2.1 Number properties

1. $99999^2 - 1^2 =$

(A) $10^{10} - 2$

(B) $(10^5 - 2)^2$

(C) $10^4(10^5 - 2)$

(D) $10^5(10^4 - 2)$

(E) $10^5(10^5 - 2)$

2. If the greatest integer k for which 3^k is a factor of $n!$ is 8, what is the largest possible value of p so that 5^p is a factor of $n!$?

(A) 2

(B) 3

(C) 4

(D) 5

(E) 6

3. If $r = 0.345$, $s = (0.345)^2$ and $t = \sqrt{0.345}$, which of the following is the correct ordering of r, s and t?

(A) $r < s < t$

(B) $r < t < s$

(C) $s < t < r$

(D) $s < r < t$

(E) $t < r < s$

4. If s is the product of the integers from 100 to 200, inclusive, and t is the product of the integers from 100 to 201, inclusive, what is $\left(\frac{1}{s} + \frac{1}{t}\right)$ in terms of t?

(A) $\frac{(201)^2}{t}$

(B) $\frac{(201)(202)}{t}$

(C) $\frac{201}{t}$

(D) $\frac{202}{t}$

(E) $\frac{(201)(202)}{t^2}$

5. If s is the sum of all integers from 1 to 30, inclusive, what is the sum of all the factors of s?

(A) 303

(B) 613

(C) 675

(D) 737

(E) 768

6. If s is the sum of the reciprocals of the consecutive integers from 91 to 100, inclusive, which of the following is less than s?

I. $\frac{1}{8}$

II. $\frac{1}{9}$

III. $\frac{1}{10}$

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

7. If the number $5m15n$, where m and n represent the thousands' and unit digits, is divisible by 36, what is the maximum value of $|m - n|$?

(A) 1
(B) 3
(C) 5
(D) 6
(E) 8

8. A positive integer n is said to be "prime-saturated" if the product of all the different positive prime factors of n is less than the square root of n. What is the greatest two-digit prime-saturated integer?

(A) 99
(B) 98
(C) 97
(D) 96
(E) 95

9. A set of numbers has the property that for any number t in the set, $(t + 2)$ is also in the set. If -1 is in the set, which of the following is also in the set?

I. -3

II. 1

III. 5

(A) Only I
(B) Only II
(C) Only I and II
(D) Only II and III

(E) I, II and III

10. If the sequence $x_1, x_2, x_3, \ldots x_n$, is such that $x_1 = 3$ and $x_{n+1} = 2x_n - 1$ for $n \geq 1$, then $x_{20} - x_{19} =$

(A) 2^{19}

(B) $2^{20} - 1$

(C) 2^{20}

(D) $2^{21} - 1$

(E) 2^{21}

11. If w, x, y and z are integers such that $1 < w \leq x \leq y \leq z$ and $w * x * y * z = 924$, then how many possible values exist for z?

(A) Three

(B) Four

(C) Five

(D) Six

(E) Seven

12. If $0 < x < 1$ and $y > 1$, $(\sqrt{x + y - 2\sqrt{xy}} + \sqrt{x + y + 2\sqrt{xy}}) =$

(A) $\sqrt{x}$

(B) $2\sqrt{x}$

(C) $\sqrt{y} + \sqrt{x}$

(D) $\sqrt{y}$

(E) $2\sqrt{y}$

13. If $x \geq 0.9$, which of the following could be the value of $\left(\frac{1}{\sqrt{x}}\right)$?

(A) 1.02

(B) 1.12

(C) 1.23

(D) 1.45

(E) 2.10

14. If x and y are positive integers and $180x = y^3$, which of the following must be an integer?

I. $\frac{x}{2^2 * 3 * 5}$

II. $\frac{x}{2 * 3^2 * 5}$

III. $\frac{x}{2 * 3 * 5^2}$

(A) Only I

(B) Only II

(C) Only III

(D) Only I and II

(E) I, II and III

15. In the correctly worked addition problem shown below, where the sum of the two-digit positive integers AB and BA is the three-digit integer AAC, and A, B, and C are different digits, what is the unit digit of the integer AAC?

$$\begin{array}{r} A\ B \\ +\ B\ A \\ \hline A\ A\ C \end{array}$$

(A) 9

(B) 6

(C) 3

(D) 2

(E) 0

16. 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) \$1326

(B) \$1352

(C) \$1378

(D) \$2652

(E) \$2756

2.2 Percents

17. A certain pair of used shoes can be repaired for $12.50 and will last for one year. A pair of the same kind of shoes can be purchased new for $28.00 and will last for two years. The average cost per year of the new shoes is what percent greater than the cost of repairing the used shoes?

(A) 3%
(B) 5%
(C) 12%
(D) 15%
(E) 24%

18. A certain state has a sales tax of 5 percent on the portion of a purchase price that is greater than $100. If a customer paid a sales tax of $4 on a particular item, what was the purchase price of the item?

(A) $120
(B) $124
(C) $180
(D) $184
(E) $220

19. A certain sales tax rate is $0.82 per $50. What is the rate, as a percent, which is thrice as much as the rate mentioned?

(A) 492%
(B) 49.2%
(C) 4.92%
(D) 1.23%
(E) 0.055%

20. A certain telescope X increases the visual range of a particular location from 90 kilometers to 270 kilometers. Another telescope Y increases the visual range of another location from 45 kilometers to 180 kilometers. By what percent is the percent increase in visual range using Y more than that obtained using X?

(A) 33
(B) 50
(C) 75
(D) 100
(E) 150

21. The population of a certain country X is 120,108,000 and its land area is 2,998,000 square kilometers. The population of another country Y is 200,323,000 and its land area is 7,899,000 square kilometers. The population density is defined as the population per square kilometer of land area. The population density of country X is approximately what percent greater or lesser than that of country Y?

(A) 60%

(B) 50%

(C) 45%

(D) 37%

(E) 15%

22. A coat's original price of \$112 was reduced by 20 percent for a sale. If the sale price was then increased by 20 percent, which of the following, expresses the single percent change, which when applied to the original price of the coat, would result in the same final price of the coat now?

(A) $100(1-0.2)^2$

(B) $100\,(1-0.4)$

(C) $100(1-0.4)^2$

(D) $100\,(1-0.8)$

(E) $100\,(1-0.96)$

23. 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 should the prescribed dosage be reduced to bring it down to the typical dosage?

(A) 7.5

(B) 9.0

(C) 11.1

(D) 12.5

(E) 14.8

24. A factory that employs 100 assembly-line workers pays each of these workers \$5 per hour for the first 40 hours worked during a week and $1\frac{1}{2}$ times that rate for hours worked in excess of 40. What was the total payroll for the assembly-line workers for a week in which 30 percent of them worked 20 hours, 50 percent worked 40 hours, and the rest worked 50 hours?

(A) \$18000

(B) \$18500

(C) \$19000

(D) \$20000

(E) \$20500

25. 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) 44%

(D) 52%

(E) 56%

26. A salesperson received 6 percent commission on the amount of total sales up to and including \$10,000, and r percent commission on the amount of total sales above \$10,000. If the salesperson received a total commission of \$920 on total sales of \$14,000, what was the value of r?

(A) 3.2
(B) 4.3
(C) 6.6
(D) 8.0
(E) 9.2

27. A shipment of 1,500 heads of cabbage, each of which was approximately the same size, was purchased for \$600. The day the shipment arrived, $\frac{2}{3}$ of the heads were sold, each at 25 percent above the cost per head. The following day the rest were sold at a price per head equal to 10 percent less than the cost per head. What was the percent profit on this shipment?

(A) 7.5%
(B) 13.3%
(C) 17.5%
(D) 22.5%
(E) 25.0%

28. Due to a 25% increase in the price of diesel, a person got 10 liters less quantity for \$50 than he was getting before the increase. What was the initial price per liter of diesel?

(A) \$1.00
(B) \$1.50
(C) \$2.25
(D) \$2.50
(E) \$3.00

29. Company K has an annual budget for a certain project, and $\frac{1}{5}$ of this budget was spent during the first quarter of the year. If $\frac{1}{8}$ of the remainder of the budget was spent during the second quarter, by what percent is the budget that was left at the end of the second quarter more than that spent in the previous two quarters?

(A) 80.0%
(B) 120.0%
(C) 125.0%
(D) 133.3%
(E) 250.0%

30. Dick and Jane each saved \$3,000 in 2006. In 2007 Dick saved 8 percent more than he did in 2006, and together he and Jane saved a total of \$5,000. Approximately, what percent less did Jane save in 2007 than he did in 2006?

(A) 8%

(B) 25%
(C) 41%
(D) 59%
(E) 70%

31. The price of each share of stock K, when traded at a certain stock exchange, first goes up by p percent and then falls down by p percent every alternate day. After one such up-down cycle, the price of the stock fell by \$2. If, after another such up-down cycle, the price per share of stock K comes to \$196.02, what was the original price per share of stock K?

(A) \$300
(B) \$270
(C) \$250
(D) \$200
(E) \$150

32. Based on this year's costs, an orchard grower budgets p dollars for planting n new trees. If the average cost of planting each tree were to increase 25 percent from this year's cost, then the number of trees that the orchard grower could plant next year using $2p$ dollars would be

(A) 12% less than n
(B) 20% less than n
(C) 33% greater than n
(D) 60% greater than n
(E) 75% greater than n

33. Before a certain tire is used, 40 percent of its total weight consists of tread. If during a lifetime of use, 50 percent, by weight, of the tire's tread is lost and no other parts of the tire is lost, what per cent of the tire's total remaining weight consists of the remaining tread?

(A) 55%
(B) 35%
(C) 30%
(D) 25%
(E) 20%

34. A nut mix contains, by weight, 20 percent peanuts and 80 percent cashews. If this mixture costs 10 percent more than the cost of an equal quantity of pure peanuts, by what percent are cashews more expensive than peanuts?

(A) 10.0%
(B) 12.5%
(C) 15.0%
(D) 22.5%
(E) 25.0%

35. At Company X, senior sales representatives visit the home office once every 30 days, and junior sales representatives visit the home office once every 20 days. The number of visits that a junior sales representative makes in a 2-year period is approximately what percent greater than the number of visits that a senior representative makes in the same period?

(A) 10%

(B) 25%

(C) 33%

(D) 50%

(E) 67%

36. Anne bought a computer for $2,000 and then paid a 5 percent sales tax, and Henry bought a computer for $1,800 and then paid a 12 percent sales tax. The total amount that Henry paid, including sales tax, was what percent less than the total amount Anne paid, including sales tax?

(A) 3%

(B) 4%

(C) 7%

(D) 10%

(E) 12%

37. In a corporation, 50 percent of the male employees and 40 percent of the female employees are at least 35 years old. If 42 percent of all the employees are at least 35 years old, what fraction of the employees in the corporation are females?

(A) $\frac{3}{5}$

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

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

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

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

38. 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 were cast by independent voters, which of the following represents the number of votes that Ms. Robbins received?

(A) $0.06N + 3200$

(B) $0.1N + 7200$

(C) $0.4N + 7200$

(D) $0.06N + 8000$

(E) $0.1N + 8000$

39. In Company X, 30 percent of the employees live over ten miles from work and 60 percent of the employees who live over ten miles from work use car pools. If 40 percent of the employees of Company X use car pools, what percent of the employees of Company X live ten miles or less from work and use car pools?

(A) 12%

(B) 20%

(C) 22%

(D) 28%

(E) 32%

40. A total of 30 percent of the geese included in a certain migration study were male. If some of the geese migrated during the study and 20 percent of the migrating geese were male, what was the ratio of the migration rate for the male geese to the migration rate for the female geese?

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

(B) $\frac{7}{12}$

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

(D) $\frac{7}{8}$

(E) $\frac{8}{9}$

41. In 2006, the book value of a certain car was $\frac{2}{3}$ of the original purchase price, and in 2008 its book value was $\frac{1}{2}$ of the original purchase price. By what percent did the book value of this car decrease from 2006 to 2008?

(A) 16.6%

(B) 25.0%

(C) 33.3%

(D) 50.0%

(E) 75.0%

42. In a certain city, 60 percent of the registered voters are Democrats and the rest are Republicans. In a mayoral race, if 75 percent of the registered voters who are Democrats and 20 percent of the registered voters who are Republicans are expected to vote for Candidate A, what percent of the registered voters are expected to vote for Candidate A?

(A) 50%

(B) 53%

(C) 54%

(D) 55%

(E) 57%

43. In 2005, 45 percent of a document storage facility's 60 customers were banks, and in 2007, 25 percent of its 144 customers were banks. What was the simple annual percent growth rate in the number of bank customers the facility had?

(A) 11.1%

(B) 16.6%

(C) 25.0%

(D) 33.3%

(E) 58.3%

44. In 2006, the book value of a certain car was $\frac{2}{3}$ of the original purchase price, and in 2008 its book value was $\frac{1}{2}$ of the original purchase price. By what percent did the book value of this car decrease from 2006 to 2008?

(A) 16.6%
(B) 25.0%
(C) 33.3%
(D) 50.0%
(E) 75.0%

45. In a certain city, 60 percent of the registered voters are Democrats and the rest are Republicans. In a mayoral race, if 75 percent of the registered voters who are Democrats and 20 percent of the registered voters who are Republicans are expected to vote for Candidate A, what percent of the registered voters are expected to vote for Candidate A?

(A) 50%
(B) 53%
(C) 54%
(D) 55%
(E) 57%

2.3 Profit & Loss

46. A collection of books went on sale, and $\frac{2}{3}$ of them were sold for \$2.50 each. If none of the 36 remaining books were sold, what was the total amount received for the books that were sold?

(A) \$180
(B) \$135
(C) \$90
(D) \$60
(E) \$54

47. A farmer produced 750 bushels of a certain crop at a cost of \$20 per bushel. If the farmer sold $\frac{2}{3}$ of the bushels for double their production cost and sold the remaining bushels at 25 percent above their production cost, what was the farmer's gross profit on the sale of the crop?

(A) \$11250
(B) \$13375
(C) \$15000
(D) \$18750
(E) \$26250

48. A furniture store sells only two models of desks, model A and model B. The selling price of a model A desk is \$120, which is 30 percent of the selling price of a model B desk. If the furniture store sells 2,000 desks, $\frac{3}{4}$ of which are model B, what is the furniture store's total revenue from the sale of desks?

(A) \$114000
(B) \$186000
(C) \$294000
(D) \$380000
(E) \$660000

49. A retailer bought a machine at a wholesale price of \$90 and later on sold it for 10% less than the suggested retail price. If the retailer made a profit equivalent to 20% of the wholesale price, what is the suggested retail price of the machine?

(A) \$81
(B) \$100
(C) \$120
(D) \$135
(E) \$160

50. A small business invests \$9,900 in equipment to produce a product. Each unit of the product costs \$0.65 to produce and is sold for \$1.20. How many units of the product must be sold before the revenue received equals the total expense of production, including the initial investment in equipment?

(A) 12000
(B) 14500
(C) 15230
(D) 18000
(E) 20000

51. A store's selling price for a certain computer would yield a profit of 40 percent of the store's cost for the computer. If the price were increased by $200, it would yield a profit of 50 percent of the computer's cost. What was the initial selling price of the computer?

(A) $2000
(B) $2400
(C) $2800
(D) $3000
(E) $3500

52. Company C produces toy trucks at a cost of $5.00 each for the first 100 trucks and $3.50 for each additional truck. If 500 toy trucks were produced by Company C and sold for $10.00 each, what was Company C's gross profit?

(A) $2250
(B) $2500
(C) $3100
(D) $3250
(E) $3500

53. A toy store's gross profit on a computer game was 10 percent of the cost of the game. If the store increased the selling price of the game from $44 to $46 and the cost of the game remained the same, then the store's gross profit on the game after the price increase was what percent of the cost of the game?

(A) 10.5%
(B) 11.0%
(C) 12.5%
(D) 13.0%
(E) 15.0%

54. A wholesaler bought 1200 radios for $18 each. He then sold 60 percent of the radios for $30 each and the rest for $15 each. What was the wholesaler's average (arithmetic mean) profit per radio?

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

55. A man sold an article at k percent profit after offering k percent discount on the listed price. Had he sold the article at $(k + 15)$ percent discount on the listed price, his profit would have been $(k - 20)$ percent. What would have been his percent profit had he sold the article without offering any discount?

(A) 5.0%

(B) 10.0%

(C) 25.0%

(D) 33.3%

(E) 38.0%

2.4 Averages

56. A certain college has a student-to-teacher ratio of 11 to 1. The average (arithmetic mean) annual salary for teachers is $52,000. If the college pays a total of $6,760,000 in annual salaries to its teachers, how many students does the college have?

(A) 130
(B) 169
(C) 1300
(D) 1430
(E) 1560

57. A club sold an average (arithmetic mean) of 92 raffle tickets per member. Among the female members, average number sold was 84, and among the male members, the average number sold was 96. What was the ratio of the number of male members to the number of female members in the club?

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

58. A college chemistry course is divided into two sections. In section A, the average score in the final examination was 92. In section B, the average score in the final examination was 84. If the average score of all 40 students in the course was 89, how many students are in section A?

(A) 15
(B) 18
(C) 20
(D) 22
(E) 25

59. A grocer has 400 pounds of coffee in stock, 20 percent of which is decaffeinated. If the grocer buys another 100 pounds of coffee of which 60 percent is decaffeinated, what percent, by weight, of the grocer's stock of coffee is decaffeinated?

(A) 28%
(B) 30%
(C) 32%
(D) 34%
(E) 40%

60. A class has 4 sections P, Q, R and S and the average weights of the students in the sections are 45lb, 50lb, 55lb and 65lb respectively. What is the maximum possible number of students in section R if there are 40 students in all sections combined and the average weight of the all students across all the sections is 55lb? It is known that each section has at least one student.

(A) 18

(B) 20

(C) 25

(D) 35

(E) 37

61. A set S consists of the integers $\{1,\ 2,\ 3,\ 4 \ldots (2n+1)\}$, where n is a positive integer. If X is the average of the odd integers in set S and Y is the average of the even integers in set S, what is the value of $(X - Y)$?

(A) 0

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

(C) 1

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

(E) 2

62. The average of seven numbers is 20. The average of the first four numbers is 19 and that of the last four is 24. What is the value of the fourth number?

(A) 23

(B) 25

(C) 32

(D) 43

(E) 63

63. Box W and Box V each contain several blue sticks and red sticks, and all of the red sticks have the same length. The length of each red stick is 18 inches less than the average length of the sticks in Box Wand 6 inches greater than the average length of the sticks in Box V. What is the difference between average (arithmetic mean) length, in inches, of the sticks in Box W and of the sticks in Box V?

(A) 3

(B) 6

(C) 12

(D) 18

(E) 24

64. At a certain company, the average (arithmetic mean) salary of 10 of the employees is \$30,000, the average salary of 30 other employees is \$40,000, and the average salary of the remaining 20 employees is \$60,000. What is the average salary of the 60 employees at the company?

(A) \$40,000

(B) \$43,000

(C) \$45,000

(D) \$50,000

(E) \$55,000

65. At a certain food 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 food stand, and the average (arithmetic mean) price of the 10 pieces of fruit comes to 56 cents. How many oranges must Mary put back so that the average price of the pieces of fruit that she keeps with her is 52 cents?

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

66. A student's average (arithmetic mean) test score on four tests is 78. If each test is scored out of 100, which of the following can be the student's score on the fifth test so that the student's average score on the five tests increases by an integer value?

(A) 82
(B) 87
(C) 89
(D) 93
(E) 95

67. A teacher gave the same test to three history classes: A, B, and C. The average (arithmetic mean) scores for the three classes were 65, 80, and 77, respectively. The ratio of the numbers of students in each class who took the test was 4 : 6 : 5, respectively. What was the average score for the three classes combined?

(A) 74
(B) 75
(C) 76
(D) 77
(E) 78

68. A total of 22 men and 26 women were at a party. The average (arithmetic mean) age of all of the people at the party was exactly 35 years. If the average age of the men was exactly 38 years, which of the following was closest to the average age, in years, of the women?

(A) 31.0
(B) 31.5
(C) 32.0
(D) 32.5
(E) 33.0

69. This is a modified question of the above question.

A total of 22 men and 26 women were at a party. The average (arithmetic mean) age of all of the people at the party was exactly 66.74 years. If the average age of the men was exactly 69.74 years, which of the following was closest to the average age, in years, of the women?

(A) 61.24

(B) 63.74
(C) 64.24
(D) 64.74
(E) 69.24

2.5 Ratio & Proportion

70. The total expenses of organizing a party has a fixed expense of $250 as the rent of the place where the party is to be organized and a variable expense depending on the number of guests attending the party. For 10 guests the total expense was estimated to be $650. What is the estimated total expense for 20 guests?

(A) $800
(B) $900
(C) $1050
(D) $1250
(E) $1300

71. A glass was filled with 10 ounces of water and spirit mixture with the components in the ratio 2 : 3 respectively. If 1 percent of the initial quantity of water and 3 percent of the initial quantity of spirit evaporated each day during a twenty-day period, what percent of the original amount of mixture evaporated during this period?

(A) 4.4%
(B) 24.4%
(C) 44.0%
(D) 50.0%
(E) 80.0%

72. In Diana's stamp collection, $\frac{4}{5}$ of the stamps are Canadian, and $\frac{3}{7}$ of the Canadian stamps were issued before 1940. If 192 stamps in Diana's collection are Canadian stamps that were issued in 1940 or later, how many stamps in her collection are not Canadian?

(A) 84
(B) 88
(C) 96
(D) 104
(E) 112

73. The ratio of the ages of A and B is 7 : 11. Which of the following cannot be the ratio of their ages after 5 years?

(A) 1 : 3
(B) 9 : 20
(C) 4 : 15
(D) 3 : 5
(E) 2 : 3

74. Company S produces two kinds of stereos: basic and deluxe. Of the stereos produced by Company S last month, $\frac{2}{3}$ were basic and the rest were deluxe. If it takes $\frac{7}{5}$ as many hours to produce a deluxe stereo as it does to produce a basic stereo, then the number of hours it took to produce the deluxe stereos last month was what fraction of the total number of hours it took to produce all the stereos?

