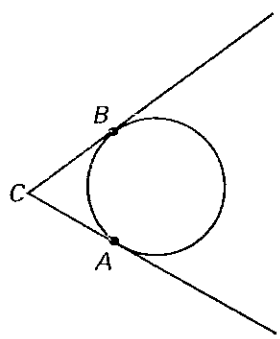
(1) 200 percent of x equals 400 percent of y.
(2) xy is the square of a positive integer.

93. If Aaron, Lee, and Tony have a total of $36, how much money does Tony have?

(1) Tony has twice as much money as Lee and $\frac{1}{3}$ as much as Aaron.
(2) The sum of the amounts of money that Tony and Lee have is half the amount that Aaron has.

94. Is z less than 0?

(1) $xy > 0$ and $yz < 0$.
(2) $x > 0$



95. The circular base of an above-ground swimming pool lies in a level yard and just touches two straight sides of a fence at points A and B, as shown in the figure above. Point C is on the ground where the two sides of the fence meet. How far from the center of the pool's base is point A?

(1) The base has area 250 square feet.
(2) The center of the base is 20 feet from point C.

96. If $xy = -6$, what is the value of $xy(x + y)$?

(1) $x - y = 5$
(2) $xy^2 = 18$

97. If the average (arithmetic mean) of 4 numbers is 50, how many of the numbers are greater than 50?

(1) None of the four numbers is equal to 50.
(2) Two of the numbers are equal to 25.

98. Is the positive square root of x an integer?

(1) $x = n^4$ and n is an integer.
(2) $x = 16$

99. If x is a positive number less than 10, is z greater than the average (arithmetic mean) of x and 10?

(1) On the number line, z is closer to 10 than it is to x.
(2) $z = 5x$

100. If n is an integer, is $n + 2$ a prime number?

(1) n is a prime number.
(2) $n + 1$ is not a prime number.

101. If $t \neq 0$, is r greater than zero?

(1) $rt = 12$
(2) $r + t = 7$

102. Is $\frac{x}{m}(m^2 + n^2 + k^2) = xm + yn + zk$?

(1) $\frac{z}{k} = \frac{x}{m}$

(2) $\frac{x}{m} = \frac{y}{n}$

103. If $R = \frac{8x}{3y}$ and $y \neq 0$, what is the value of R?

(1) $x = \frac{2}{3}$
(2) $x = 2y$

104. A bookstore that sells used books sells each of its paperback books for a certain price and each of its hardcover books for a certain price. If Joe, Maria, and Paul bought books in this store, how much did Maria pay for 1 paperback book and 1 hardcover book?

(1) Joe bought 2 paperback books and 3 hardcover books for \$12.50.
(2) Paul bought 4 paperback books and 6 hardcover books for \$25.00.

105. If x, y, and z are positive, is $x = \frac{y}{z^2}$?

(1) $z = \frac{y}{xz}$

(2) $z = \sqrt{\frac{y}{x}}$

106. If n is an integer between 2 and 100 and if n is also the square of an integer, what is the value of n?

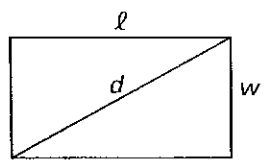
(1) n is even.
(2) The cube root of n is an integer.

107 For a certain set of n numbers, where $n > 1$, is the average (arithmetic mean) equal to the median?

(1) If the n numbers in the set are listed in increasing order, then the difference between any pair of successive numbers in the set is 2.
(2) The range of the n numbers in the set is $2(n-1)$.

108. If d is a positive integer, is $\sqrt{d}$ an integer?

(1) d is the square of an integer.
(2) $\sqrt{d}$ is the square of an integer.



109. What is the area of the rectangular region above?

(1) $\ell + w = 6$
(2) $d^2 = 20$

110. Is the positive integer n a multiple of 24 ?

(1) n is a multiple of 4.
(2) n is a multiple of 6.

111. If x is a positive integer and w is a negative integer, what is the value of xw?

(1) $x^w = \frac{1}{2}$
(2) $w = -1$

112. If x is an integer, is y an integer?

(1) The average (arithmetic mean) of x, y, and $y - 2$ is x.
(2) The average (arithmetic mean) of x and y is not an integer.

113. In the fraction $\frac{x}{y}$, where x and y are positive integers, what is the value of y?

(1) The least common denominator of $\frac{x}{y}$ and $\frac{1}{3}$ is 6.
(2) $x = 1$

114. Is $\frac{1}{a-b} < b - a$?

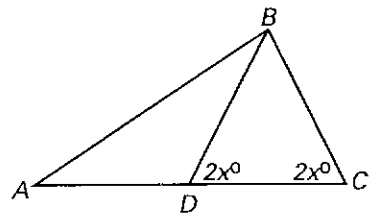
(1) $a < b$
(2) $1 < |a - b|$

115. If x and y are nonzero integers, is $x^y < y^x$?

(1) $x = y^2$
(2) $y > 2$

116. If x is a positive integer, is $\sqrt{x}$ an integer?

(1) $\sqrt{4x}$ is an integer.
(2) $\sqrt{3x}$ is not an integer.



117. In triangle ABC above, what is the length of side BC?

(1) Line segment AD has length 6.
(2) $x = 36$

118. If $rs \neq 0$, is $\frac{1}{r} + \frac{1}{s} = 4$?

(1) $r + s = 4rs$
(2) $r = s$

Data Sufficiency Answer Key

1. E
2. D
3. D
4. B
5. E
6. C
7. E
8. C
9. B
10. E
11. B
12. E
13. C
14. B
15. D
16. E
17. C
18. C
19. A
20. C
21. A
22. B
23. A
24. D
25. C
26. A
27. A
28. E
29. B
30. A
31. E
32. A
33. B
34. E
35. B
36. E
37. A
38. D
39. A
40. E
41. A
42. A
43. D
44. C
45. E
46. B
47. C
48. C
49. D
50. B
51. E
52. D
53. A
54. B
55. A
56. B
57. E
58. A
59. D
60. C
61. D
62. C
63. B
64. E
65. D
66. B
67. E
68. E
69. A
70. C
71. C
72. D
73. A
74. A
75. D
76. A
77. C
78. A
79. C
80. A
81. C
82. A
83. C
84. A
85. B
86. E
87. D
88. C
89. C
90. B
91. C
92. E
93. A
94. C
95. A
96. B
97. E
98. D
99. A
100. E
101. C
102. C
103. B
104. E
105. D
106. B
107. A
108. D
109. C
110. E
111. A
112. A
113. E
114. A
115. C
116. A
117. A
118. A