(A) $\frac{7}{17}$

(B) $\frac{14}{31}$

(C) $\frac{7}{15}$

(D) $\frac{17}{35}$

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

75. 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) 5 to 4

(B) 9 to 5

(C) 16 to 15

(D) 4 to 5

(E) 5 to 16

76. At a monthly meeting, $\frac{2}{5}$ of the attendees were males and $\frac{7}{8}$ of the male attendees arrived on time. If $\frac{9}{10}$ of the female attendees arrived on time, what fraction of the attendees at the monthly meeting who did not arrive on time are males?

(A) $\frac{11}{100}$

(B) $\frac{3}{25}$

(C) $\frac{11}{50}$

(D) $\frac{9}{20}$

(E) $\frac{5}{11}$

77. Ann, Carol, and Judy paid a total of \$45 for their dinner at a restaurant. If Ann paid $\frac{2}{5}$ of what Judy paid, Carol paid \$17 and Judy paid the rest, what fraction of the total amount did Judy pay?

(A) $\frac{2}{9}$

(B) $\frac{14}{45}$

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

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

(E) $\frac{4}{9}$

78. A total of n trucks and cars are parked in a lot. If the number of cars is $\frac{1}{4}$ the number of trucks, and $\frac{2}{3}$ of the trucks are pickups, how many pickups, in terms of n, are parked in the lot?

(A) $\frac{n}{12}$

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

(C) $\frac{5n}{12}$

(D) $\frac{8n}{15}$

(E) $\frac{11n}{12}$

79. A wire that weighs 20 pounds is cut into two pieces so that one of the pieces weighs 16 pounds and is 36 feet long. If the weight of each piece is directly proportional to the square of its length, how many feet long is the other piece of wire?

(A) 9

(B) 12

(C) 18

(D) 24

(E) 27

80. A sum of money was divided between John and Bob so that the ratio of John's share to Bob's share was 5 : 3. If John's share exceeded $\frac{5}{9}$ of the total sum of money by \$50, what was Bob's share?

(A) \$180

(B) \$270

(C) \$340

(D) \$450

(E) \$720

81. In a certain English class, $\frac{1}{4}$ of the number of girls is equal to $\frac{1}{6}$ of the total number of students. What is the ratio of the number of boys to the number of girls in the class?

(A) 1 : 4

(B) 1 : 3

(C) 1 : 2

(D) 2 : 3

(E) 2 : 1

82. In a certain quiz that consists of 10 questions, each question after the first is worth 4 points more than the preceding question. If the 10 questions on the quiz are worth a total of 360 points, how many points is the third question worth?

(A) 18

(B) 24
(C) 26
(D) 32
(E) 44

83. In a certain school, 40 more than $\frac{1}{3}$ of all the students are taking a science course and $\frac{1}{4}$ of those taking a science course are taking physics. If $\frac{1}{8}$ of all the students in the school are taking physics, how many students are in the school?

(A) 240
(B) 300
(C) 480
(D) 720
(E) 960

84. In a certain class containing 36 students, some boys and some girls, exactly $\frac{1}{3}$ of the boys and exactly $\frac{1}{4}$ of the girls walk to school. What is the greatest possible number of students in this class who walk to school?

(A) 9
(B) 10
(C) 11
(D) 12
(E) 13

85. In a certain English class, $\frac{1}{4}$ of the number of girls is equal to $\frac{1}{6}$ of the total number of students. What is the ratio of the number of boys to the number of girls in the class?

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

86. In a certain shipment, there are 30 boxes which weigh either 10 pounds or 20 pounds, and the average (arithmetic mean) weight of the boxes in the shipment is 18 pounds. If the average weight of the boxes in the shipment is to be reduced to 16 pounds by including few extra 10-pound boxes, how many extra 10-pound boxes must be included?

(A) 4
(B) 6
(C) 10
(D) 20
(E) 24

87. How many liters of pure alcohol must be added to a 90-liter solution that is 20 percent alcohol in order to produce a solution that is 25 percent alcohol?

(A) 4.5

(B) 5.0

(C) 5.5

(D) 6.0

(E) 6.5

2.6 Speed, Time, & Distance

88. A bus trip of 450 miles would have taken one hour less if the average speed S for the trip had been greater by five miles per hour. What was the average speed S, in miles per hour, for the trip?

(A) 10
(B) 40
(C) 45
(D) 50
(E) 55

89. A car traveled 462 miles per full tank of gasoline on the highway and 336 miles per full tank of gasoline in the city. If the car traveled six fewer miles per gallon in the city than on the highway, how many miles per gallon did the car travel in the city?

(A) 14
(B) 16
(C) 21
(D) 22
(E) 27

90. A car traveling at a certain constant speed takes two seconds longer to travel one kilometer than it would take to travel one kilometer at 75 kilometers per hour. At what speed, in kilometers per hour, is the car traveling?

(A) 71.5
(B) 72
(C) 72.5
(D) 73
(E) 73.5

91. A certain car increased its average speed by 5 miles per hour in each successive 5-minute interval after the first interval. If in the first 5-minute interval, its average speed was 20 miles per hour, how many miles did the car travel in the third 5-minute interval?

(A) 1.0
(B) 1.5
(C) 2.0
(D) 2.5
(E) 3.0

92. A certain pilot flew 400 miles to City K at an average speed of 350 miles per hour with the wind and made the trip back at an average speed of 250 miles per hour against the wind. Which of the following is closest to the pilot's average speed, in miles per hour, for the round-trip?

(A) 280
(B) 290

(C) 300

(D) 310

(E) 320

93. A driver completed the first 20 miles of a 40-mile trip at an average speed of 50 miles per hour. At what average speed (in miles per hour) did the driver complete the remaining 20 miles to achieve an average speed of 60 miles per hour for the entire 40-mile trip? It is known that the driver did not make any stops during the 40-mile trip.

(A) 65

(B) 68

(C) 70

(D) 75

(E) 80

94. A hiker walked for two days. On the second day the hiker walked at an average speed of 1 mile per hour faster than he walked on the first day. If during the two days he walked a total of 64 miles and spent a total of 18 hours walking, which of the following could be his average speed (in miles per hour) on the first day?

(A) 2

(B) 3

(C) 4

(D) 5

(E) 6

95. If two trains are 120 miles apart and are traveling toward each other on parallel tracks at constant rates of 30 miles per hour and 40 miles per hour, how far apart will they be one hour before they meet?

(A) 10

(B) 30

(C) 40

(D) 50

(E) 70

96. Because of construction, the speed limit along an 8-mile section of highway is reduced from 55 miles per hour to 35 miles per hour. Approximately how many minutes more will it take to travel along this section of highway at the new speed limit than it would have taken at the old speed limit?

(A) 5

(B) 8

(C) 10

(D) 15

(E) 24

97. Cars X and Y traveled the same 80-mile route. If car X took 2 hours and car Y traveled at an average speed which was 50 percent faster than the average speed of car X, how many hours did it take car Y to travel the route?

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

(B) 1

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

(D) $1\frac{3}{5}$

(E) 3

98. Joe drives five times farther in 50 minutes than what Bob drives in 40 minutes. If Joe drives at a speed of 36 miles per hour, at what speed, in miles per hour, does Bob drive?

(A) 6.0

(B) 9.0

(C) 20.0

(D) 32.5

(E) 64.8

99. A train left a station P at 6 am and reached another station Q at 11 am. Another train left station Q at 7 am and reached P at 10 am. At what time did the two trains pass one another?

(A) 7:50 am

(B) 8:13 am

(C) 8:30 am

(D) 8:42 am

(E) 9:03 am

2.7 Time & Work

100. A certain machine produces 1,000 units of product P per hour. Working 12 hours each day, another machine, twice as efficient, will produce how many units of product P in seven days?

(A) 7,000
(B) 24,000
(C) 40,000
(D) 100,000
(E) 168,000

101. A pump started filling an empty pool with water and continued at a constant rate until the pool was full. At noon, the pool was $\frac{1}{3}$ full, and $1\frac{1}{4}$ hours later, it was $\frac{3}{4}$ full. What would be the total number of hours that another pump thrice as efficient would take to completely fill a pool twice as large?

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

102. Two taps can fill a cistern in 20 minutes and 30 minutes. The first tap was opened initially for x minutes after which the second tap was opened. If it took a total of 15 minutes for the tank to be filled, what is the value of x?

(A) 5.0
(B) 7.5
(C) 9.0
(D) 10.0
(E) 12.5

103. An empty swimming pool with a capacity of 5,760 gallons is filled by a pipe at the rate of 12 gallons per minute. There is an emptying pipe which can empty the pool which is $\frac{3}{4}$ full in 9 hours. How many hours does it take to fill the entire pool which is already half filled, if both pipes are kept open?

(A) 6
(B) 12
(C) 24
(D) 36
(E) 72

104. Machine A produces parts twice as fast as machine B does. Machine B produces 100 parts of product X in 40 minutes. If each machine produces parts at a constant rate, how many parts of product Y does machine A produce in 6 minutes, if each part of product Y takes $\frac{3}{2}$ times of the time taken to produce each part of product X?

(A) 45
(B) 30
(C) 25
(D) 20
(E) 15

105. Machine A, operating alone at its constant rate, produces 500 feet of a particular fiber in 2 hours. Machine B, operating alone at its constant rate, produces 500 feet of the same fiber in 3 hours. Machine C, operating alone at its constant rate, produces 500 feet of the same fiber in 6 hours. How many hours will it take machines A, B, and C, operating together at their respective constant rates, to produce 1,000 feet of the fiber?

(A) 1.0
(B) 1.5
(C) 2.0
(D) 2.5
(E) 3.0

106. On a 3-day fishing trip, 4 adults consumed food costing $60. If it is known that one child consumes half the amount of food consumed by an adult in the same time, for the same food costs per person per day, what would be the cost of food consumed by 6 adults and 3 children during a 4-day fishing trip?

(A) $180
(B) $150
(C) $125
(D) $90
(E) $75

107. Mark and Kate individually take 12 hours more and 27 hours more, respectively, to complete a certain project than what they would have taken to complete the same project working together. How many hours do Mark and Kate take to complete the project, working together?

(A) 12
(B) 16
(C) 18
(D) 24
(E) 39

2.8 Computational

108. A certain liquid leaks out of a container at the rate of k liters for every x hours. If the liquid costs 6 dollars per liter, what is the cost, in dollars, of the amount of the liquid that will leak out in y hours?

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

(B) $\frac{6x}{ky}$

(C) $\frac{6k}{xy}$

(D) $\frac{6ky}{x}$

(E) $\frac{6xy}{k}$

109. A certain quantity is measured on two different scales, the R-scale and the S-scale, that are related linearly. Measurements on the R-scale of 6 and 24 correspond to measurements on the S-scale of 30 and 60, respectively. What measurement on the R-scale corresponds to a measurement of 100 on the S-scale?

(A) 20

(B) 36

(C) 48

(D) 60

(E) 84

110. If Jack had twice the amount of money that he has, he would have exactly the amount necessary to buy three hamburgers at \$0.96 a piece and two milk shakes at \$1.28 a piece. How much money does Jack have?

(A) \$1.60

(B) \$2.24

(C) \$2.72

(D) \$3.36

(E) \$5.44

111. The population of a certain country increases at the rate of 30,000 people every month. The population of the country in 2012 was 360 million. In which year would the population of the country be 378 million?

(A) 2060

(B) 2061

(C) 2062

(D) 2063

(E) 2064

112. A restaurant buys fruit in cans, each containing $3\frac{1}{2}$ cups of fruit. If the restaurant uses $\frac{1}{2}$ cup of the fruit in each serving of its fruit compote, what is the least number of cans needed to prepare 60 servings of the compote?

(A) 7
(B) 8
(C) 9
(D) 10
(E) 12

113. Coins are to be put into 7 pockets so that each pocket contains at least one coin. At most 3 of the pockets are to contain the same number of coins, and no two of the remaining pockets are to contain an equal number of coins. What is the least possible number of coins needed for the pockets?

(A) 7
(B) 13
(C) 17
(D) 22
(E) 28

114. During a spring season, a certain glacier surged at the rate of $\frac{1}{4}$ mile per 25 days. How many hours does it take the glacier to cover one foot? (1 mile = 5,280 feet)

(A) $\frac{5}{264}$
(B) $\frac{6}{25}$
(C) $\frac{5}{11}$
(D) $\frac{11}{5}$
(E) $\frac{25}{6}$

115. At a certain carpet factory, if carpeting of width 10 feet is moving continuously through a dryer at a constant speed of 2160 feet per hour, how many SECONDS does it take for an area of 1 square foot of carpeting to move through the dryer?

(A) $\frac{1}{6}$
(B) $\frac{1}{3}$
(C) 6
(D) 36
(E) 60

116. At a certain company, each employee has a salary grade s that is at least 1 and at most 5. Each employee receives an hourly wage p, in dollars, determined by the formula $p = 950 + 0.25(s - 1)$. An employee with a salary grade of 5 receives how many more dollars per hour than an employee with a salary grade of 1?

(A) \$0.50
(B) \$1.00
(C) \$1.25
(D) \$1.50
(E) \$1.75

117. At a garage sale, the prices of all the items sold were different. The items sold were radios and DVD players. If the price of a radio sold at the garage sale was the 15^{th} highest price as well as the 20^{th} lowest price among the prices of the radios sold, and the price of a DVD player sold was the 29^{th} highest price as well as the 37^{th} lowest price among all the prices of all the items sold, how many DVD players were sold at the garage sale?

(A) 30
(B) 31
(C) 32
(D) 64
(E) 65

118. An author received \$0.80 in royalties for each of the first 100,000 copies of her book sold, and \$0.60 in royalties for each additional copy sold. If she received a total of \$260,000 in royalties, how many copies of her book were sold?

(A) 130,000
(B) 300,000
(C) 380,000
(D) 400,000
(E) 420,000

119. A tourist purchased a total of \$1,500 worth of traveler's checks in \$10 and \$50 denominations. During the trip, the tourist cashed only seven checks and then lost all the rest. If the number of \$10 checks cashed was one more or one less than the number of \$50 checks cashed, what is the minimum possible value of the checks that were lost?

(A) \$1430
(B) \$1310
(C) \$1290
(D) \$1270
(E) \$1150

2.9 Interest

120. A sum of money invested under simple interest, amounts to $1200 in three years and $1500 in five years. What is the rate at which the sum of money was invested?

(A) 10%
(B) 15%
(C) 20%
(D) 25%
(E) 45%

121. The difference, after two years, between compound interest and simple interest on a certain sum of money invested at the same rate of interest, is $18. If the simple interest accumulated on the sum after two years is $180, what is the rate of interest at which the sum of money was invested?

(A) 36%
(B) 30%
(C) 25%
(D) 20%
(E) 10%

122. Andrew borrows equal sums of money under simple interest at 5% and 4% rate of interest. He finds that if he repays the former sum on a certain date six months before the latter, he will have to pay the same amount of $1100 in each case. What is the total sum that he had borrowed?

(A) $750
(B) $1000
(C) $1500
(D) $2000
(E) $4000

123. A total of $10,000 was invested in two certificates of deposit at simple annual interest rates of 6 percent and 8 percent, respectively. If the total interest on the two certificates was $720 at the end of one year, what fractional part of the 10,000 was invested at the higher rate?

(A) $\frac{3}{8}$
(B) $\frac{2}{5}$
(C) $\frac{1}{2}$
(D) $\frac{3}{5}$
(E) $\frac{3}{4}$

124. In 2005, 45 percent of a document storage facility's 60 customers were banks, and in 2007, 25 percent of its 144 customers were banks. What was the simple annual percent growth rate in the number of bank customers the facility had?

(A) 11.1%
(B) 16.6%
(C) 25.0%
(D) 33.3%
(E) 58.3%

125. A basket contains five apples, of which one is spoiled and the rest are good. If Henry is to select two apples from the basket simultaneously and at random, what is the probability that the two apples selected will include the spoiled apple?

(A) $\frac{1}{20}$
(B) $\frac{1}{10}$
(C) $\frac{1}{5}$
(D) $\frac{2}{5}$
(E) $\frac{3}{5}$

126. At the start of an experiment, a certain population consisted of x organisms. At the end of each month after the start of the experiment, the population size increased by twice of its size at the beginning of that month. If the total population at the end of five months is greater than 1000, what is the minimum possible value of x?

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

127. At the end of each year, the value of a certain antique watch is c percent more than its value one year earlier, where c has the same value each year. If the value of the watch was k dollars on January 1, 1992, and m dollars on January 1, 1994, then in terms of m and k, what was the value of the watch, in dollars, on January 1, 1995?

(A) $m + \frac{1}{2}(m - k)$
(B) $m + \frac{1}{2}\left(\frac{m-k}{k}\right)m$
(C) $\frac{m\sqrt{m}}{\sqrt{k}}$
(D) $\frac{m^2}{2k}$
(E) km^2

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

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

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

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

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

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

129. The compound interest on a certain sum of money invested at a certain rate of interest in the 2^{nd} year and in the 3^{rd} year was \$600 and \$720 respectively. What was the rate of interest at which the sum of money was invested?

(A) 12.0%

(B) 12.5%

(C) 15.0%

(D) 20.0%

(E) 25.0%

2.10 Functions

130. If the function f is defined by $f(x) = x^2 + \frac{1}{x^2}$ for all non-zero numbers x, then $\left(f\left(-\frac{1}{\sqrt{x}}\right)\right)^2 =$

(A) $\frac{2}{f(x^2)}$

(B) $\left(\frac{1}{f(\sqrt{x})}\right)^2$

(C) $1 - (f(\sqrt{x}))^2$

(D) $f(x) - 2$

(E) $f(x) + 2$

131. The function f is defined by $f(x) = -\frac{1}{x}$ for all non-zero numbers x. If $f(a) = -\frac{1}{2}$ and $f(ab) = \frac{1}{6}$, then $b =$

(A) 3

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

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

(D) -3

(E) -12

132. 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) $\sqrt{u + 10}$

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

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

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

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

133. The function f is defined for each positive three-digit integer n by $f(n) = 2^x 3^y 5^z$, where x, y and z are the hundreds', tens and unit digits of n, respectively. If m and v are three-digit positive integers such that $f(m) = 9f(v)$, then $m - v =$

(A) 8

(B) 9

(C) 18

(D) 20

(E) 80

134. For which of the following functions f, is $f(x) = f(1 - x)$ for all x?

(A) $f(x) = 1 - x$

(B) $f(x) = 1 - x^2$

(C) $f(x) = x^2 - (1-x)^2$

(D) $f(x) = x^2(1-x)^2$

(E) $f(x) = \dfrac{x}{1-x}$

135. If $f(x) = \dfrac{1}{x}$ and $g(x) = \dfrac{x}{x^2+1}$, for all $x > 0$, what is the minimum value of $f(g(x))$?

(A) 0

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

(C) 1

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

(E) 2

136. If $P(r) = \dfrac{8r}{1-r}$, for what value of r does $P(r) = \dfrac{1}{2}P(3)$?

(A) 6

(B) 3

(C) 0

(D) -3

(E) -6

137. If $3f(x) + 2f(-x) = 5x - 10$, what is the value of $f(1)$?

(A) 0

(B) 1

(C) 2

(D) 3

(E) 4

2.11 Permutation & Combination & Probability

138. $C_n^m = \frac{m!}{(m-n)!.n!}$ for non-negative integers m and n, $m \geq n$. If $C_3^5 = C_x^5$ and $x \neq 3$, what is the value of x?

(A) 0
(B) 1
(C) 2
(D) 4
(E) 5

139. A "code" is defined as a sequence of three dots arranged in a row. Each dot is colored either "yellow" or "blue". How many distinct codes can be formed?

(A) 3
(B) 5
(C) 6
(D) 8
(E) 9

140. A certain office supply store stocks two sizes of self-stick notepads, each in four colors: blue, green, yellow and pink. The store packs the notepads in packages that contain either three notepads of the same size and the same color or three notepads of the same size and of three different colors. If the order in which the colors are packed is not considered, how many different packages of the types described above are possible?

(A) 6
(B) 8
(C) 16
(D) 24
(E) 32

141. A certain restaurant offers six kinds of cheese and two kinds of fruit for its dessert platter. If each dessert platter contains an equal number of kinds of cheese and an equal number of kinds of fruits, how many different dessert platters could the restaurant offer?

(A) 8
(B) 12
(C) 15
(D) 21
(E) 27

142. A certain stock exchange designates each stock with a one, two or three-letter code, where each letter is selected from the 26 letters of the alphabet. If the letters may be repeated and if the same letters used in a different order constitute a different code, how many different stocks is it possible to uniquely designate with these codes?

(A) 2951

(B) 8125

(C) 15600

(D) 16302

(E) 18278

143. A certain university will select one of seven candidates eligible to fill a position in the Mathematics department and two of ten candidates eligible to fill two identical positions in the Computer Science department. If none of the candidates is eligible for a position in both departments, how many different sets of three candidates are there to fill the three positions?

(A) 42

(B) 70

(C) 140

(D) 165

(E) 315

144. A company has assigned a distinct three-digit code number to each of its 330 employees. Each code number was formed from the digits 2, 3, 4, 5, 6, 7, 8, 9 and no digit appears more than once in any one code number. How many unassigned code numbers are there?

(A) 6

(B) 58

(C) 174

(D) 182

(E) 399

145. A company plans to assign identification numbers to its employees. Each number is to consist of four different digits from 0 to 9, inclusive, except that the first digit cannot be 0. If any digit can be repeated any number of times in a particular code, how many different identification numbers are possible that are odd numbers?

(A) 2520

(B) 2268

(C) 3240

(D) 4500

(E) 9000

146. A fast-food company plans to build four new restaurants. If there are six sites A, B, C, D, E and F, that satisfy the company's criteria for location of the new restaurants, in how many different ways can the company select the four sites if the order of selection does not matter, given that both the sites A and B cannot be selected simultaneously?

(A) 4

(B) 5

(C) 6

(D) 9

(E) 15

147. A photographer wants to arrange 6 men of 6 different heights for a photograph by placing them in two rows of three so that each man in the first row is standing in front of someone in the second row. The heights of the men within each row must increase from left to right, and each man in the second row must be taller than the man standing in front of him. How many such arrangements of the 6 men are possible?

(A) 5
(B) 6
(C) 9
(D) 24
(E) 36

148. 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 alphabetic 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

149. Departments A, B, and C have 10 employees each, and department D has 20 employees. Departments A, B, C, and D have no employees in common. A task force is to be formed by selecting 1 employee from each of departments A, B, and C and 2 employees from department D. How many different task forces are possible?

(A) 19,000
(B) 40,000
(C) 100,000
(D) 190,000
(E) 400,000

150. An analyst will recommend a combination of 3 industrial stocks, 2 transportation stocks, and 2 utility stocks. If the analyst can choose from 5 industrial stocks, 4 transportation stocks, and 3 utility stocks, how many different combinations of 7 stocks are possible?

(A) 12
(B) 19
(C) 60
(D) 180
(E) 720

151. In a meeting of 3 representatives from each of 6 different companies, each representative shook hands with every person other than those from his or her own company. How many handshakes took place in the meeting?

(A) 45

(B) 135
(C) 144
(D) 270
(E) 288

152. A three-digit code for certain logs uses the digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 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. If the digits may be repeated in the same code, how many different codes are possible?

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

153. A box contains exactly 24 balls, of which 12 are red and 12 are blue. If two balls are to be picked from this box at random and without replacement, what is the probability that both balls will be red?

(A) $\frac{11}{46}$
(B) $\frac{1}{4}$
(C) $\frac{5}{12}$
(D) $\frac{17}{40}$
(E) $\frac{19}{40}$

154. A certain basket contains 10 apples, seven of which are red and three of which are green. If three different apples are to be selected at random from the basket, what is the probability that two of the apples selected will be red and one will be green?

(A) $\frac{7}{40}$
(B) $\frac{7}{20}$
(C) $\frac{49}{100}$
(D) $\frac{21}{40}$
(E) $\frac{7}{10}$

155. 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%

156. A certain club has 20 members. What is the ratio of number of 5-member committees that can be formed from the members of the club to the number of 4-member committees that can be formed from the members of the club?

(A) 16 to 1
(B) 15 to 1
(C) 16 to 5
(D) 15 to 6
(E) 5 to 4

157. A certain company assigns employees to offices in such a way that some of the offices can be empty and more than one employee can be assigned to an office. In how many ways can the company assign three employees to two different offices?

(A) 5
(B) 6
(C) 7
(D) 8
(E) 9

158. A certain company employs six senior officers and four junior officers. If a committee is to be created that is made up of three senior officers and one junior officer, how many different committees are possible?

(A) 8
(B) 24
(C) 58
(D) 80
(E) 210

159. A certain company expects quarterly earnings of \$0.80 per share of stock, half of which will be distributed as dividends to shareholders while the rest will be used for research and development. If earnings are greater than expected, shareholders will receive an additional \$0.04 per share for each additional \$0.10 of per share earnings. If quarterly earnings are \$1.10 per share, what will be the dividend paid to a person who owns 200 shares of the company's stock?

(A) \$92
(B) \$96
(C) \$104
(D) \$120
(E) \$240

160. A certain company sold 800 units of its product for \$8 each and 1,000 units of its product for \$5 each. If the company's cost of producing each unit of its product was \$6, what was the company's profit or loss on the 1,800 units of its product?

(A) \$1,600

(B) \$600 loss

(C) No profit or loss

(D) \$600 profit

(E) \$1,600 profit

161. A certain company that sells only cars and trucks reported that revenues from car sales in 1997 were down 11 percent from 1996 and revenues from truck sales in 1997 were up 7 percent from 1996. If total revenues from car sales and truck sales in 1997 were up 1 percent from 1996, what is the ratio of revenue from car sales in 1996 to revenue from truck sales in 1996?

(A) 1:2

(B) 4:5

(C) 1:1

(D) 3:2

(E) 5:3

162. A certain company's profit in 1996 was 15 percent greater than its profit in 1995, and its profit in 1997 was 20 percent greater than its profit in 1996. The company's profit in 1997 was what percent greater than its profit in 1995?

(A) 5%

(B) 18%

(C) 33%

(D) 35%

(E) 38%

163. A certain computer program generates a sequence of numbers $a_1, a_2, \ldots a_n$ such that $a_1 = a_2 = 1$ and $a_k = a_{(k-1)} + 2a_{(k-2)}$ for all integers k such that $3 \leq k \leq n$. If $n > 6$, then $a_7 =$

(A) 32

(B) 43

(C) 64

(D) 100

(E) 128

164. If the probability that stock A will increase in value during the next month is 0.54 and the probability that stock B will increase in value during the next month is 0.38, what is the approximate probability that exactly one of stock A and stock B would increase in value during the next month? It is known that price fluctuations of stock A in no way affect the price fluctuations of stock B.

(A) 0.21

(B) 0.29

(C) 0.51

(D) 0.73

(E) 0.92

165. A coin that is tossed will land heads or tails, and each outcome has equal probability. What is the probability that the coin will land heads at least once on two tosses?

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

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

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

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

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

166. A contest will consist of n questions, each of which is to be answered either “True" or “False.” Anyone who answers all n questions correctly will be a winner. What is the least value of n for which the probability is less than $\frac{1}{1000}$, that a person who randomly guesses the answer to each question will be a winner?

(A) 5

(B) 10

(C) 50

(D) 100

(E) 1000

167. A gum ball dispenser has 24 gum balls – 12 white and 12 black, which are dispensed at random. If the first three gum balls dispensed are black, what is the probability that the next two gum balls dispensed will also be black?

(A) $\frac{6}{35}$

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

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

(D) $\frac{3}{7}$

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

168. A jar contains 16 marbles, of which 4 are red, 3 are blue, and the rest are yellow. If 2 marbles are to be selected at random from the jar, one at a time without being replaced, what is the probability that one marble selected will be red and the other marble selected will be blue?

(A) $\frac{3}{64}$

(B) $\frac{1}{20}$

(C) $\frac{1}{10}$

(D) $\frac{1}{8}$

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

169. A shipment of eight television sets contains two LCD sets and six LED sets. If two television sets are to be chosen at random from this shipment, what is the probability that at least one of the two sets chosen will be a LCD set?

(A) $\frac{1}{7}$

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

(C) $\frac{5}{14}$

(D) $\frac{13}{28}$

(E) $\frac{15}{28}$

170. In a stack of cards, 9 cards are blue and the rest are red. If 2 cards are to be chosen at random from the stack without replacement, the probability that the cards chosen will both be blue is $\frac{6}{11}$. What is the number of cards in the stack?

(A) 10

(B) 11

(C) 12

(D) 15

(E) 18

171. A string of 10 light bulbs is wired in such a way that if any individual light bulb fails, the entire string fails. If for each individual light bulb the probability of failing during time period T is 0.06, what is the probability that the string of light bulbs will fail during time period T?

(A) 0.06^{10}

(B) 0.06

(C) $1 - 0.94^{10}$

(D) 0.94^{10}

(E) $1 - 0.06^{10}$

172. 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) $\frac{1}{6}$

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

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

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

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

173. 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) $\frac{1}{6}$

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

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

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

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

2.12 Sets

174. A club with a total membership of 30 has formed committees, M, S, and R, which have 8, 12, and 5 members, respectively. If no member of the committee M is on either of the other two committees, what is the greatest possible number of members in the club who are on none of the committees?

(A) 5
(B) 7
(C) 8
(D) 10
(E) 12

175. In each production lot for a certain toy, 25 percent of the toys are red and 75 percent of the toys are blue. Half the toys are size A and half are size B. If 10 out of a lot of 100 toys are red and size A, how many of the toys are blue and size B?

(A) 15
(B) 25
(C) 30
(D) 35
(E) 40

176. In an isosceles triangle PQR, if the measure of angle P is 80^o, which of the following could be the measure of angle R ?

I. 20^o
II. 50^o
III. 80^o

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

177. According to a survey, 7 percent of teenagers have not used a computer to play games, 11 percent have not used a computer to write reports, and 95 percent have used a computer for at least one of the above purposes. What percent of the teenagers in the survey have used a computer both to play games and to write reports?

(A) 13%
(B) 56%
(C) 77%
(D) 87%
(E) 91%

178. In a survey, 2000 executives were each asked whether they read newsletter A or newsletter B. According to the survey, 55 percent of the executives read newsletter A,

62 percent read newsletter B, and 37 percent read both newsletter A and newsletter B. How many of the executives surveyed read at most one among newsletter A and newsletter B?

(A) 1600

(B) 1260

(C) 900

(D) 860

(E) 760

179. In a certain region, the number of children who have been vaccinated against rubella is twice the number of children who have been vaccinated against mumps. The number of children who have been vaccinated against both is twice the number of children who have been vaccinated only against mumps. If 5,000 have been vaccinated against both, how many have been vaccinated only against rubella?

(A) 2500

(B) 7500

(C) 10000

(D) 15000

(E) 17500

2.13 Statistics & Data Interpretation

180. 150, 200, 250, n: (not in order)

Which of the following could be the median of the four integers listed above (not in order)?

I. 175
II. 215
III. 235

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

181. 40, 45, 50, 55, 60, 75, 75, 100, 100, 100

The list above shows the scores of ten schoolchildren on a certain test. If the standard deviation of the ten scores is 22.4, rounded to the nearest tenth, how many of the scores are more than 1 standard deviation below the mean of the ten scores?

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

182. A certain list consists of 21 different numbers. If n is a number in the list and is four times the average (arithmetic mean) of the other 20 numbers in the list, then n is what fraction of the sum of the 21 numbers in the list?

(A) $\frac{1}{20}$
(B) $\frac{1}{6}$
(C) $\frac{4}{21}$
(D) $\frac{1}{5}$
(E) $\frac{5}{21}$

183. If the average (arithmetic mean) of 3, 8 and w is greater than or equal to w and smaller than or equal to $3w$, how many integer values of w exist?

(A) 5
(B) 4
(C) 3

(D) 2

(E) 1

184. If the average (arithmetic mean) of five distinct positive integers is 10, what is the least possible value of the greatest of the five numbers?

(A) 11

(B) 12

(C) 24

(D) 40

(E) 46

185. If the average (arithmetic mean) of x, y and 20 is 10 greater than the average of x, y, 20 and 30, what is the average of x and y?

(A) 40

(B) 45

(C) 60

(D) 75

(E) 95

186. A set of 15 different integers has a median of 30 and a range of 30. What is the greatest possible integer that could be in this set?

(A) 42

(B) 47

(C) 50

(D) 53

(E) 60

187. The mean of the set of the positive integers $\{4, 4, 5, 5, 6, x\}$ is $\frac{x^2}{2}$. What is the range of the above set of integers?

(A) 1

(B) 2

(C) 3

(D) 4

(E) 5

188. Company A has a total of n employees, where n is an odd integer, and no two employees have the same annual salary. The annual salaries of the n employees are listed in increasing order, and the 16^{th} salary in the list is the median of the annual salaries. If the sum of the annual salaries of Company A's employees is \$942,400, what is the average (arithmetic mean) of the annual salaries of Company A's employees?

(A) \$29450

(B) \$30400

(C) \$32500

(D) $47120

(E) $58900

189.

Time	Amount of bacteria
1:00 pm	10.0 grams
4:00 pm	x grams
7:00 pm	14.4 grams

Data for a certain biology experiment are given in the table above. If the amount of bacteria present increased by the same fraction during each of the two 3-hour periods shown, how many grams of bacteria were present at 4:00 pm?

(A) 12.0

(B) 12.1

(C) 12.2

(D) 12.3

(E) 12.4

190. According to the table given below, the number of fellows was approximately what percent of the total membership of organization X?

Membership of an Organization X, 2008	
Honorary members	78
Fellows	9209
Members	35509
Associate members	27909
Affiliates	2372

(A) 9%

(B) 12%

(C) 18%

(D) 25%

(E) 35%

191. According to the table below, what was the approximate average number of watts of electricity used per hour per appliance in the household on May 1?

Electricity usage in a certain household on May 1		
Appliance	Number of hours in use	Number of watts of electricity used per hour
TV	4	145
Computer	3	155
VCR	2	45
Stereo	2	109

(A) 31
(B) 74
(C) 123
(D) 281
(E) 338

2.14 Linear Equations

192. A cashier mentally reversed the digits of one customer's correct amount of change and thus gave the customer an incorrect amount of change. If the cash register contained 45 cents more than it should have as a result of this error, which of the following could have been the correct amount of change in cents?

(A) 14
(B) 45
(C) 54
(D) 65
(E) 83

193. A certain business produced x rakes each month from November through February and shipped $\frac{x}{2}$ rakes at the beginning of each month from March through October. The business paid no storage costs for the rakes from November through February, but it paid storage costs of \$0.10 per rake each month from March through October for the rakes that had not been shipped. In terms of x, what was the total storage cost, in dollars, that the business paid for the rakes for the 12 months from November through October?

(A) $0.4x$
(B) $1.2x$
(C) $1.4x$
(D) $1.6x$
(E) $3.2x$

194. 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 is the total number of apples and bananas did the customer purchase? The customer purchased at least one of both the fruits.

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

195. If $x + y + z = 2$, and $x + 2y + 3z = 6$ and $y \neq 0$, then what is the value of $\left(\frac{x}{y}\right)$?

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

196. An optometrist charges $150 per pair for soft contact lenses and $85 per pair for hard contact lenses. Last week she sold five more pairs of soft lenses than hard lenses. If her total sales for pairs of contact lenses last week were $1690, what was the total number of pairs of contact lenses that she sold?

(A) 11

(B) 13

(C) 15

(D) 17

(E) 19

2.15 Quadratic Equations & Polynomials

197. If $x \geq 0$ and $x = \sqrt{8xy - 16y^2}$, then in terms of y, $x =$

(A) $-4y$

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

(C) y

(D) $4y$

(E) $4y^2$

198. What is the difference between the maximum and the minimum value of $\left(\frac{x}{y}\right)$ for which $(x-2)^2 = 9$ and $(y-3)^2 = 25$?

(A) $-\frac{15}{8}$

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

(C) $\frac{9}{8}$

(D) $\frac{19}{8}$

(E) $\frac{25}{8}$

199. If x and y are positive integers and $2x + 3y + xy = 12$, what is the value of $(x + y)$?

(A) 2

(B) 4

(C) 5

(D) 6

(E) 8

200. An object thrown directly upward is at a height of h feet, t seconds after it was thrown, where $h = -16(t-3)^2 + 150$. What is the height of the object now once it reached its maximum height and descended for 2 seconds?

(A) 6 feet

(B) 86 feet

(C) 134 feet

(D) 150 feet

(E) 214 feet

201. 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 $0 \leq t \leq 10$. 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

2.16 Inequalities

202. Bill's school is 10 miles from his home. He travels 4 miles from school to football practice, and then 2 miles to a friend's house. If he is then x miles from home, what is the range of possible values for x?

(A) $2 \le x \le 10$
(B) $4 \le x \le 10$
(C) $4 \le x \le 12$
(D) $4 \le x \le 16$
(E) $6 \le x \le 16$

203. $2x + y = 12$ $|y| \le 12$

For how many ordered pairs (x, y) that are solutions of the above system such that x and y both are integers?

(A) 7
(B) 10
(C) 12
(D) 13
(E) 14

204. If the cost of 12 eggs varies between \$0.90 and \$1.20, and the cost of 5 sandwiches varies between \$10 and \$15, then the cost of 4 eggs and 3 sandwiches varies between

(A) \$2.15 and \$3.20
(B) \$2.30 and \$3.40
(C) \$6.40 and \$9.30
(D) \$6.30 and \$9.40
(E) \$9.30 and \$12.40

205. If $x < 0$ and $0 < y < 1$, which of the following has the greatest value?

(A) x^2
(B) $(xy)^2$
(C) $\left(\frac{x}{y}\right)^2$
(D) $\frac{x^2}{y}$
(E) x^2y

206. Anne traveled from City A to City B in 4 hours, and her speed was between 25 miles per hour and 45 miles per hour. John also traveled from City A to City B along the same route in 2 hours, and his speed was between 45 miles per hour and 60 miles per hour. Which of the following could be the distance, in miles, from City A to City B?

(A) 95

(B) 115
(C) 125
(D) 160
(E) 180

2.17 Geometry–Lines & Triangles

207. If each of the two lines l and m are parallel to line n, which of the following MUST be correct?

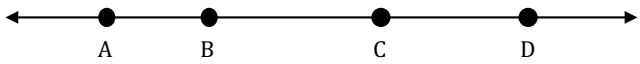
I. Lines l, m and n lie in the same plane.

II. Lines l and m are parallel to one another.

III. Line l is the same as line m.

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

208. On the line segment AD shown below, AB $= \frac{1}{2}$CD and BD $= \frac{3}{2}$AC. If BC = 24, then AD =



(A) 24
(B) 48
(C) 72
(D) 96
(E) 120

209. R, S, T, and U are points on a line, and U is the midpoint of line segment ST. If the lengths of line segments RS, RT, and ST are 20, 4, and 16, respectively, what is the length of line segment RU?

(A) 6
(B) 8
(C) 12
(D) 14
(E) 16

210. A cash register in a certain clothing store is the same distance from two dressing rooms in the store. The distance between the two dressing rooms is 16 feet, which of the following could be the distance between the cash register and either dressing room?

I. 6 feet
II. 12 feet
III. 24 feet

(A) I only
(B) II only
(C) III only

(D) I and II

(E) II and III

211. A certain right triangle has sides of length x, y and z, where $x < y < z$. If the area of this triangular region is 1, which of the following indicates all of the possible values of y?

(A) $y > \sqrt{2}$

(B) $\frac{\sqrt{3}}{2} < y < \sqrt{2}$

(C) $\frac{\sqrt{2}}{3} < y < \frac{\sqrt{3}}{2}$

(D) $\frac{\sqrt{3}}{4} < y < \frac{\sqrt{2}}{3}$

(E) $y < \frac{\sqrt{3}}{4}$

212. A certain right triangle has sides of length x, y and z, where $x < y < z$. If the area of this triangular region is 1, which of the following indicates all of the possible values of z?

(A) $z > 2$

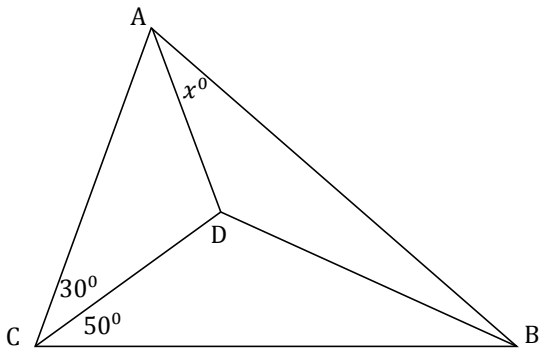
(B) $\sqrt{2} < z < 2$

(C) $\sqrt{2} < z < \sqrt{3}$

(D) $1 < z < \sqrt{2}$

(E) $z < 1$

213. In the figure below, DA = DB = DC. What is the value of x?



(A) 10

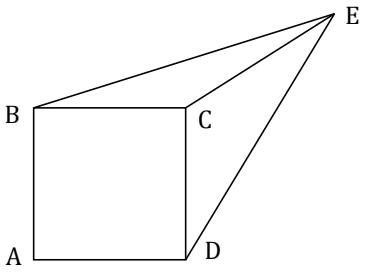
(B) 20

(C) 30

(D) 40

(E) 50

214. In the figure below, each side of square ABCD has length 1, the length of line segment CE is 1, and the length of line segment BE is equal to the length of line segment DE. What is the area of the triangular region BCE?



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

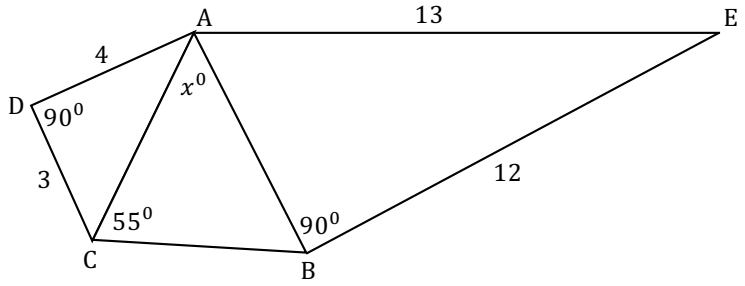
(B) $\frac{\sqrt{2}}{4}$

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

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

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

215. In the figure shown below, what is the value of x?



(A) 55

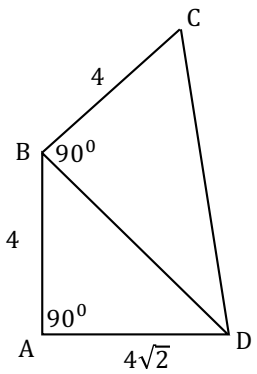
(B) 60

(C) 65

(D) 70

(E) 75

216. In the figure below, what is the perimeter of triangle BCD?



(A) $4 + 4\sqrt{3}$

(B) 12

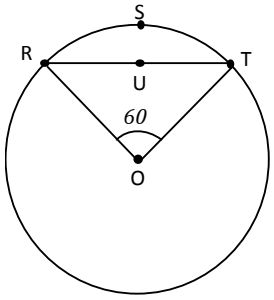
(C) $12 + 4\sqrt{3}$

(D) $8 + 8\sqrt{3}$

(E) $16\sqrt{2}$

2.18 Geometry–Circles

217. If the circle below has centre O and length of the arc RST is 18π, what is the perimeter of the region RSTU?



(A) $12\pi + 18$

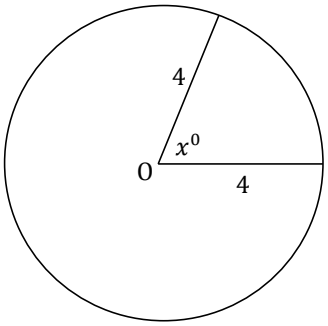
(B) $12\pi + 27$

(C) $18\pi + 27$

(D) $18\pi + 54$

(E) $18\pi + 108$

218. In the figure below, O is the center of the circle. If the area of the sector containing the angle x^o is 2π, what is the value of x?



(A) 22.5

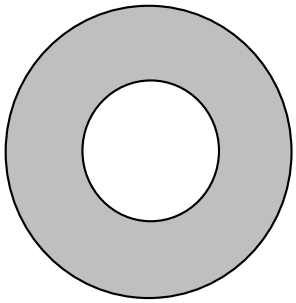
(B) 30.0

(C) 45.0

(D) 60.0

(E) 90.0

219. In the figure shown below, 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

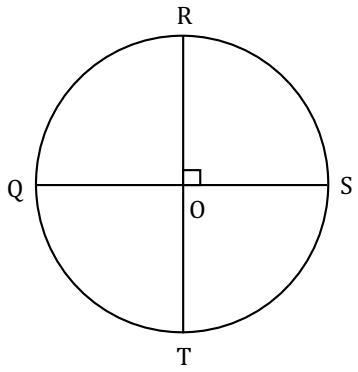
(B) 3

(C) 2

(D) $\sqrt{3}$

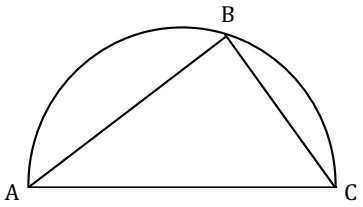
(E) $\sqrt{2}$

220. In the figure shown below, line segments QS and RT are diameters of the circle. If the distance between Q and R is $\frac{8}{\sqrt{2}}$, what is the area of the circle?



(A) 4π
(B) 8π
(C) 16π
(D) 32π
(E) 64π

221. In the figure shown below, the triangle ABC is inscribed in a 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

222. An equilateral triangle that has an area of $9\sqrt{3}$ is inscribed in a circle. What is the area of the circle?

(A) 6π
(B) 9π
(C) 12π
(D) $9\sqrt{3}\pi$
(E) $18\sqrt{3}\pi$

2.19 Geometry–Polygon

223. A circular mat with diameter 20 inches is placed on a square tabletop, having its sides equal to 24 inches. Which of the following is closest to the fraction of the tabletop NOT covered by the mat?

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

(B) $\frac{3}{5}$

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

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

(E) $\frac{9}{20}$

224. Rectangular floors having perimeter of 16 meters are to be covered with carpet squares that measure 1 meter by 1 meter each, costing \$6 apiece. What is the maximum possible cost for the number of carpet squares needed to cover any such rectangular floor if the sides of the floors are integers?

(A) \$42

(B) \$72

(C) \$90

(D) \$96

(E) \$120

225. A rectangular photograph is surrounded by a border that is 1 inch wide on each side. The total area of the photograph and the border is m square inches. If the border had been 2 inches wide on each side, the total area would have been $(m + 52)$ square inches. What is the perimeter of the photograph, in inches?

(A) 34

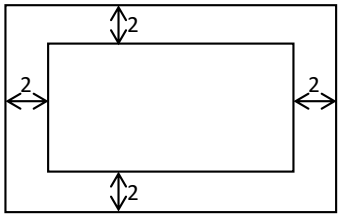
(B) 36

(C) 38

(D) 40

(E) 42

226. A rectangular picture is surrounded by a border, as shown in the figure below. Without the border, the length of the picture is twice its width. If the area of the border is 196 square inches, what is the length, in inches, of the picture, excluding the border?



(A) 10

(B) 15

(C) 30

(D) 40

(E) 60

227. Two brothers inherited a rectangular field of dimension 80 feet by 120 feet. If they decide to split the land into two equal rectangles, then what is the minimum cost required to fence one such half at the rate of $2 per feet?

(A) $240

(B) $280

(C) $320

(D) $560

(E) $640

228. A rectangular park has a perimeter of 560 feet and a diagonal measurement of 200 feet. What is its area, in square feet?

(A) 19200

(B) 19600

(C) 20000

(D) 20400

(E) 20800

229. A solid yellow stripe is to be painted in the middle of a certain highway. If 1 gallon of paint covers an area of p square feet of highway, how many gallons of paint will be needed to paint a stripe t inches wide on a stretch of highway m miles long? (1 mile = 5,280 feet, and 1 foot = 12 inches)

(A) $\frac{5280mt}{12p}$

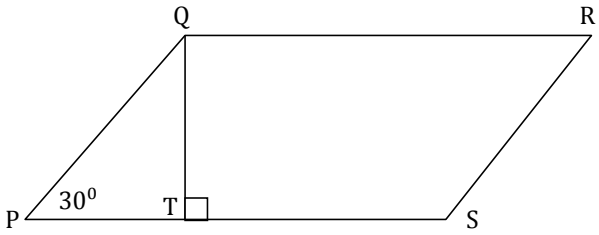
(B) $\frac{5280pt}{12m}$

(C) $\frac{5280mpt}{12}$

(D) $\frac{5280 * 12m}{pt}$

(E) $\frac{5280 * 12p}{mt}$

230. In the parallelogram PQRS shown below, if PQ = 4 and QR = 6, what is the area of PQRS?



(A) 8

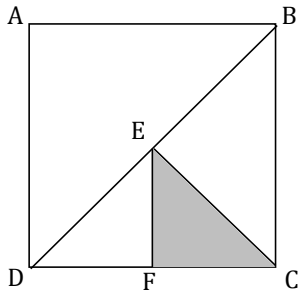
(B) 12

(C) 24

(D) $8\sqrt{3}$

(E) $12\sqrt{3}$

231.



In square ABCD above, if DE = EB and DF = FC, then the area of the shaded region is what fraction of the area of square region ABCD?

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

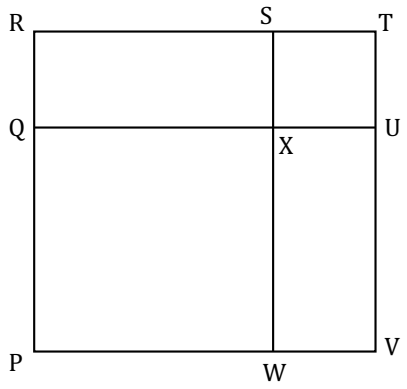
(B) $\frac{1}{8}$

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

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

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

232. In the figure shown below, the area of square region PRTV is 81, and the ratio of the area of square region XSTU to the area of square region PQXW is 1 to 4. What is the length of segment RS?



(A) 5.0

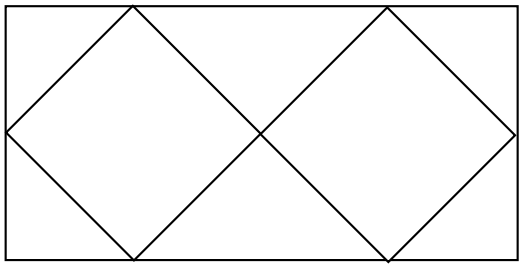
(B) 5.5

(C) 6.0

(D) 6.5

(E) 7.0

233.



In the figure above, two identical squares are inscribed in the rectangle. If the perimeter of the rectangle is $18\sqrt{2}$, then what is the perimeter of each square?

(A) $8\sqrt{2}$

(B) 12

(C) 16

(D) $12\sqrt{2}$

(E) 18

234. A certain number of desks and bookshelves, at least one each, are to be placed along a library wall that is 16 meters long. Each desk is 2 meters long, and each bookshelf is 1.5 meters long. If the maximum possible number of desks and bookshelves are to be placed along the wall, then the space along the wall that is left over will be how many meters long?

(A) 0.5

(B) 1.0

(C) 1.5

(D) 2.0

(E) 3.0

235. A thin piece of wire 40 meters long is cut into two pieces. One piece is used to form a circle with radius r, and the other is used to form a square. If no wire is left over, which of the following represents the total area, in square meters, of the circular and the square regions in terms of r?

(A) πr^2

(B) $\pi r^2 + 10$

(C) $\pi r^2 + \frac{1}{4}\pi^2 r^2$

(D) $\pi r^2 + (40 - 2\pi r)^2$

(E) $\pi r^2 + \left(10 - \frac{1}{2}\pi r\right)^2$

2.20 Geometry–3 Dimensional

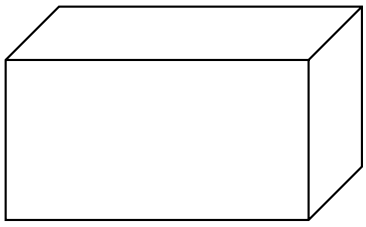
236. A certain right circular cylinder has a radius of 5 inches. A certain quantity of liquid fills this cylinder to a height of 9 inches. When all of this liquid is poured into a second right circular cylinder, the liquid fills the second cylinder to a height of 4 inches. What is the radius of the second cylinder, in inches?

(A) 6.0
(B) 6.5
(C) 7.0
(D) 7.5
(E) 8.0

237. A circular rim 28 inches in diameter rotates the same number of inches per second as a circular rim 35 inches in diameter. If the smaller rim makes x revolutions per second, how many revolutions per minute does the larger rim make in terms of x?

(A) $\frac{48\pi}{x}$
(B) $75x$
(C) $48x$
(D) $24x$
(E) $\frac{x}{75\pi}$

238. In the rectangular solid below, the three faces shown have areas 12, 15, and 20. What is the volume of the solid?



(A) 60
(B) 120
(C) 450
(D) 1800
(E) 3600

239. 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) $\sqrt[3]{\frac{2}{3}x}$
(C) $\sqrt[3]{\frac{3}{2}x}$

(D) $\frac{2}{3}\sqrt[3]{x}$

(E) $\frac{3}{2}\sqrt[3]{x}$

240. Two oil cans, X and Y, are right circular cylinders, and the height and the radius of Y are each twice those of X. If the oil in can X, which is filled to capacity, sells for \$2, then at the same rate, how much does the oil in can Y sell for, if Y is filled to only half its capacity?

(A) \$1

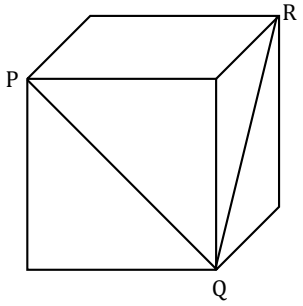
(B) \$2

(C) \$4

(D) \$8

(E) \$16

241. For the cube shown below, what is the degree measure of $\angle$PQR?



(A) 30^o

(B) 45^o

(C) 60^o

(D) 75^o

(E) 90^o

242. A solid cube is placed in a cylindrical container. Which of the following percent values COULD possibly represent the ratio of the volume of the cylinder not occupied by the cube to the volume of the cylinder? (Assume the value of π to be 3)

(A) 16%

(B) 25%

(C) 28%

(D) 32%

(E) 36%

2.21 Co-ordinate geometry

243. In the coordinate plane, a diameter of a circle has the end points $(-3, -6)$ and $(5, 0)$. What is the area of the circle?

(A) 5π

(B) $10\sqrt{2}\pi$

(C) 25π

(D) 50π

(E) 100π

244. A straight line in the XY-plane has a slope of 2 and a Y-intercept of 2. On this line, what is the X-coordinate of the point whose Y-coordinate is 500?

(A) 249

(B) 498

(C) 676

(D) 823

(E) 1002

245. In the XY-plane, a line n passes through the origin and has a slope 4. If points $(1, c)$ and $(d, 2)$ are on the line n, what is the value of $\frac{c}{d}$?

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

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

(C) 2

(D) 4

(E) 8

246. In the XY-plane, the point $(-2, -3)$ is the center of a circle. The point $(-2, 1)$ lies inside the circle and the point $(4, -3)$ lies outside the circle. If the radius of the circle is an integer, then what is the value of r?

(A) 6

(B) 5

(C) 4

(D) 3

(E) 2

247. In the XY-plane, the points (c, d), $(c, -d)$ and $(-c, -d)$ are three vertices of a certain square. If $c < 0$ and $d > 0$, which of the following points is in the same quadrant as the fourth vertex of the square?

(A) $(-5, -3)$

(B) $(-5, 3)$

(C) $(5, -3)$

(D) $(3, -5)$

(E) $(3,\ 5)$

248. In the XY-plane, the vertices of a triangle have coordinates $(0,\ 0)$, $(3,\ 3)$ and $(7,\ 0)$. What is the perimeter of the triangle?

(A) $\sqrt{34}$

(B) $\sqrt{43}$

(C) 13

(D) $7 + 6\sqrt{2}$

(E) $12 + 3\sqrt{2}$

249. If the points $(a, 0)$, $(0, b)$ and $(1,\ 1)$ are collinear, what is the value of $\left(\frac{1}{a} + \frac{1}{b}\right)$?

(A) -1

(B) 0

(C) 1

(D) 2

(E) 3

250. In the XY-plane, what is the area of the triangle formed by the line $3y - 4x = 24$ and the X and Y axes?

(A) 6

(B) 14

(C) 24

(D) 36

(E) 48

Chapter 3

Data Sufficiency Question Bank

Data Sufficiency

For most of you, Data Sufficiency (DS) may be a new format. The DS format is very unique to the GMAT exam. The format is as follows: There is a question stem followed by two statements, labeled statement (1) and statement (2). These statements contain additional information.

Your task is to use the additional information from each statement alone to answer the question. If none of the statements alone helps you answer the question, you must use the information from both the statements together. There may be questions which cannot be answered even after combining the additional information given in both the statements. Based on this, the question always follows standard five options which are always in a fixed order.

(A) Statement (1) ALONE is sufficient, but statement (2) ALONE is not sufficient to answer the question asked.

(B) Statement (2) ALONE is sufficient, but statement (1) ALONE is not sufficient to answer the question asked.

(C) BOTH statements (1) and (2) TOGETHER are sufficient to answer the question asked, but NEITHER statement ALONE is sufficient to answer the question asked.

(D) EACH statement ALONE is sufficient to answer the question asked.

(E) Statements (1) and (2) TOGETHER are NOT sufficient to answer the question asked, and additional data specific to the problem are needed.

3.1 Numbers

251. For any positive integer x, the 2-height of x is defined to be the greatest non-negative integer n such that 2^n is factor of x. For example, the 2-height of 24 is 3 as 3 is the greatest exponent of 2 which is also a factor of 24. If k and m are positive integers, is the 2-height of k greater than the 2-height of m?

(1) $k > m$

(2) $\frac{k}{m}$ is an even integer

252. For each positive integer n, the integer $n^{\#}$ is defined by $n^{\#} = n^2 + 1$. What is the value of the positive integer k?

(1) When k is divided by 4, the remainder is 1

(2) $18 \leq k^{\#} \leq 36$

253. Harvey teaches a certain number of biology students in two classes, K and L. He can divide the students in class K into seven groups of n students each. However, if he divides the students in class L into six groups of p students each; one student will be left over. How many students are in class L?

(1) $n = p$

(2) There are five more students in class K than in class L

254. How many different positive factors does the integer n have?

(1) $n = a^4b^3$, where a and b are different positive prime numbers.

(2) The only positive prime numbers that are factors of n are 5 and 7.

255. If $\sqrt{x}$ is an integer, what is the value of $\sqrt{x}$?

(1) $11 < x < 17$

(2) $2 < \sqrt{x} < 5$

256. If $xy^{\left(\frac{4}{3}\right)} = \sqrt[3]{432}$, is $x + y = 5$?

(1) y is a positive integer.

(2) x is an integer.

257. If $xy \neq 0$, what is the value of $\frac{25x^2}{y^2}$?

(1) $x = 3$

(2) $5x - 2y = 0$

258. If $|m + 4| = 2$, what is the value of m?

(1) $m < 0$

(2) $m^2 + 8m + 12 = 0$

259. If $|n + 5| = 5$, what is the value of n?

(1) $n^2 \neq 0$
(2) $n^2 + 10n = 0$

260. If $1 < d < 2$, is the tenth's digit of the decimal representation of d equal to 9?

(1) $d + 0.01 < 2$
(2) $d + 0.05 > 2$

261. If a and b are integers, is b even?

(1) $3a + 4b$ is even.
(2) $3a + 5b$ is even.

262. If a, b, k and m are positive integers, is a^k a factor of b^m?

(1) a is a factor of b.
(2) $k \leq m$

263. If four of the five integers in a list are $10, -2, -8$, and 0, what is the fifth integer?

(1) The product of the five integers is 0.
(2) The sum of the given four integers divided by the fifth integer is 0.

264. If J, S and V are points on the number line, what is the distance between S and V?

(1) The distance between J and S is 20.
(2) The distance between J and V is 25.

265. If k is a positive integer, what is the remainder when 2^k is divided by 10?

(1) k is divisible by 10.
(2) k is divisible by 4.

266. If k, m, and p are integers, is $(k - m - p)$ odd?

(1) k and m are even and p is odd.
(2) k, m and p are consecutive integers.

267. If k, m and t are positive integers and $\frac{k}{6} + \frac{m}{4} = \frac{t}{12}$, do t and 12 have a common factor greater than 1?

(1) k is a multiple of 3.
(2) m is a multiple of 3.

268. If m and v are integers, what is the value of $(m + v)$?

(1) $mv = 6$
(2) $(m + v)^2 = 25$

269. If m is a positive integer, then what is the number of digits of m^3?

(1) m has three digits.
(2) m^2 has five digits.

270. If m, p and t are positive integers and $m < p < t$, is the product mpt an even integer?

(1) $t - p = p - m$
(2) $t - m = 16$

271. If $n = 3k$, is k an integer?

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

272. If n and k are positive integers, is $\frac{n}{k}$ an even integer?

(1) n is divisible by 8.
(2) k is divisible by 4.

273. If n and k are positive integers, is n divisible by 6?

(1) $n = k\,(k + 1)\,(k - 1)$
(2) $(k - 1)$ is a multiple of 3.

274. If n is a positive integer and r is the remainder when $(n - 1)\,(n + 1)$ is divided by 24, what is the value of r?

(1) 2 is not a factor of n.
(2) 3 is not a factor of n.

275. If n is a positive integer, is $(n^3 - n)$ divisible by 4?

(1) $n = 2k + 1$, where k is an integer.
(2) $(n^2 + n)$ is divisible by 6.

276. If n is a positive integer, is n odd?

(1) $3n$ is odd.
(2) $(n + 3)$ is even.

277. If n is a positive integer, what is the value of n?

(1) When n is divided by 3, the remainder is 2.
(2) When n^2 is divided by 3, the remainder is 1.

278. If n is a positive integer, what is the value of the hundreds' digit of 30^n?

(1) $30^n > 1000$.
(2) n is a multiple of 3.

279. If n is an integer and $100 < n < 200$, what is the value of n?

(1) $\frac{n}{36}$ is an odd integer.

(2) $\frac{n}{45}$ is an even integer.

280. If n is an integer and $2 < n < 6$, what is the value of n?

(1) n is a factor of 15.

(2) n is a factor of 21.

281. If n is an integer and $x^n - x^{-n} = 0$, what is the value of x?

(1) x is an integer.

(2) $n \neq 0$

282. If n is an integer between 10 and 99, is $n < 80$?

(1) The sum of the two digits of n is a prime number.

(2) Each of the two digits of n is a prime number.

283. If n is an integer, is $\frac{n}{7}$ an integer?

(1) $\frac{3n}{7}$ is an integer.

(2) $\frac{5n}{7}$ is an integer.

284. If n is an integer, is $10^n \leq 0.001$?

(1) $n \leq -2$

(2) $n > -5$

285. If p, r, s and t are non-zero integers, is $\frac{p}{r} = \frac{s}{t}$?

(1) $s = 3p$ and $t = 3r$

(2) $3p = 2r$ and $3s = 2t$

286. If p, s and t are positive prime numbers, what is the value of $p^3s^3t^3$?

(1) $p^3st = 728$

(2) $t = 13$

287. If the positive integer x is a multiple of 12 and the positive integer y is a multiple of 10, is x^2y a multiple of 216?

(1) x is a multiple of 8.

(2) y is a multiple of 6.

288. If q is a positive integer less than 17 and r is the remainder when 17 is divided by q, what is the value of r?

(1) $q > 10$
(2) $q = 2^k$, where k is a positive integer.

289. If $r > 0$, is $rs > 0$?

(1) $s \leq r$
(2) $s \geq r$

290. If r and s are integers, is r divisible by 7?

(1) The product rs is divisible by 49.
(2) s is divisible by 7.

291. If r and s are non-zero integers, is $\frac{r}{s}$ an integer?

(1) $r - 1 = (s + 1)(s - 1)$
(2) $r - s = 20$

292. If r and t are integers, what is the value of t?

(1) $t^{r-1} = 1$
(2) $r \neq 1$

293. If p is a constant and $a_{n-1} + a_n = pn(n - 1)$ for all positive integers n, what is the value of ?

(1) $a_{31} - a_{29} = 120$
(2) $a_2 = 6$

294. If R, S, &T are numbers on the number line, not necessarily in that order, is the value of $|R - T|$ at least 9?

(1) $|R - S| = 50$.
(2) $|S - T| = 41$.

295. If $r, s,$ &t are positive integers, is $(r + s + t)$ even?

(1) $(r + s)$ is even.
(2) $(s + t)$ is even.

296. If r, s, w are positive numbers such that $w = 60r + 80s$ and $r + s = 1$, is $w > 70$?

(1) $r > \frac{1}{2}$
(2) $r > s$

297. If S is a set of 10 consecutive integers, is the integer 5 present in S?

(1) The integer -3 is present in S.
(2) The integer 4 is present in S.

298. If the sequence S has 250 terms, what is the 243^{rd} term of S?

(1) The 242^{nd} term of S is -494.

(2) The first term of S is -12 and each term of S after the first term is 2 less than the preceding term.

299. If the digit h is the hundredths' digit in the decimal $d = 0.2h6$, what is the value of d rounded to the nearest tenth?

(1) $d < \frac{1}{4}$

(2) $h < 5$

300. If the integer n is greater than 1, is n equal to 2?

(1) n has exactly two distinct positive factors.

(2) The difference of any two distinct positive factors of n is odd.

301. If the product of the digits of the two-digit positive integer n is 12, what is the value of n?

(1) n can be expressed as the sum of two perfect squares in exactly one way.

(2) n is smaller than 40.

302. If the sum of three integers is even, is the product of the three integers a multiple of 4?

(1) All three integers are equal.

(2) All three integers are not even.

303. If the tens digit of the three-digit positive number k is non-zero, what is the tens' digit of k?

(1) The tens' digit of $(k + 9)$ is 3

(2) The tens' digit of $(k + 4)$ is 2

304. If v and w are different integers, does $v = 0$?

(1) $vw = v^2$

(2) $w = 0$

305. If $vmt \neq 0$, is $v^2m^3t^4 > 0$?

(1) $m > v^2$

(2) $m > t^3$

306. If x and y are integers, is y an even integer?

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

(2) x is an odd integer.

307. If x and y are integers, what is the value of $(2x^{6y} - 4)$?

(1) $x^{2y} = 16$

(2) $xy = 4$

308. If x and y are positive integers and 18 is a multiple of xy^2, what is the value of y?

(1) x is a factor of 54 and is less than half of 54.

(2) y is a multiple of 3.

309. If x and y are positive integers and $x^y = x^{2y-3}$, what is the value of y^x?

(1) $x = 2$

(2) $x^2 < 9$

310. If x and y belong to the set $\{2, 4\}$, and $x^{ky} = x^{(ly^2-8)}$, is $kl > 2$?

(1) $k = -6$

(2) $3l - k = 3$

311. If x and y are non-zero integers, what is the value of $(x^{2y} - 1)$?

(1) $|x| + |y| = 5$, where $1 < |x| < y$

(2) $|x^2 - 4| + |y - 3| = 0$

312. If x and y are positive integers and r is the remainder when $(3^{4x+2} + y)$ is divided by 10, what is the value of r?

(1) $x = 25$

(2) $y = 1$

313. If x and y are positive integers, what is the value of $(x + y)^2$?

(1) $x = y - 3$

(2) x and y are prime numbers.

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

(1) $3^x + 5^y = 134$

(2) $y = 3$

315. If x and y are distinct positive integers, is $|x - y|$ a factor of 12?

(1) $x^2 - 6x + y^2 - 4y = 0$

(2) $x = 1$

316. If x and z are positive integers, is at least one of them a prime number?

(1) $x^2 = 15 + z^2$

(2) $(x - z)$ is a prime number.

317. If x is a positive integer, does the remainder, when $(7^x + 1)$ is divided by 100, have 0 as the tens digit?

(1) $x = 4n + 2$, where n is a positive integer.

(2) $x > 5$

318. If x, y and z are positive integers, is xz even?

(1) $(2xy - x)$ is even

(2) $(x^2 + xz)$ is even

319. If x, y and z are positive integers, is $y > x$?

(1) $y^2 = xz$

(2) $z - x > 0$

320. If z is positive, is $|x - y| > 0$?

(1) $xy + 2z = z$

(2) $x^2 - 2x = 0$

321. If y is an integer and $y = |x| + x^3$, is $y = 0$?

(1) $x < 0$

(2) $y < 1$

322. In the decimal representation of x, where $0 < x < 1$,is the tenths' digit of x non-zero?

(1) $16x$ is an integer.

(2) $8x$ is an integer.

323. In the sequence of non-zero numbers $t_1, t_2, t_3, \ldots t_n, \ldots$, the value of $t_{(n+1)} = \frac{t_n}{2}$, for all positive integers n. What is the value of t_5?

(1) $t_3 = \frac{1}{4}$

(2) $t_1 - t_5 = \frac{15}{16}$

324. Is 2^x greater than 100?

(1) $2^{\sqrt{x}} = 8$

(2) $\frac{1}{2^x} < 0.01$

325. Is $|x| < 1$?

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

(2) $|x - 3| \neq 0$

326. Is $\sqrt{(x-5)^2} = (5 - x)$?

(1) $- - x|x| > 0$

(2) $5 - x > 0$

327. Is $\frac{x}{y} < xy$?

(1) $xy > 0$

(2) $y < -1$

3.2 Percents

328. An attorney charged a fee for estate planning services for a certain estate. The attorney's fee was what percent of the assessed value of the estate?

(1) The assessed value of the estate was $1.2 million.

(2) The attorney charged $2,400 for the estate planning services.

329. Are at least 10 percent of Country X's citizens who are 65 years old or older employed?

(1) In Country X, 11.3 percent of the population is 65 years old or older.

(2) In Country X, of the population 65 years old or older, 20 percent of the men and 10 percent of the women are employed.

330. By what percent was the price of a certain candy bar increased?

(1) The price of the candy bar was increased by 5 cents.

(2) The price of the candy bar after the increase was 45 cents.

331. Did Sally pay less than x dollars, including sales tax, for her bicycle?

(1) The price Sally paid for her bicycle was $0.9x$ dollars, excluding the 10 percent sales tax

(2) The price Sally paid for her bicycle was $170, excluding the 10 percent sales tax

332. Does Joe weigh more than Tim?

(1) Tim's weight is 80 percent of Joe's weight.

(2) Joe's weight is 125 percent of Tim's weight.

333. Each week a certain salesman is paid a fixed amount equal to $300 plus a commission equal to 5 percent of the amount of total sales that week over $1,000. What was the total amount paid to the salesman last week?

(1) The total amount the salesman was paid last week is equal to 10 percent of the amount of total sales last week.

(2) The salesman's total sales last week was $5,000

334. Each week Connie receives a base salary of $500, plus a 20 percent commission on the total amount of her sales that week in excess of $1,500. What was the total amount of Connie's sales last week?

(1) Last week Connie's base salary and commission totaled $1,200

(2) Last week Connie's commission was $700

335. For a certain car repair, the total charge consisted of a charge for parts, a charge for labor, and a 6 percent sales tax on both the charge for parts and the charge for labor. If the charge for parts, excluding sales tax, was $50.00, what was the total charge for the repair?

(1) The sales tax on the charge for labor was $9.60

(2) The total sales tax was $12.60

336. For what percent of those tested for a certain infection was the test accurate; that is, positive for those who had the infection and negative for those who did not have the infection?

(1) Of those who tested positive for the infection, 8 did not have the infection.

(2) Of those tested for the infection, 90 percent tested negative.

337. From 1985 to 1994, what was the percent increase in total trade of the United States?

(1) Total trade of the United States in 1985 was 17 percent of gross domestic product in 1985.

(2) Total trade of the United States in 1994 was 23 percent of gross domestic product in 1994.

338. From 2004 to 2007, the value of foreign goods consumed annually in the United States increased by what percent?

(1) In both 2004 and 2007, the value of foreign goods consumed constituted 20 percent of the total value of goods consumed in the United States that year.

(2) In 2007 the total value of goods consumed in the United States was 20 percent higher than that in 2004.

339. From May 1 to May 30 in the same year, the balance in a checking account had increased. What was the balance in the checking account on May 30?

(1) If, from May 1 to May 30, the increase in the balance in the checking account had been 12 percent, then the balance in the account on May 30 would have been $ 504.

(2) From May 1 to May 30, the increase in the balance in the checking account was 8 percent.

340. Guy's net income equals his gross income minus his deductions. By what percent did Guy's net income change on January 1, 1989, when both his gross income and his deductions increased?

(1) Guy's gross income increased by 4 percent on January 1, 1989.

(2) Guy's deductions increased by 15 percent on January 1, 1989.

341. How many of the boys in a group of 100 children have brown hair?

(1) Of the children in the group, 60 percent have brown hair.

(2) Of the children in the group, 40 are boys.

342. If Jack's and Kate's annual salaries in 2005 were each 10 percent higher than their respective annual salaries in 2004, what was Jack's annual salary in 2004?

(1) The sum of Jack's and Kate's annual salaries in 2004 was $80,000.

(2) The sum of Jack's and Kate's annual salaries in 2005 was $88,000.

343. If $n > 0$, is 20% of n greater than 10% of the sum of n and 0.5?

(1) $n < 0.1$

(2) $n > 0.01$

344. If p and r are positive, is 25 percent of p equal to 10 percent of r?

(1) r is 300 percent greater than p.

(2) p is 80 percent less than $(r + p)$.

345. If the Lincoln Library's total expenditure for books, periodicals, and newspapers last year was $35,000, how much of the expenditure was on books?

(1) The expenditures for newspapers were 40 percent greater than the expenditures for periodicals.

(2) The total of the expenditures for periodicals and newspapers was 25 percent less than the expenditures for books.

346. In 1993, Mr. Jacobs paid 4.8 percent of his income in state taxes. In 1994, what percent of Mr. Jacobs' income did he pay in state taxes?

(1) In 1993, Mr. Jacobs' taxable income was $42,500.

(2) In 1994 Mr. Jacobs paid $232 more in state tax than he did in 1993.

347. In 2001, Joe paid 5.1 percent of his income in taxes. In 2002, did Joe pay less than 5.1 percent of his income in taxes?

(1) From 2001 to 2002, Joe's income increased by 10 percent.

(2) Taxes paid in 2002 are 3.4 percent of Joe's income in 2001.

348. In 1997, there were 300 female employees at Company C. If the number of female employees at Company C increased by 60 percent from 1977 to 1987, by what percent did the number of female employees at Company C increase from 1987 to 1997?

(1) From 1977 to 1997, the number of female employees increased by 200 percent at Company C.

(2) In 1977, there were 100 female employees at Company C.

349. In June 1989, what was the ratio of the number of sales transactions made by salesperson X to the number of sales transactions made by salesperson Y?

(1) In June 1989, salesperson X made 50 percent more sales transactions than salesperson Y did in May 1989.

(2) In June 1989, salesperson Y made 25 percent more sales transactions than in May 1989.

3.3 Profit & Loss

350. A clothing store acquired an item at a cost of x dollars and sold the item for y dollars. The store's gross profit from the item was what percent of its cost for the item?

(1) $y - x = 20$

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

351. A construction company was paid a total of $500,000 for a construction project. The company's only costs for the project were for labor and materials. Was the company's profit from the project greater than $150,000?

(1) The company's total cost was three times its cost for materials

(2) The company's profit was greater than its cost for labor

352. A merchant discounted the sale price of a coat and the sale price of a sweater. Was the discount in dollar on coat greater than that on sweater?

(1) The percent discount on the coat was 2 percentage points greater than the percent discount on the sweater

(2) Before the discounts, the sale price of the coat was $10 less than the sale price of the sweater

353. A store purchased a Brand C computer for the same amount that it paid for a Brand D computer and then sold them both at higher prices. The store's gross profit on the Brand C computer was what percent greater than its gross profit on the Brand D computer?

(1) The price at which the store sold the Brand C computer was 15 percent greater than the price at which the store sold the Brand D computer.

(2) The store's gross profit on the Brand D computer was $300.

354. If the list price of a new car was $12,300, what was the cost of the car to the dealer?

(1) The cost price, when raised by 25 percent was equal to the list price.

(2) The car was sold for $11,070, which was 12.5 percent more than the cost to the dealer.

3.4 Averages (including weighted averages)

355. A total of 20 amounts are entered on a spreadsheet that has 5 rows and 4 columns; each of the 20 positions in the spreadsheet contains one amount. The average (arithmetic mean) of the amounts in row i is $R_i (1 \le i \le 5)$. The average of the amounts in column j is $C_j (1 \le j \le 4)$. What is the average of all 20 amounts on the spreadsheet?

(1) $R_1 + R_2 + R_3 + R_4 + R_5 = 550$

(2) $C_1 + C_2 + C_3 + C_4 = 440$

356. All 48 seniors in a certain high school take one of the two English classes. What is the average (arithmetic mean) height of the seniors in this school?

(1) In the school, the average height of the seniors in the English class with the larger number of students is 70 inches.

(2) In the school, the average height of the seniors in the English class with the smaller number of students is $\frac{4}{5}$ of the average height of the seniors in the other English class.

357. Division R of Company Q has 1,000 employees. What is the average (arithmetic mean) annual salary of the employees at Company Q?

(1) The average annual salary of the employees in Division R is \$30,000

(2) The average annual salary of the employees at Company Q who are not in Division R is \$35,000

358. If every car sold last week at a certain used-car dealership was either a Coupe or a Sedan, what was the average (arithmetic mean) sale price for all the cars that were sold at the dealership last week?

(1) The average sale price for the Sedans that were sold at the dealership last week was \$10,600.

(2) The average sale price for the Coupes that were sold at the dealership last week was \$8,400.

359. If Jill's average (arithmetic mean) score for three games of bowling was 168, what was her lowest score?

(1) Jill's highest score was 204.

(2) The sum of Jill's two highest scores was 364.

360. A group of 20 friends went out for lunch. Five of them spent \$21 each and the rest spent \$$x$ less than the average of all of them. Is the value of the average amount spent by all the friends \$12?

(1) $x = 3$

(2) The total amount spent by all the friends is \$240.

3.5 Ratio & Proportion

361. A department manager distributed a number of pens, pencils, and pads among the staff in the department, with each staff member receiving x pens, y pencils, and z pads. How many staff members were in the department?

(1) The numbers of pens, pencils, and pads that each staff member received were in the ratio 2 : 3 : 4 respectively

(2) The manager distributed a total of 18 pens, 27 pencils, and 36 pads

362. At the beginning of the year, the Finance Committee and the Planning Committee of a certain company each had n members, and no one was a member of both the committees. At the end of the year, 5 members left the Finance Committee and 3 members left the Planning Committee. How many members did the Finance Committee have at the beginning of the year?

(1) The ratio of the total number of members who left at the end of the year to the total number of members at the beginning of the year was 1 : 6

(2) At the end of the year, 21 members remained on the Planning Committee

363. Bucket X and bucket Y contain only water and bucket Y was $\frac{1}{2}$ full. If all of the water in bucket X was poured into bucket Y, then what fraction of the capacity of Y was filled with water?

(1) Before the water from X was poured, X was $\frac{1}{3}$ full.

(2) X and Y have the same capacity.

364. Color X ink is created by blending red, blue, green, and yellow inks in the ratio 6 : 5 : 2 : 2. What is the number of liters of green ink that was used to create a certain batch of color X ink?

(1) The amount of red ink used to create the batch is 2 liters more than the amount of blue ink used to create the batch

(2) The batch consists of 30 liters of color X ink

365. How many liters of apple juice were added to the cranberry juice in a certain container?

(1) The amount of apple juice that was added was $\frac{3}{2}$ times the amount of cranberry juice in the container.

(2) There was 5 liters of cranberry juice in the container.

366. If all the employees of Company K who worked there last January are still there, how many employees does Company K have now?

(1) Last January the ratio of the number of male employees to the number of female employees was 2 to 3.

(2) Since last January, Company K has employed 400 new male employees and no new female employees, raising the ratio of the number of male employees to the number of female employees to 3 to 4.

367. If, on a fishing trip, Jim and Tom each caught some fish, did Jim catch more fish than Tom?

(1) Jim caught $\frac{2}{3}$ of the total number of fish they caught together.

(2) After Tom stopped fishing, Jim continued fishing until he had caught 12 more fish.

368. The ratio of the number of male and female workers in a company in 2002 was 3 : 4. Was the percent increase in the number of men more than that in the number of women from 2002 to 2003?

(1) The ratio of the number of male workers in 2002 to 2003 was 3 : 5.

(2) The ratio of the number of male and female workers in 2003 was 10 : 7.

369. In a certain senior citizens' club, are more than $\frac{1}{4}$ of the members over 75 years of age?

(1) Exactly 60 percent of the female members are over 60 years of age, and, of them, $\frac{1}{3}$ are over 75 years of age.

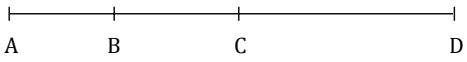
(2) Exactly 10 male members are over 75 years of age.

370. In a certain professionals' club, are more than $\frac{1}{3}$ of the members mechanical engineers? Only those who are engineers can be mechanical engineers.

(1) Exactly 75 percent of the female members are engineers, and, of them, $\frac{1}{3}$ are mechanical engineers.

(2) Exactly 30 percent of the male members are engineers.

371. What is the length of the line AD?



(1) AC = 10, BD = 15

(2) $\frac{AB}{BC} = \frac{BC}{CD}$

3.6 Mixtures

372. Two containers contain milk and water solutions of volume x liters and y liters, respectively. What would be the minimum concentration of milk in either container so that when the entire contents of both containers are mixed, 30 liters of 80 percent milk solution is obtained?

(1) $x = 2y$

(2) $x = y + 10$

373. From a cask containing y liters of milk, x liters of milk is drawn out and z liters of water are then added to the cask. This process is repeated one more time. What is the fraction of milk finally present in the mixture in the cask?

(1) $x = 20, y = 100$

(2) x and z form 20% and 10% of y, respectively

374. Two containers contain milk and water solutions of volume x liters and y liters, respectively. What would be the minimum concentration of milk in either container so that when the entire contents of both containers are mixed, 30 liters of 80 percent milk solution is obtained?

(1) $x = 2y$

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375. From a cask containing y liters of milk, x liters of milk is drawn out and z liters of water are then added to the cask. This process is repeated one more time. What is the fraction of milk finally present in the mixture in the cask?

(1) $x = 20, y = 100$

(2) x and z form 20% and 10% of y, respectively

3.7 Speed, Time, & Distance

376. Chan and Mieko drove separate cars along the entire length of a certain route. If Chan made the trip in 15 minutes, how many minutes did it take Mieko to make the same trip?

(1) Mieko's average speed for the trip was $\frac{3}{4}$ of Chan's average speed.

(2) The route is 14 miles long.

377. How many miles long is the route from Houghton to Callahan?

(1) It will take one hour less time to travel the entire route at an average rate of 55 miles per hour than at an average rate of 50 miles per hour.

(2) It will take 11 hours to travel the first half of the route at an average rate of 25 miles per hour.

378. In planning for a trip, Joan estimated both the distance of the trip, in miles, and her average speed, in miles per hour. She accurately divided her estimated distance by her estimated average speed to obtain an estimate for the time, in hours, that the trip would take. Was her estimated time within 0.5 hour of the actual time that the trip took?

(1) Joan's estimate for the distance was within 5 miles of the actual distance.

(2) Joan's estimate for her average speed was within 10 miles per hour of her actual average speed.

379. Is the number of seconds required to travel d feet at r feet per second greater than the number of seconds required to travel D feet at R feet per second?

(1) d is 30 greater than D

(2) r is 30 greater than R

3.8 Time & Work

380. If a certain machine produces screws and bolts at a constant rate, how many seconds will it take the machine to produce 300 bolts?

(1) It takes the machine 56 seconds to produce 40 screws.

(2) It takes the machine 1.5 times more time to produce 1 bolt than to produce one screw.

381. If two copying machines work simultaneously at their respective constant rates, how many copies do they produce in 5 minutes?

(1) One of the machines produces copies at the constant rate of 250 copies per minute.

(2) One of the machines produces copies at twice the constant rate of the other machine.

382. A group of 5 equally efficient skilled workers together take 18 hours to finish a job. How long will it take for a group of 4 skilled workers and 3 apprentices to do the same job, if each skilled worker works at an identical rate and each apprentice works at an identical rate?

(1) An apprentice works at $\frac{2}{3}$ the rate of a skilled worker.

(2) 6 apprentices and 5 skilled workers take 10 hours to complete the same job.

3.9 Computational

383. A certain dealership has a number of cars to be sold by its salespeople. How many cars are to be sold?

(1) If each of the salespeople sells 4 of the cars, 23 cars will remain unsold

(2) If each of the salespeople sells 6 of the cars, 5 cars will remain unsold

384. A certain employee is paid \$9 per hour for an 8-hour workday. If the employee is paid $1\frac{1}{2}$ times this rate for time worked in excess of 8 hours during a single day, how many hours did the employee work today?

(1) The employee was paid \$27 more for the hours worked today than for the hours worked yesterday

(2) Yesterday the employee worked 8 hours

385. A family-size box of cereal contains more cereal and costs more than the regular-size box of cereal. What is the cost per ounce of the family-size box of cereal?

(1) The family-size box of cereal contains 10 ounces more than the regular-size box of cereal.

(2) The family-size box of cereal costs \$5.40.

386. A total of 100 customers purchased books at a certain bookstore last week. If these customers purchased a total of 200 books, how many of the customers purchased only one book each?

(1) None of the customers purchased more than three books

(2) 20 of the customers purchased only two books each

387. At a certain company, 25 percent of the employees are male and 50 percent of the employees are sales staff. What is the number of employees at this company?

(1) Exactly seven of the employees at the company are males who are sales staff.

(2) There are 16 more female employees than male employees at the company.

388. At a fruit stand yesterday, the price of each apple was \$0.10 more than the price of each orange. What was the total revenue from the sale of oranges at the fruit stand yesterday?

(1) The number of oranges sold at the fruit stand yesterday was 5 more than the number of apples.

(2) The total revenue from the sale of apples at the fruit stand yesterday was \$15.00

389. At the beginning of last month, a stationery store had in stock 250 writing pads, which had cost the store \$0.75 each. During the same month, the store made only one purchase of writing pads. What was the total amount of inventory, in dollar, of the writing pads it had in stock at the end of the last month?

(1) Last month, the store purchased 150 writing pads for \$0.80 each.

(2) Last month, the total revenue from the sale of writing pads was \$180

390. Development planners determined the number of new housing units needed in a certain area by using the formula $H = kJ$, where H is the number of new housing units needed in the area, J is the number of new jobs to be created in the area, and k is a constant. How many new housing units did the planners determine were needed?

(1) The number of new jobs to be created was 60,000

(2) According to the formula used by the planners, if 37,500 jobs were to be created, then 7,500 new housing units would be needed

391. During week W, how much did it cost, per mile, for the gasoline used by car X?

(1) During week W, car X used gasoline that cost $3.10 per gallon.

(2) During week W, car X was driven 270 miles.

392. Each of 20 parents chose one of five days from Monday through Friday to attend parent-teacher conferences. If more parents chose Monday than Tuesday, did at least one of the parents choose Friday?

(1) None of the five days was chosen by more than 5 parents

(2) More parents chose Monday than Wednesday

393.

r	s	t
u	v	w
x	y	z

Each of the letters in the table above represents one of the numbers 1, 2, or 3, and each of these numbers occurs exactly once in each row and exactly once in each column. What is the value of r?

(1) $v + z = 6$

(2) $s + t + u + x = 6$

394. For all integers x and y, the operation $\triangle$ is defined by $x \triangle y = (x + 2)^2 + (y + 3)^2$. What is the value of integer t?

(1) $t \triangle 2 = 74$

(2) $2 \triangle t = 80$

395. From Leland's gross pay of p dollars last week, t percent was deducted for taxes and then s dollars was deducted for savings. What amount of Leland's gross pay last week remained after these two deductions?

(1) $p - s = 244$

(2) $pt = 7,552$

396. If a certain city loses 12 percent of its daily water supply each day because of water-main breaks, what is the cost in dollars to the city per day for this loss?

(1) The city's daily water supply is 350 million gallons.

(2) The cost to the city for each 12,000 gallons of water loss is $2.

397. If Ann saves x dollars each week and Beth saves y dollars each week, what is the total amount that they together save per week?

(1) Beth saves $ 5 more per week than Ann saves per week.

(2) It takes Ann six weeks to save the same amount that Beth saves in five weeks.

398. If Antonio bought two half-liter cartons of same ice cream during a special sale, what percent of the total regular price of the two cartons did he save?

(1) Antonio paid the regular price for the first carton and received the second carton for half the regular price.

(2) The regular price of the ice cream Antonio bought was $4.00 per half-liter carton.

399. If the symbol '∇' represents either of addition, subtraction, multiplication or division, what is the value of $6 \nabla 2$?

(1) $10 \nabla 5 = 2$

(2) $4 \nabla 2 = 2$

400. In 2004, Mr. John bought a total of n shares of stock X and Mrs. John bought a total of 300 shares of stock X. If the couple held all of their respective shares throughout 2005, and Mr. John's dividends on his n shares totaled $150 in 2005, what was Mrs. John's total dividend on her 300 shares in 2005?

(1) In 2005, the annual dividend on each share of stock X was $0.75

(2) In 2004, Mr. John bought a total of 200 shares of stock X.

401. In a demographic study, the population and total income of a certain region were estimated, and both estimates had lower and upper limits. At the time of the estimates, was the average income per person for the region greater than $16,500?

(1) The lower limit for the estimate of the population was 330,000 people.

(2) The lower limit for the estimate of the total income was $5,500,000,000.

402.

$$\blacksquare + \triangle = \forall$$

In the addition problem above, each of the symbols $\blacksquare$, $\triangle$ and $\forall$ represents a positive digit. If $\blacksquare < \triangle$, what is the value of $\triangle$?

(1) $\forall = 4$

(2) $\blacksquare = 1$

3.10 Simple Interest

403. A total of $\$60,000$ was invested for one year. Part of this amount earned simple annual interest at the rate of x percent per year, and the rest earned simple annual interest at the rate of y percent per year. If the total interest earned on investment of $\$60,000$ for that year was $\$4,080$, what is the value of x?

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

(2) The ratio of the amount that earned interest at the rate of x percent per year to the amount that earned interest at the rate of y percent per year was 3 to 2

404. John lent one part of an amount of money at 10 percent rate of simple interest and the remaining at 22 percent rate of simple interest, both for one year. At what rate was the larger part lent?

(1) The total amount lent was $\$2400$.

(2) The average rate of simple interest he received on the total amount was 15 percent.

3.11 Compound Interest

405. \$10,000 is deposited in a certain account that pays r percent annual interest compounded annually. The amount $D(t)$, in dollars, that the deposit will grow to in t years is given by $D(t) = 10,000\left(1 + \frac{r}{100}\right)^t$. What amount will the deposit grow to in 3 years?

(1) $D(1) = 11,000$

(2) $r = 10$

3.12 Functions

406. For all integers n, the function f is defined by $f(n) = a^n$, where a is a constant. What is the value of $f(1)$?

(1) $f(2) = 100$

(2) $f(3) = -1000$

407. For all numbers x, the function f is defined by $f(x) = 3x + 1$, and the function g is defined by $g(x) = \dfrac{x-1}{3}$. If c is a positive number, what is the value of $g(c)$?

(1) $f(c) = 13$

(2) $f(1) = c$

408. If f is the function defined by $f(x) = 2x$ for $x \geq 0$ and $f(x) = x^2$ for $x < 0$, what is the value of $f(c)$?

(1) $|c| = 2$

(2) $c < 0$

3.13 Permutation & Combination

409. A box contains 10 light bulbs, fewer than half of which are defective. Two bulbs are to be drawn simultaneously from the box. If n of the bulbs in box are defective, what is the value of n?

(1) The probability that the two bulbs to be drawn will be defective is $\frac{1}{15}$

(2) The probability that one of the bulbs to be drawn will be defective and the other will not be defective is $\frac{7}{15}$

410. A certain jar contains only b black marbles, w white marbles, and r red marbles If one marble is to be chosen at random from the jar, is the probability that the marble chosen will be red greater than the probability that the marble chosen will be white?

(1) $\frac{r}{b+w} > \frac{w}{b+r}$

(2) $b - w > r$

411. In a 21 apartment building, there are in total 12 men and 9 women residing in one apartment each. If a poll taken is to select one of the apartments at random, what is the probability that the resident of the apartment selected will be a woman who is a student?

(1) Of the women, four are students.

(2) Of the women, five are not students.

412. Each of the eggs in a bowl is dyed red, or green, or blue. If one egg is to be removed at random, what is the probability that the egg will be green?

(1) There are 5 red eggs in the bowl.

(2) The probability that the egg will be blue is $\frac{1}{3}$

413. If two different representatives are to be selected at random from a group of 10 employees and if p is the probability that both the representatives selected will be women, is $p > \frac{1}{2}$?

(1) More than half of the 10 employees are women.

(2) The probability that both representatives selected will be men is less than $\frac{1}{10}$.

414. If each of the students in a certain mathematics class is either a junior or a senior, how many students are in the class?

(1) If one student is to be chosen at random from the class to attend a conference, the probability that the student chosen will be a senior is $\frac{4}{7}$.

(2) There are five more seniors in the class than juniors.

3.14 Sets

415. In a school election, if each of the 900 voters voted for either Edith or Jose (but not both), what percent of the female voters in this election voted for Jose?

(1) 80 percent of the female voters voted for Edith.

(2) 60 percent of the male voters voted for Jose.

416. In a survey of 200 college graduates, 30 percent said that they had received student loans during their college careers, and 40 percent said that they had received scholarships. What percent of those surveyed said that they had received neither student loans nor scholarships during their college careers?

(1) 25 percent of those surveyed said that they had received scholarships but no loans.

(2) 50 percent of those surveyed who said that they had received loans also said that they had received scholarships.

417. Is the number of members of Club X greater than the number of members of Club Y?

(1) Of the members of Club X, 20 percent are also members of Club Y.

(2) Of the members of Club Y, 30 percent are also members of Club X.

3.15 Statistics & Data Interpretation

418. A scientist recorded the number of eggs in each of 10 birds' nests. What was the standard deviation of the numbers of eggs in the 10 nests?

(1) The average (arithmetic mean) number of eggs for the 10 nests was 4

(2) Each of the 10 nests contained the same number of eggs

419. Each of the 45 boxes on shelf J weighs less than each of the 44 boxes on shelf K. What is the median weight of the 89 boxes on these shelves?

(1) The heaviest box on shelf J weighs 15 pounds

(2) The lightest box on shelf K weighs 20 pounds

420. If each of the eight employees working on a certain project received an award, was the amount of each award the same?

(1) The standard deviation of the amounts of the eight awards was 0.

(2) The total amount of the eight awards was $ 10,000.

421. If the average (arithmetic mean) of five different numbers is 12, what is the median of the five numbers?

(1) The median of the five numbers is equal to $\frac{1}{3}$ of the sum of the four numbers other than the median.

(2) The sum of the four numbers other than the median is equal to 45.

422. If the average (arithmetic mean) of four different numbers is 30, how many of the numbers are greater than 30?

(1) None of the four numbers is greater than 60.

(2) Two of the four numbers are 9 and 10.

423. If the average (arithmetic mean) of the assessed values of x houses is $ 212,000 and the average of the assessed values of y other houses is $ 194,000, what is the average of the assessed values of the $x + y$ houses?

(1) $x + y = 36$

(2) $x = 2y$

424. Is the standard deviation of the salaries of Company Y's employees greater than the standard deviation of the salaries of Company Z's employees?

(1) The average (arithmetic mean) salary of Company Y's employees is greater than the average salary of Company Z's employees.

(2) The median salary of Company Y's employees is greater than the median salary of Company Z's employees.

3.16 Linear Equations

425. A certain bakery sells rye bread in 16-ounce loaves and 24-ounce loaves, and all loaves of the same size sell for the same price per loaf regardless of the number of loaves purchased. What is the price of a 24-ounce loaf of rye bread?

(1) The total price of a 16-ounce loaf and a 24-ounce loaf of this bread is $2.40

(2) The total price of two 16-ounce loaves and one 24-ounce loaf of this bread is $3.40

426. A certain database charges users a registration fee of x dollars, and it charges registered users y dollars per file downloaded. If there are no other charges for users of this database, what is the amount of the registration fee?

(1) The total charge to download 50 files is $150, including the registration fee.

(2) The total charge to download 100 files is $225, including the registration fee.

427. A shirt and a pair of gloves cost a total of $ 41.70. How much does the pair of gloves cost?

(1) The shirt costs twice as much as the gloves

(2) The shirt costs $27.80

428. A swim club sold only individual and family memberships. It charged $300 for an individual membership. If the club's total revenue from memberships was $480,000, what was the charge for a family membership?

(1) The revenue from individual memberships was $\frac{1}{4}$ of the total revenue from memberships

(2) The club sold 1.5 times as many family memberships as individual memberships

429. At a sale, all books were priced equally and all magazines were priced equally. What was the price of 3 books and 4 magazines at the sale?

(1) At the sale, the price of a book was $1.45 more than the price of a magazine.

(2) At the sale, the price of 6 books and 8 magazines was $43.70

430. Currently there are 50 picture books on each shelf in the children's section of a library. If these books were to be placed on smaller shelves with 30 picture books on each shelf, how many of the smaller shelves would be needed to hold all of these books?

(1) The number of smaller shelves needed is 6 more than the current number of shelves

(2) Currently there are 9 shelves in the children's section

431. Is $2m - 3n = 0$?

(1) $m \neq 0$

(2) $6m = 9n$

432. Each week John earns x dollars an hour for the first 40 hours he works a week and y dollars for each additional hour. How many dollars an hour does John earn for the first 40 hours?

(1) $y = 1.5x$

(2) If John works 45 hours in a week, he earns a total of $570 that week.

433. For a convention, a hotel charges a daily room rate of \$120 for one person and x dollars for each additional person. What is the charge for each additional person?

(1) The daily cost per person for 4 people sharing the cost of a room equally is \$45.

(2) The daily cost per person for 2 people sharing the cost of a room equally is \$25 more than the corresponding cost for 4 people.

434. For a recent play performance, the ticket prices were \$25 per adult and \$15 per child. A total of 500 tickets were sold for the performance. How many of the tickets were sold to adults?

(1) Revenue from ticket sales for this performance totaled \$10,500

(2) The average (arithmetic mean) price per ticket sold was \$21

435. For a week Raymond is paid at the rate of x dollars per hour for the first t hours ($t > 4$) he works and \$ 2 per hour for the hours worked in excess of t hours. If x and t are integers, what is the value of t?

(1) If Raymond works $(t - 3)$ hours in one week, he will earn \$14.

(2) If Raymond works $(t + 3)$ hours in one week, he will earn \$23.

436. From May 1, 1980, to May 1, 1995, the closing price of a share of stock X doubled. What was the closing price of a share of stock on May 1, 1980?

(1) From May 1, 1995, to May 1, 2004, the closing price of a share of stock X doubled.

(2) From May 1, 1995, to May 1, 2004, the closing price of a share of stock X increased by \$ 4.50

437. How many books does Ricardo have?

(1) If Ricardo had 15 fewer books, he would have only half as many books as he actually has.

(2) Ricardo has twice as many fiction books as non-fiction books.

438. How many years did Dr. Jones live?

(1) If Dr. Jones had become a doctor 10 years earlier than he actually did, he would have been a doctor for exactly $\frac{2}{3}$ of his life.

(2) If Dr. Jones had become a doctor 10 years later than he actually did, he would have been a doctor for exactly $\frac{1}{3}$ of his life.

439. If $r = \frac{x + y}{2}$ and $s = \frac{x - y}{2}$, what is the value of $(r + s)$?

(1) $y = 4$.

(2) $x = 6$.

440. If $\frac{x}{600} = \frac{y}{300}$, is $y = 1000$?

(1) $x + y = 3000$

(2) $3x = 6000$

441. In what year was Ellen born?

(1) Ellen's brother, Pete, who is 2 years older than Ellen, was born in 1986.

(2) In 2005, Pete turned 18 years old.

3.17 Quadratic Equations & Polynomials

442. How many more men than women are in the room?

(1) There are a total of 20 men and women in the room.

(2) The number of men in the room equals the square of the number of women in the room.

443. If $x^2 + y^2 = 1$, is $(x + y) = 1$?

(1) $xy = 0$.

(2) $y = 0$.

444. If $x \neq y$, is $x + y = xy$?

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

(2) $x^2 - y^2 = x^2y - xy^2$

445. If $x(x - 5)(x + 2) = 0$, is $x < 0$?

(1) $x^2 - 7x \neq 0$

(2) $x^2 - 2x - 15 \neq 0$

446. If $xy \neq 0$, what is the value of $\left(\frac{1}{x} + \frac{1}{y}\right)$?

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

(2) $xy = 6(x + y)$

447. If $x^2 - y = w$, what is the value of x?

(1) $w + y = 4$

(2) $y = 1$

448. If $(y + 3)(y - 1) - (y - 2)(y - 1) = r(y - 1)$, what is the value of y?

(1) $r^2 = 25$

(2) $r = 5$

449. If b, c and d are constants and $x^2 + bx + c = (x + d)^2$ for all values of x, what is the value of c?

(1) $d = 3$

(2) $b = 6$

450. If $x^2 + 3x + c = (x + a)(x + b)$ for all x, what is the value of c?

(1) $a = 1$

(2) a and b are positive integers.

3.18 Inequalities

451. During a summer vacation, was the average (arithmetic mean) number of books that Carolyn read per week greater than the average number of books that Jacob read per week?

(1) Twice the average number of books that Carolyn read per week was greater than 5 less than twice the average number of books that Jacob read per week.

(2) During the last 5 weeks of the vacation, Carolyn read a total of 3 books more than Jacob.

452. If $\frac{1}{4}$ of the larger of two positive numbers is greater than five times the smaller of the same two numbers, is the smaller number less than four?

(1) The larger number is greater than 70.

(2) The larger number is less than 80.

453. If $xy \neq 0$, is $\frac{x}{y} = 1$?

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

(2) $xy > 0$

454. If $xyz \neq 0$, is $x(y + z) \geq 0$?

(1) $|y + z| = |y| + |z|$

(2) $|x + y| = |x| + |y|$

455. If $R = \frac{P}{Q}$, is $R \leq P$?

(1) $P > 50$

(2) $0 < Q \leq 20$

456. If $s^4v^3x^7 < 0$, is $svx < 0$?

(1) $v < 0$

(2) $x > 0$

457. If $\frac{x}{2} = \frac{3}{y}$, is $x < y$?

(1) $y \geq 3$

(2) $y \leq 4$

458. If $-2x > 3y$, is $x < 0$?

(1) $y > 0$

(2) $2x + 5y - 20 = 0$

459. If a and b are positive, is $(a^{-1} + b^{-1})^{-1} < (a^{-1}b^{-1})^{-1}$?

(1) $a = 2b$

(2) $a + b > 1$

460. If a, b, c and d are positive integers, is $\left(\frac{a}{b}\right) * \left(\frac{c}{d}\right) > \frac{c}{b}$?

(1) $c > b$
(2) $a > d$

461. If w and c are integers, is $w > 0$?

(1) $w + c > 50$
(2) $c > 48$

462. If $wz < 2$, is $z < 1$?

(1) $w > 2$
(2) $z < 2$

463. If $x > 0$, is $x^2 < x$?

(1) $0.1 < x < 0.4$
(2) $x^3 < x^2$

464. If $x > 1$ and $y > 1$, is $x < y$?

(1) $\frac{x^2}{xy + x} < 1$
(2) $\frac{xy}{y^2 - y} < 1$

465. If $x \neq 0$, is $\frac{x^2}{|x|} < 1$?

(1) $x < 1$
(2) $x > -1$

466. If x and y are integers and $y = |x + 3| + |4 - x|$, does y equal 7?

(1) $x < 4$
(2) $x > -3$

467. If x and y are integers and $x > 0$, is $y > 0$?

(1) $7x - 2y > 0$
(2) $- - y < x$

468. If x and y are integers, is $(x + y) > 2$?

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

469. If x and y are positive integers and $y = \sqrt{9 - x}$, what is the value of y?

(1) $x < 8$
(2) $y > 1$

470. If x and y are positive, is $3x > 7y$?

(1) $x > y + 4$
(2) $-5x < -14y$

471. If x and y are positive, is $4x > 3y$?

(1) $x > y - x$
(2) $\frac{x}{y} < 1$

472. If x is a negative integer, is $x < -3$?

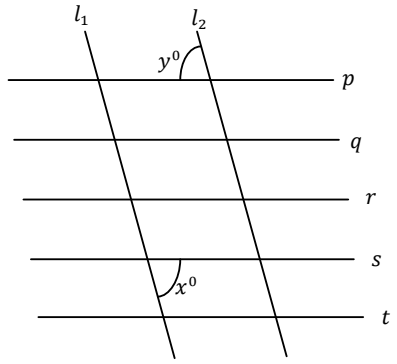
(1) $x^2 + 6x < 7$
(2) $x^2 + |x| \leq 2$

473. If $x + y > 0$, is $xy < 0$?

(1) $x^{2y} < 1$
(2) $x + 2y < 0$

3.19 Geometry–Lines

474. If $l_1 || l_2$ in the figure given below, is $x = y$?

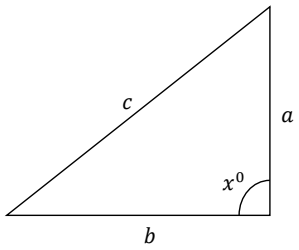


(1) $p || r$ and $r || t$

(2) $q || s$

3.20 Geometry–Triangles

475. In the triangle below, is $x > 90$?



(1) $a^2 + b^2 < 15$

(2) $c > 4$

476. In triangle ABC, point X is the midpoint of side AC and point Y is the midpoint of side BC. If point R is the midpoint of line segment XC and if point S is the midpoint of line segment YC, what is the area of the triangular region CRS ?

(1) The area of the triangular region ABX is 32.

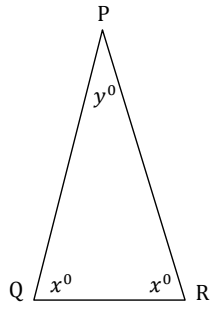
(2) The length of one of the altitudes of triangle ABC is 8.

477. In triangle PQR, the measure of angle P is 30^0 greater than twice the measure of angle Q. What is the measure of angle R?

(1) PQ = QR

(2) The measure of angle P is 78^0.

478. In triangle PQR below, what is the value of y?

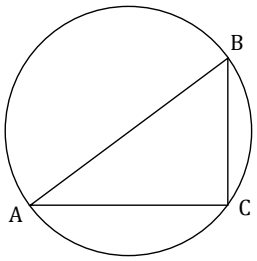


(1) $\frac{3}{2}x = 120$

(2) $x + y = 100$

3.21 Geometry–Circles

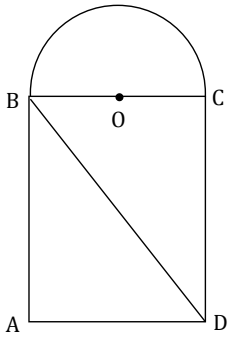
479. In the figure shown, triangle ABC is inscribed in the circle. What is the circumference of the circle?



(1) The perimeter of the triangle ABC is 48.

(2) The ratio of the lengths of BC, AC, and AB respectively, is 3 : 4 : 5.

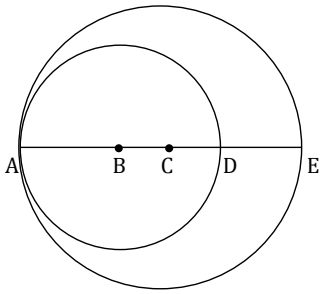
480. In the figure below, ABCD is a rectangle. What is the area of the semi-circular region with centre O and diameter BC?



(1) $\frac{BC}{AB} = \frac{3}{4}$

(2) BD = 25

481. In the figure, points A, B, C, D, and E lie on a line. A is the point of contact of the two circles, B is the center of the smaller circle, C is the center of the larger circle, D is a point on the smaller circle, and E is a point on the larger circle. What is the area of the region inside the larger circle but outside the smaller circle?



(1) AB = 3 and BC = 2

(2) CD = 1 and DE = 4

3.22 Geometry–Polygon

482. Can a certain rectangular sheet of glass be positioned on a rectangular tabletop so that it covers the entire tabletop and its edges are parallel to the edges of the tabletop?

(1) The tabletop is 36 inches wide by 60 inches long.

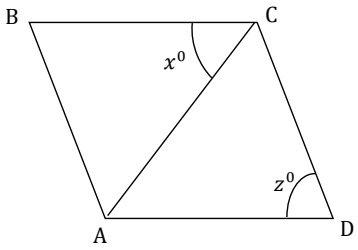
(2) The area of one face of the sheet of glass is 2,400 square inches.

483. If the length of a certain rectangle is 2 greater than the width of the rectangle, what is the perimeter of the rectangle?

(1) The length of the diagonal of the rectangle is 10.

(2) The area of the rectangular region is 48.

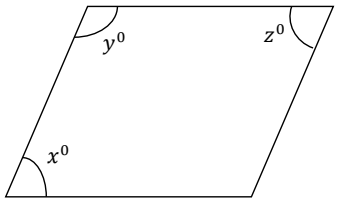
484. In the figure shown below, the line segment AD is parallel to the line segment BC. Is AC the shortest side of triangle ACD?



(1) $x = 50$

(2) $z = 70$

485. In the parallelogram shown below, what is the value of x?



(1) $y = 2x$

(2) $x + z = 120$

3.24 Co-ordinate geometry

486. A certain circle in the XY-plane has its center at the origin. If P is a point on the circle, what is the sum of the squares of the coordinates of P?

(1) The radius of the circle is 4.

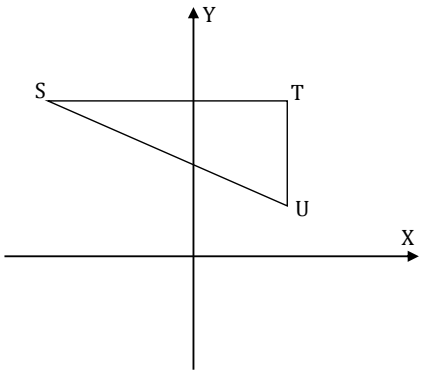
(2) The sum of the coordinates of P is 0.

487. If line k in the XY-plane has equation $y = mx + b$, where m and b are constants, what is the slope of k?

(1) k is parallel to the line with equation $y = (1 - m)x + b + 1$.

(2) k intersects the line with equation $y = 2x + 3$ at the point (2, 7).

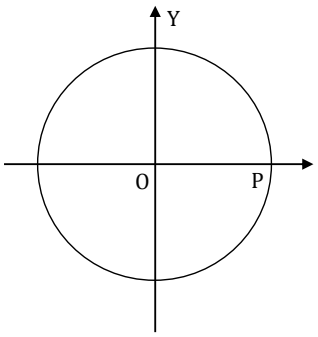
488. In the figure below, ST and TU are parallel to the X-axis and Y-axis respectively. What is the sum of the coordinates of point T?



(1) The Y-coordinate of point U is 1.

(2) The X-coordinate of point S is -5.

489. In the figure shown, the circle has center O and radius 50, and point P has coordinates $(50,\ 0)$. If point Q (not shown) is on the circle, what is the length of line segment PQ?



(1) The X-coordinate of point Q is -30.
(2) The Y-coordinate of point Q is -40.

490. In the rectangular coordinate system, are the points (r, s) and (u, v) equidistant from the origin?

(1) $r + s = 1$
(2) $u = 1 - r$ and $v = 1 - s$

491. In the XY-plane, does the point (a, b) lie above the line $y = x$?

(1) $a = 2$
(2) $b = a + 2$

492. In the XY-plane, is the slope of the line k positive?

(1) Line k is perpendicular to the line passing though the points $(1,\ 1)$ and $(-2,\ 5)$.
(2) Line k makes a negative intercept on the X-axis and a positive intercept on the Y-axis.

493. In the XY-plane, lines l and k intersect at the point $\left(\frac{16}{5}, \frac{12}{5}\right)$. What is the slope of line l?

(1) The product of the slopes of lines l and k is -1.
(2) Line k passes through the origin.

494. In the XY-plane, lines a and b are parallel. If the Y-intercept of line a is -1, what is the Y-intercept of line b?

(1) The X-intercept of line a is -1.
(2) Line b passes through the point $(10,\ 20)$.

495. In the XY-plane, the point (r, s) lies on a circle with centre at the origin. What is the value of $(r^2 + s^2)$?

(1) The circle has radius 2.
(2) The point $\left(\sqrt{2},\ -\sqrt{2}\right)$ lies on the circle.

496. In the XY-plane, region R consists of all the points (x, y) such that $2x + 3y \leq 6$. Is the point (r, s)in region R?

(1) $3r + 2s = 6$

(2) $r \leq 3$ and $s \leq 2$

497. In the XY-plane, the line k passes through the origin and through the point (a, b), where $ab \neq 0$. Is $b > 0$?

(1) The slope of line k is negative.

(2) $a < b$

498. In the XY-plane, the line with equation $ax + by + c = 0$, where $abc \neq 0$, has slope $\frac{2}{3}$. What is the value of b?

(1) $a = 4$

(2) $c = -6$

499. In the XY-plane, the sides of a certain rectangle are parallel to the X and Y axes. If one of the vertices of the rectangle is $(-1, -2)$, what is the perimeter of the rectangle?

(1) One of the vertices of the rectangle is $(2, -2)$.

(2) One of the vertices of the rectangle is $(2,\ 3)$.

500. In the XY-plane, what is the slope of line l?

(1) The line l does not intersect with the line having equation $y = 1 - x$

(2) The line l intersects with the line having equation $y = x - 1$

4.3 Sample 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. If $x + y = 2$ and $x^2 + y^2 = 2$, what is the value of xy?

   (A) –2
   (B) –1
   (C) 0
   (D) 1
   (E) 2

2. Points A, B, C, and D, in that order, lie on a line. If $AB = 3$ cm, $AC = 4$ cm, and $BD = 6$ cm, what is CD, in centimeters?

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

3. What is the value of $x^2yz - xyz^2$, if $x = -2$, $y = 1$, and $z = 3$?

   (A) 20
   (B) 24
   (C) 30
   (D) 32
   (E) 48

4. If $x > y$ and $y > z$, which of the following represents the greatest number?

   (A) $x - z$
   (B) $x - y$
   (C) $y - x$
   (D) $z - y$
   (E) $z - x$

5. To order certain plants from a catalog, it costs $3.00 per plant, plus a 5 percent sales tax, plus $6.95 for shipping and handling regardless of the number of plants ordered. If Company C ordered these plants from the catalog at the total cost of $69.95, how many plants did Company C order?

   (A) 22
   (B) 21
   (C) 20
   (D) 19
   (E) 18

6. Company C produces toy trucks at a cost of $5.00 each for the first 100 trucks and $3.50 for each additional truck. If 500 toy trucks were produced by Company C and sold for $10.00 each, what was Company C's gross profit?

   (A) $2,250
   (B) $2,500
   (C) $3,100
   (D) $3,250
   (E) $3,500

7. 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

8. Of the following, which is least?

(A) $\frac{0.03}{0.00071}$

(B) $\frac{0.03}{0.0071}$

(C) $\frac{0.03}{0.071}$

(D) $\frac{0.03}{0.71}$

(E) $\frac{0.03}{7.1}$

9. The maximum recommended pulse rate R, when exercising, for a person who is x years of age is given by the equation $R = 176 - 0.8x$. What is the age, in years, of a person whose maximum recommended pulse rate when exercising is 140 ?

(A) 40
(B) 45
(C) 50
(D) 55
(E) 60

10. If the average (arithmetic mean) of 5 numbers j, $j + 5$, $2j - 1$, $4j - 2$, and $5j - 1$ is 8, what is the value of j ?

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

(B) $\frac{7}{13}$

(C) 1
(D) 3
(E) 8

11. Guadalupe owns 2 rectangular tracts of land. One is 300 m by 500 m and the other is 250 m by 630 m. The combined area of these 2 tracts is how many square meters?

(A) 3,360
(B) 307,500
(C) 621,500
(D) 704,000
(E) 2,816,000

12. There are five sales agents in a certain real estate office. One month Andy sold twice as many properties as Ellen, Bob sold 3 more than Ellen, Cary sold twice as many as Bob, and Dora sold as many as Bob and Ellen together. Who sold the most properties that month?

(A) Andy
(B) Bob
(C) Cary
(D) Dora
(E) Ellen

13. In a field day at a school, each child who competed in n events and scored a total of p points was given an overall score of $\frac{p}{n} + n$. Andrew competed in 1 event and scored 9 points. Jason competed in 3 events and scored 5, 6, and 7 points, respectively. What was the ratio of Andrew's overall score to Jason's overall score?

(A) $\frac{10}{23}$

(B) $\frac{7}{10}$

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

(D) $\frac{10}{9}$

(E) $\frac{12}{7}$

14. Which of the following represent positive numbers?

I. $-3 - (-5)$
II. $(-3)(-5)$
III. $-5 - (-3)$

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

15. If $\frac{x}{4}$ is 2 more than $\frac{x}{8}$, then $x =$

(A) 4
(B) 8
(C) 16
(D) 32
(E) 64

16. 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) $24 + x$

17. A grocer has 400 pounds of coffee in stock, 20 percent of which is decaffeinated. If the grocer buys another 100 pounds of coffee of which 60 percent is decaffeinated, what percent, by weight, of the grocer's stock of coffee is decaffeinated?

(A) 28%
(B) 30%
(C) 32%
(D) 34%
(E) 40%

18. The toll T, in dollars, for a truck using a certain bridge is given by the formula $T = 1.50 + 0.50(x - 2)$, where x is the number of axles on the truck. What is the toll for an 18-wheel truck that has 2 wheels on its front axle and 4 wheels on each of its other axles?

(A) \$2.50
(B) \$3.00
(C) \$3.50
(D) \$4.00
(E) \$5.00

19. For what value of x between -4 and 4, inclusive, is the value of $x^2 - 10x + 16$ the greatest?

(A) -4
(B) -2
(C) 0
(D) 2
(E) 4

20. If $x = -\frac{5}{8}$ and $y = -\frac{1}{2}$, what is the value of the expression $-2x - y^2$?

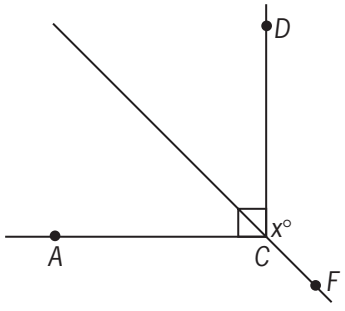
(A) $-\frac{3}{2}$
(B) -1
(C) 1
(D) $\frac{3}{2}$
(E) $\frac{7}{4}$

21. 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

22. If $x - y = R$ and $xy = S$, then $(x - 2)(y + 2) =$

(A) $R + S - 4$
(B) $R + 2S - 4$
(C) $2R - S - 4$
(D) $2R + S - 4$
(E) $2R + S$



23. In the figure above, if F is a point on the line that bisects angle ACD and the measure of angle DCF is $x°$, which of the following is true of x ?

(A) $90 \le x < 100$
(B) $100 \le x < 110$
(C) $110 \le x < 120$
(D) $120 \le x < 130$
(E) $130 \le x < 140$

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

I. 3 and $\frac{1}{3}$

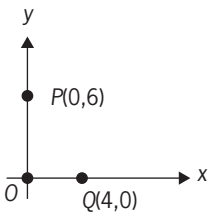
II. $\frac{1}{17}$ and $\frac{-1}{17}$

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

25. A rope 20.6 meters long is cut into two pieces. If the length of one piece of rope is 2.8 meters shorter than the length of the other, what is the length, in meters, of the longer piece of rope?

(A) 7.5
(B) 8.9
(C) 9.9
(D) 10.3
(E) 11.7



26. In the rectangular coordinate system shown above, points *O*, *P*, and *Q* represent the sites of three proposed housing developments. If a fire station can be built at any point in the coordinate system, at which point would it be equidistant from all three developments?

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

27. What is the perimeter, in meters, of a rectangular garden 6 meters wide that has the same area as a rectangular playground 16 meters long and 12 meters wide?

(A) 48
(B) 56
(C) 60
(D) 76
(E) 192

28. Of the total amount that Jill spent on a shopping trip, excluding taxes, she spent 50 percent on clothing, 20 percent on food, and 30 percent on other items. If Jill paid a 4 percent tax on the clothing, no tax on the food, and an 8 percent tax on all other items, then the total tax that she paid was what percent of the total amount that she spent, excluding taxes?

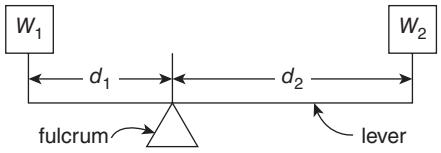
(A) 2.8%
(B) 3.6%
(C) 4.4%
(D) 5.2%
(E) 6.0%

29. How many integers x satisfy both $2 < x \leq 4$ and $0 \leq x \leq 3$?

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

30. At the opening of a trading day at a certain stock exchange, the price per share of stock K was \$8. If the price per share of stock K was \$9 at the closing of the day, what was the percent increase in the price per share of stock K for that day?

(A) 1.4%
(B) 5.9%
(C) 11.1%
(D) 12.5%
(E) 23.6%



31. As shown in the diagram above, a lever resting on a fulcrum has weights of w_1 pounds and w_2 pounds, located d_1 feet and d_2 feet from the fulcrum. The lever is balanced and $w_1d_1 = w_2d_2$. Suppose w_1 is 50 pounds and w_2 is 30 pounds. If d_1 is 4 feet less than d_2, what is d_2, in feet?

(A) 1.5
(B) 2.5
(C) 6
(D) 10
(E) 20

32. The number of rooms at Hotel G is 10 less than twice the number of rooms at Hotel H. If the total number of rooms at Hotel G and Hotel H is 425, what is the number of rooms at Hotel G ?

(A) 140
(B) 180
(C) 200
(D) 240
(E) 280

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

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

34. 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) $(10^4)^6$

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

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

36. If r and s are positive integers such that $(2^r)(4^s) = 16$, then $2r + s =$

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

37. 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°

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

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

39. Three people each contributed x dollars toward the purchase of a car. They then bought the car for y dollars, an amount less than the total number of dollars contributed. If the excess amount is to be refunded to the three people in equal amounts, each person should receive a refund of how many dollars?

(A) $\frac{3x-y}{3}$

(B) $\frac{x-y}{3}$

(C) $\frac{x-3y}{3}$

(D) $\frac{y-3x}{3}$

(E) $3(x-y)$

40. 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

$$2x+2y=-4$$
$$4x+y=1$$

41. In the system of equations above, what is the value of x?

(A) -3

(B) -1

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

(D) 1

(E) $1\frac{3}{4}$

42. Last week Jack worked 70 hours and earned \$1,260. If he earned his regular hourly wage for the first 40 hours worked, $1\frac{1}{2}$ times his regular hourly wage for the next 20 hours worked, and 2 times his regular hourly wage for the remaining 10 hours worked, what was his regular hourly wage?

(A) \$7.00

(B) \$14.00

(C) \$18.00

(D) \$22.00

(E) \$31.50

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

(A) $\sqrt{6}$

(B) $2\sqrt{6}$

(C) $1+\sqrt{6}$

(D) $1+2\sqrt{6}$

(E) $2+\sqrt{6}$

44. 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

45. 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

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

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

47. 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

48. If a and b are positive integers and $(2^a)^b = 2^3$, what is the value of $2^a\,2^b$?

(A) 6
(B) 8
(C) 16
(D) 32
(E) 64

49. $\dfrac{1}{3-\dfrac{1}{3-\dfrac{1}{3-1}}} =$

(A) $\frac{7}{23}$
(B) $\frac{5}{13}$
(C) $\frac{2}{3}$
(D) $\frac{23}{7}$
(E) $\frac{13}{5}$

50. After 4,000 gallons of water were added to a large water tank that was already filled to $\frac{3}{4}$ of its capacity, the tank was then at $\frac{4}{5}$ of its capacity. How many gallons of water does the tank hold when filled to capacity?

(A) 5,000
(B) 6,200
(C) 20,000
(D) 40,000
(E) 80,000

51. Five machines at a certain factory operate at the same constant rate. If four of these machines, operating simultaneously, take 30 hours to fill a certain production order, how many fewer hours does it take all five machines, operating simultaneously, to fill the same production order?

(A) 3
(B) 5
(C) 6
(D) 16
(E) 24

52. How many integers between 1 and 16, inclusive, have exactly 3 different positive integer factors?
(Note: 6 is NOT such an integer because 6 has 4 different positive integer factors: 1, 2, 3, and 6.)

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

53. 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) 0.0007
(D) 0.0047
(E) 0.0153

54. Stephanie has $2\frac{1}{4}$ cups of milk on hand and makes 2 batches of cookies, using $\frac{2}{3}$ cup of milk for each batch of cookies. Which of the following describes the amount of milk remaining after she makes the cookies?

(A) Less than $\frac{1}{2}$ cup

(B) Between $\frac{1}{2}$ cup and $\frac{3}{4}$ cup

(C) Between $\frac{3}{4}$ cup and 1 cup

(D) Between 1 cup and $1\frac{1}{2}$ cups

(E) More than $1\frac{1}{2}$ cups

55. A school club plans to package and sell dried fruit to raise money. The club purchased 12 containers of dried fruit, each containing $16\frac{3}{4}$ pounds. What is the maximum number of individual bags of dried fruit, each containing $\frac{1}{4}$ pounds, that can be sold from the dried fruit the club purchased?

(A) 50

(B) 64

(C) 67

(D) 768

(E) 804

56. The sequence a_1, a_2, a_3, a_4, a_5 is such that $a_n = a_{n-1} + 5$ for $2 \leq n \leq 5$. If $a_5 = 31$, what is the value of a_1 ?

(A) 1

(B) 6

(C) 11

(D) 16

(E) 21

57. A certain bridge is 4,024 feet long. Approximately how many minutes does it take to cross this bridge at a constant speed of 20 miles per hour? (1 mile = 5,280 feet)

(A) 1

(B) 2

(C) 4

(D) 6

(E) 7

58. 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

59. The annual interest rate earned by an investment increased by 10 percent from last year to this year. If the annual interest rate earned by the investment this year was 11 percent, what was the annual interest rate last year?

(A) 1%

(B) 1.1%

(C) 9.1%

(D) 10%

(E) 10.8%

60. A total of 5 liters of gasoline is to be poured into two empty containers with capacities of 2 liters and 6 liters, respectively, such that both containers will be filled to the same percent of their respective capacities. What amount of gasoline, in liters, must be poured into the 6-liter container?

(A) $4\frac{1}{2}$

(B) 4

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

(D) 3

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

61. List S consists of 10 consecutive odd integers, and list T consists of 5 consecutive even integers. If the least integer in S is 7 more than the least integer in T, how much greater is the average (arithmetic mean) of the integers in S than the average of the integers in T ?

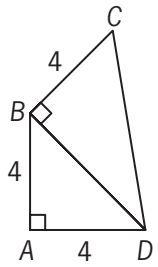
(A) 2

(B) 7

(C) 8

(D) 12

(E) 22



62. In the figure above, what is the area of triangular region *BCD* ?

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

63. What is the larger of the 2 solutions of the equation $x^2 - 4x = 96$?

(A) 8
(B) 12
(C) 16
(D) 32
(E) 100

64. Of the goose eggs laid at a certain pond, $\frac{2}{3}$ hatched, and $\frac{3}{4}$ of the geese that hatched from those eggs survived the first month. Of the geese that survived the first month, $\frac{3}{5}$ did not survive the first year. If 120 geese survived the first year and if no more than one goose hatched from each egg, how many goose eggs were laid at the pond?

(A) 280
(B) 400
(C) 540
(D) 600
(E) 840

65. Judy bought a quantity of pens in packages of 5 for \$0.80 per package. She sold all of the pens in packages of 3 for \$0.60 per package. If Judy's profit from the pens was \$8.00, how many pens did she buy and sell?

(A) 40
(B) 80
(C) 100
(D) 200
(E) 400

66. If $x^2 - 2x - 15 = 0$ and $x > 0$ which of the following must be equal to 0 ?

I. $x^2 - 6x + 9$
II. $x^2 - 7x + 10$
III. $x^2 - 10x + 25$

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

67. $\frac{(39{,}897)(0.0096)}{198.76}$ is approximately

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

68. If a square region has area n, what is the length of the diagonal of the square in terms of n ?

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

69. The "prime sum" of an integer n greater than 1 is the sum of all the prime factors of n, including repetitions. For example, the prime sum of 12 is 7, since $12 = 2 \times 2 \times 3$ and $2 + 2 + 3 = 7$. For which of the following integers is the prime sum greater than 35 ?

(A) 440
(B) 512
(C) 620
(D) 700
(E) 750

70. Each machine at a toy factory assembles a certain kind of toy at a constant rate of one toy every 3 minutes. If 40 percent of the machines at the factory are to be replaced by new machines that assemble this kind of toy at a constant rate of one toy every 2 minutes, what will be the percent increase in the number of toys assembled in one hour by all the machines at the factory, working at their constant rates?

(A) 20%
(B) 25%
(C) 30%
(D) 40%
(E) 50%

71. When a subscription to a new magazine was purchased for m months, the publisher offered a discount of 75 percent off the regular monthly price of the magazine. If the total value of the discount was equivalent to buying the magazine at its regular monthly price for 27 months, what was the value of m ?

(A) 18
(B) 24
(C) 30
(D) 36
(E) 48

72. At a garage sale, all of the prices of the items sold were different. If the price of a radio sold at the garage sale was both the 15th highest price and the 20th lowest price among the prices of the items sold, how many items were sold at the garage sale?

(A) 33
(B) 34
(C) 35
(D) 36
(E) 37

73. Half of a large pizza is cut into 4 equal-sized pieces, and the other half is cut into 6 equal-sized pieces. If a person were to eat 1 of the larger pieces and 2 of the smaller pieces, what fraction of the pizza would remain uneaten?

(A) $\frac{5}{12}$
(B) $\frac{13}{24}$
(C) $\frac{7}{12}$
(D) $\frac{2}{3}$
(E) $\frac{17}{24}$

74. If $a = 1 + \frac{1}{4} + \frac{1}{16} + \frac{1}{64}$ and $b = 1 + \frac{1}{4}a$, then what is the value of $a - b$?

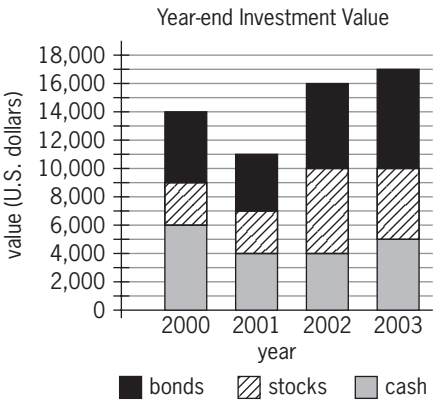
(A) $-\frac{85}{256}$
(B) $-\frac{1}{256}$
(C) $-\frac{1}{4}$
(D) $\frac{125}{256}$
(E) $\frac{169}{256}$

75. In a certain learning experiment, each participant had three trials and was assigned, for each trial, a score of either –2, –1, 0, 1, or 2. The participant's final score consisted of the sum of the first trial score, 2 times the second trial score, and 3 times the third trial score. If Anne received scores of 1 and –1 for her first two trials, not necessarily in that order, which of the following could NOT be her final score?

(A) –4
(B) –2
(C) 1
(D) 5
(E) 6

76. For all positive integers m and v, the expression $m \Theta v$ represents the remainder when m is divided by v. What is the value of $((98 \Theta 33) \Theta 17) - (98 \Theta (33 \Theta 17))$?

(A) –10
(B) –2
(C) 8
(D) 13
(E) 17



77. The chart above shows year-end values for Darnella's investments. For just the stocks, what was the increase in value from year-end 2000 to year-end 2003 ?

(A) $1,000
(B) $2,000
(C) $3,000
(D) $4,000
(E) $5,000

78. If the sum of the reciprocals of two consecutive odd integers is $\frac{12}{35}$, then the greater of the two integers is

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

79. What is the sum of the odd integers from 35 to 85, inclusive?

(A) 1,560
(B) 1,500
(C) 1,240
(D) 1,120
(E) 1,100

80. In a certain sequence, each term after the first term is one-half the previous term. If the tenth term of the sequence is between 0.0001 and 0.001, then the twelfth term of the sequence is between

(A) 0.0025 and 0.025
(B) 0.00025 and 0.0025
(C) 0.000025 and 0.00025
(D) 0.0000025 and 0.000025
(E) 0.00000025 and 0.0000025

81. A certain drive-in movie theater has a total of 17 rows of parking spaces. There are 20 parking spaces in the first row and 21 parking spaces in the second row. In each subsequent row there are 2 more parking spaces than in the previous row. What is the total number of parking spaces in the movie theater?

(A) 412
(B) 544
(C) 596
(D) 632
(E) 692

82. Ada and Paul received their scores on three tests. On the first test, Ada's score was 10 points higher than Paul's score. On the second test, Ada's score was 4 points higher than Paul's score. If Paul's average (arithmetic mean) score on the three tests was 3 points higher than Ada's average score on the three tests, then Paul's score on the third test was how many points higher than Ada's score?

(A) 9
(B) 14
(C) 17
(D) 23
(E) 25

83. The price of a certain stock increased by 0.25 of 1 percent on a certain day. By what fraction did the price of the stock increase that day?

(A) $\frac{1}{2,500}$

(B) $\frac{1}{400}$

(C) $\frac{1}{40}$

(D) $\frac{1}{25}$

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

84. 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

85. For each trip, a taxicab company charges $4.25 for the first mile and $2.65 for each additional mile or fraction thereof. If the total charge for a certain trip was $62.55, how many miles at most was the trip?

(A) 21

(B) 22

(C) 23

(D) 24

(E) 25

86. When 24 is divided by the positive integer n, the remainder is 4. Which of the following statements about n must be true?

I. n is even.

II. n is a multiple of 5.

III. n is a factor of 20.

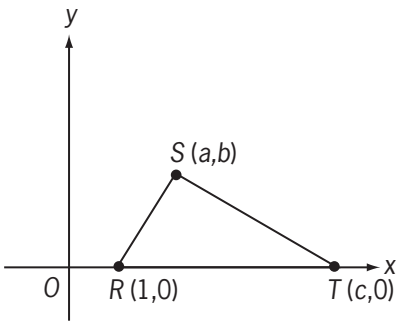
(A) III only

(B) I and II only

(C) I and III only

(D) II and III only

(E) I, II, and III



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

88. What is the thousandths digit in the decimal equivalent of $\frac{53}{5,000}$?

(A) 0

(B) 1

(C) 3

(D) 5

(E) 6

89. The product of 3,305 and the 1-digit integer x is a 5-digit integer. The units (ones) digit of the product is 5 and the hundreds digit is y. If A is the set of all possible values of x and B is the set of all possible values of y, then which of the following gives the members of A and B?

	A	B
(A)	{1, 3, 5, 7, 9}	{0, 1, 2, 3, 4, 5, 6, 7, 8, 9}
(B)	{1, 3, 5, 7, 9}	{1, 3, 5, 7, 9}
(C)	{3, 5, 7, 9}	{1, 5, 7, 9}
(D)	{5, 7, 9}	{1, 5, 7}
(E)	{5, 7, 9}	{1, 5, 9}

90. What is the largest integer n such that $\frac{1}{2^n} > 0.01$?

(A) 5
(B) 6
(C) 7
(D) 10
(E) 51

91. If x and y are integers such that $2 < x \leq 8$ and $2 < y \leq 9$, what is the maximum value of $\frac{1}{x} - \frac{x}{y}$?

(A) $-3\frac{1}{8}$
(B) 0
(C) $\frac{1}{4}$
(D) $\frac{5}{18}$
(E) 2

92. Items that are purchased together at a certain discount store are priced at \$3 for the first item purchased and \$1 for each additional item purchased. What is the maximum number of items that could be purchased together for a total price that is less than \$30?

(A) 25
(B) 26
(C) 27
(D) 28
(E) 29

93. The average (arithmetic mean) length per film for a group of 21 films is t minutes. If a film that runs for 66 minutes is removed from the group and replaced by one that runs for 52 minutes, what is the average length per film, in minutes, for the new group of films, in terms of t?

(A) $t + \frac{2}{3}$
(B) $t - \frac{2}{3}$
(C) $21t + 14$
(D) $t + \frac{3}{2}$
(E) $t - \frac{3}{2}$

94. A garden center sells a certain grass seed in 5-pound bags at \$13.85 per bag, 10-pound bags at \$20.43 per bag, and 25-pound bags at \$32.25 per bag. If a customer is to buy at least 65 pounds of the grass seed, but no more than 80 pounds, what is the least possible cost of the grass seed that the customer will buy?

(A) \$94.03
(B) \$96.75
(C) \$98.78
(D) \$102.07
(E) \$105.36

95. If $x = -|w|$, which of the following must be true?

(A) $x = -w$
(B) $x = w$
(C) $x^2 = w$
(D) $x^2 = w^2$
(E) $x^3 = w^3$

96. Which of the following lines in the xy-plane does not contain any point with integers as both coordinates?

(A) $y = x$
(B) $y = x + \frac{1}{2}$
(C) $y = x + 5$
(D) $y = \frac{1}{2}x$
(E) $y = \frac{1}{2}x + 5$

97. 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

98. 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

99. A certain financial institution reported that its assets totaled \$2,377,366.30 on a certain day. Of this amount, \$31,724.54 was held in cash. Approximately what percent of the reported assets was held in cash on that day?

(A) 0.00013%
(B) 0.0013%
(C) 0.013%
(D) 0.13%
(E) 1.3%

$$\begin{array}{r} AB \\ +\ BA \\ \hline AAC \end{array}$$

100. In the correctly worked addition problem shown, where the sum of the two-digit positive integers AB and BA is the three-digit integer AAC, and A, B, and C are different digits, what is the units digit of the integer AAC?

(A) 9
(B) 6
(C) 3
(D) 2
(E) 0

$$3r \le 4s + 5$$
$$|s| \le 5$$

101. Given the inequalities above, which of the following CANNOT be the value of r?

(A) –20
(B) –5
(C) 0
(D) 5
(E) 20

102. If m is an even integer, v is an odd integer, and $m > v > 0$, which of the following represents the number of even integers less than m and greater than v?

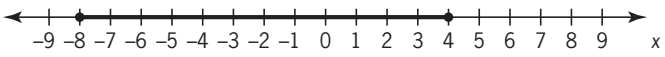
(A) $\frac{m-v}{2} - 1$
(B) $\frac{m-v-1}{2}$
(C) $\frac{m-v}{2}$
(D) $m - v - 1$
(E) $m - v$

103. A positive integer is divisible by 9 if and only if the sum of its digits is divisible by 9. If n is a positive integer, for which of the following values of k is $25 \times 10^n + k \times 10^{2n}$ divisible by 9 ?

(A) 9
(B) 16
(C) 23
(D) 35
(E) 47

104. The perimeter of rectangle A is 200 meters. The length of rectangle B is 10 meters less than the length of rectangle A and the width of rectangle B is 10 meters more than the width of rectangle A. If rectangle B is a square, what is the width, in meters, of rectangle A ?

(A) 10
(B) 20
(C) 40
(D) 50
(E) 60



105. On the number line, the shaded interval is the graph of which of the following inequalities?

(A) $|x| \leq 4$
(B) $|x| \leq 8$
(C) $|x - 2| \leq 4$
(D) $|x - 2| \leq 6$
(E) $|x + 2| \leq 6$

106. Of all the students in a certain dormitory, $\frac{1}{2}$ are first-year students and the rest are second-year students. If $\frac{4}{5}$ of the first-year students have not declared a major and if the fraction of second-year students who have declared a major is 3 times the fraction of first-year students who have declared a major, what fraction of all the students in the dormitory are second-year students who have not declared a major?

(A) $\frac{1}{15}$
(B) $\frac{1}{5}$
(C) $\frac{4}{15}$
(D) $\frac{1}{3}$
(E) $\frac{2}{5}$

107. If the average (arithmetic mean) of x, y, and z is $7x$ and $x \neq 0$, what is the ratio of x to the sum of y and z ?

(A) 1:21
(B) 1:20
(C) 1:6
(D) 6:1
(E) 20:1

108. $\frac{(-1.5)(1.2) - (4.5)(0.4)}{30} =$

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

109. In the coordinate plane, line k passes through the origin and has slope 2. If points $(3,y)$ and $(x,4)$ are on line k, then $x + y =$

(A) 3.5
(B) 7
(C) 8
(D) 10
(E) 14

110. If a, b, and c are constants, $a > b > c$, and $x^3 - x = (x - a)(x - b)(x - c)$ for all numbers x, what is the value of b ?

(A) -3
(B) -1
(C) 0
(D) 1
(E) 3

111. 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

112. $17^3 + 17^4 =$

(A) 17^7
(B) $17^3(18)$
(C) $17^6(18)$
(D) $2(17^3) + 17$
(E) $2(17^3) - 17$

113. Jonah drove the first half of a 100-mile trip in x hours and the second half in y hours. Which of the following is equal to Jonah's average speed, in miles per hour, for the entire trip?

(A) $\frac{50}{x+y}$
(B) $\frac{100}{x+y}$
(C) $\frac{25}{x}+\frac{25}{y}$
(D) $\frac{50}{x}+\frac{50}{y}$
(E) $\frac{100}{x}+\frac{100}{y}$

114. What is the greatest number of identical bouquets that can be made out of 21 white and 91 red tulips if no flowers are to be left out? (Two bouquets are identical whenever the number of red tulips in the two bouquets is equal and the number of white tulips in the two bouquets is equal.)

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

115. In the xy-plane, the points (c,d), $(c,-d)$, and $(-c,-d)$ are three vertices of a certain square. If $c < 0$ and $d > 0$, which of the following points is in the same quadrant as the fourth vertex of the square?

(A) $(-5,-3)$
(B) $(-5,3)$
(C) $(5,-3)$
(D) $(3,-5)$
(E) $(3,5)$

116. 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

117. If the amount of federal estate tax due on an estate valued at $1.35 million is $437,000 plus 43 percent of the value of the estate in excess of $1.25 million, then the federal tax due is approximately what percent of the value of the estate?

A. 30%
B. 35%
C. 40%
D. 45%
E. 50%

118. If $\frac{3}{10^4} = x\%$, then $x =$

(A) 0.3
(B) 0.03
(C) 0.003
(D) 0.0003
(E) 0.00003

119. 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) $\frac{x + ny}{n+1}$

120. 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) $3n$

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. What is the remainder when 3^{24} is divided by 5 ?

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

123. If the volume of a ball is 32,490 cubic millimeters, what is the volume of the ball in cubic centimeters? (1 millimeter = 0.1 centimeter)

(A) 0.3249
(B) 3.249
(C) 32.49
(D) 324.9
(E) 3,249

124. David used part of $100,000 to purchase a house. Of the remaining portion, he invested $\frac{1}{3}$ of it at 4 percent simple annual interest and $\frac{2}{3}$ of it at 6 percent simple annual interest. If after a year the income from the two investments totaled $320, what was the purchase price of the house?

(A) $96,000
(B) $94,000
(C) $88,000
(D) $75,000
(E) $40,000

125. 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) $\frac{3x}{80}$

126. 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) $\frac{4}{5}$

127. In the sequence $x_0, x_1, x_2, \ldots, x_n$, each term from x_1 to x_k is 3 greater than the previous term, and each term from x_{k+1} to x_n is 3 less than the previous term, where n and k are positive integers and $k < n$. If $x_0 = x_n = 0$ and if $x_k = 15$, what is the value of n?

(A) 5

(B) 6

(C) 9

(D) 10

(E) 15

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

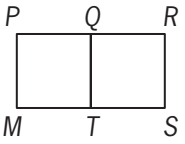
(A) $3x^2 - x + 2$

(B) $3x^2 + 1$

(C) $3x^2$

(D) $3x^2 - 1$

(E) $3x^2 - 2$



Note: Not drawn to scale.

129. In the figure shown above, line segment QR has length 12, and rectangle $MPQT$ is a square. If the area of rectangular region $MPRS$ is 540, what is the area of rectangular region $TQRS$?

(A) 144

(B) 216

(C) 324

(D) 360

(E) 396

130. 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) $1\frac{1}{2}$

131. A certain manufacturer sells its product to stores in 113 different regions worldwide, with an average (arithmetic mean) of 181 stores per region. If last year these stores sold an average of 51,752 units of the manufacturer's product per store, which of the following is closest to the total number of units of the manufacturer's product sold worldwide last year?

(A) 10^6

(B) 10^7

(C) 10^8

(D) 10^9

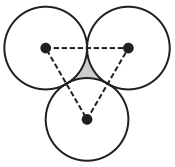
(E) 10^{10}

132. Andrew started saving at the beginning of the year and had saved $240 by the end of the year. He continued to save and by the end of 2 years had saved a total of $540. Which of the following is closest to the percent increase in the amount Andrew saved during the second year compared to the amount he saved during the first year?

(A) 11%
(B) 25%
(C) 44%
(D) 56%
(E) 125%

133. Two numbers differ by 2 and sum to S. Which of the following is the greater of the numbers in terms of S?

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



134. The figure shown above consists of three identical circles that are tangent to each other. If the area of the shaded region is $64\sqrt{3} - 32\pi$, what is the radius of each circle?

(A) 4
(B) 8
(C) 16
(D) 24
(E) 32

135. In a numerical table with 10 rows and 10 columns, each entry is either a 9 or a 10. If the number of 9s in the nth row is $n - 1$ for each n from 1 to 10, what is the average (arithmetic mean) of all the numbers in the table?

(A) 9.45
(B) 9.50
(C) 9.55
(D) 9.65
(E) 9.70

136. A positive integer n is a perfect number provided that the sum of all the positive factors of n, including 1 and n, is equal to $2n$. What is the sum of the reciprocals of all the positive factors of the perfect number 28?

(A) $\frac{1}{4}$
(B) $\frac{56}{27}$
(C) 2
(D) 3
(E) 4

137. The infinite sequence $a_1, a_2, \ldots, a_n, \ldots$ is such that $a_1 = 2$, $a_2 = -3$, $a_3 = 5$, $a_4 = -1$, and $a_n = a_{n-4}$ for $n > 4$. What is the sum of the first 97 terms of the sequence?

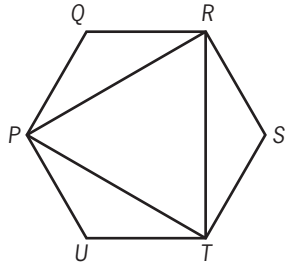
(A) 72
(B) 74
(C) 75
(D) 78
(E) 80

138. The sequence $a_1, a_2, \ldots a_n, \ldots$ is such that $a_n = 2a_{n-1} - x$ for all positive integers $n \geq 2$ and for a certain number x. If $a_5 = 99$ and $a_3 = 27$, what is the value of x?

(A) 3
(B) 9
(C) 18
(D) 36
(E) 45

139. A window is in the shape of a regular hexagon with each side of length 80 centimeters. If a diagonal through the center of the hexagon is w centimeters long, then $w =$

(A) 80
(B) 120
(C) 150
(D) 160
(E) 240



140. In the figure shown, *PQRSTU* is a regular polygon with sides of length x. What is the perimeter of triangle *PRT* in terms of x?

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

141. In a certain medical survey, 45 percent of the people surveyed had the type A antigen in their blood and 3 percent had both the type A antigen and the type B antigen. Which of the following is closest to the percent of those with the type A antigen who also had the type B antigen?

(A) 1.35%
(B) 6.67%
(C) 13.50%
(D) 15.00%
(E) 42.00%

142. On a certain transatlantic crossing, 20 percent of a ship's passengers held round-trip tickets and also took their cars aboard the ship. If 60 percent of the passengers with round-trip tickets did not take their cars aboard the ship, what percent of the ship's passengers held round-trip tickets?

(A) $33\frac{1}{3}\%$
(B) 40%
(C) 50%
(D) 60%
(E) $66\frac{2}{3}\%$

143. If x and k are integers and $(12^x)(4^{2x+1}) = (2^k)(3^2)$, what is the value of k?

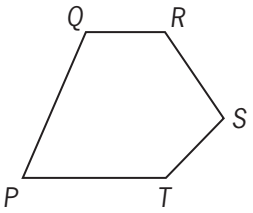
(A) 5
(B) 7
(C) 10
(D) 12
(E) 14

144. If S is the sum of the reciprocals of the 10 consecutive integers from 21 to 30, then S is between which of the following two fractions?

(A) $\frac{1}{3}$ and $\frac{1}{2}$
(B) $\frac{1}{4}$ and $\frac{1}{3}$
(C) $\frac{1}{5}$ and $\frac{1}{4}$
(D) $\frac{1}{6}$ and $\frac{1}{5}$
(E) $\frac{1}{7}$ and $\frac{1}{6}$

145. For every even positive integer m, $f(m)$ represents the product of all even integers from 2 to m, inclusive. For example, $f(12) = 2 \times 4 \times 6 \times 8 \times 10 \times 12$. What is the greatest prime factor of $f(24)$?

(A) 23
(B) 19
(C) 17
(D) 13
(E) 11



Note: Not drawn to scale.

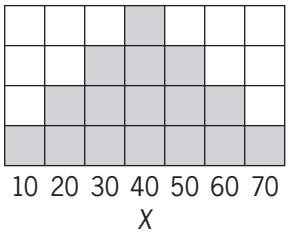
146. In pentagon $PQRST$, $PQ = 3$, $QR = 2$, $RS = 4$, and $ST = 5$. Which of the lengths 5, 10, and 15 could be the value of PT ?

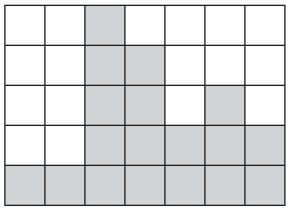
(A) 5 only
(B) 15 only
(C) 5 and 10 only
(D) 10 and 15 only
(E) 5, 10, and 15

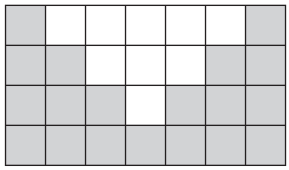
3, k, 2, 8, m, 3

147. 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

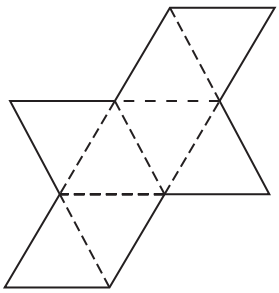






148. If the variables, X, Y, and Z take on only the values 10, 20, 30, 40, 50, 60, or 70 with frequencies indicated by the shaded regions above, for which of the frequency distributions is the mean equal to the median?

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



149. When the figure above is cut along the solid lines, folded along the dashed lines, and taped along the solid lines, the result is a model of a geometric solid. This geometric solid consists of 2 pyramids, each with a square base that they share. What is the sum of the number of edges and the number of faces of this geometric solid?

(A) 10
(B) 18
(C) 20
(D) 24
(E) 25

$$2x + y = 12$$
$$|y| \le 12$$

150. For how many ordered pairs (x,y) that are solutions of the system above are x and y both integers?

(A) 7
(B) 10
(C) 12
(D) 13
(E) 14

151. The points R, T, and U lie on a circle that has radius 4. If the length of arc RTU is $\frac{4\pi}{3}$, what is the length of line segment RU?

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

152. A certain university will select 1 of 7 candidates eligible to fill a position in the mathematics department and 2 of 10 candidates eligible to fill 2 identical positions in the computer science department. If none of the candidates is eligible for a position in both departments, how many different sets of 3 candidates are there to fill the 3 positions?

(A) 42
(B) 70
(C) 140
(D) 165
(E) 315

153. A survey of employers found that during 1993 employment costs rose 3.5 percent, where employment costs consist of salary costs and fringe-benefit costs. If salary costs rose 3 percent and fringe-benefit costs rose 5.5 percent during 1993, then fringe-benefit costs represented what percent of employment costs at the beginning of 1993?

(A) 16.5%
(B) 20%
(C) 35%
(D) 55%
(E) 65%

154. The subsets of the set $\{w, x, y\}$ are $\{w\}$, $\{x\}$, $\{y\}$, $\{w, x\}$, $\{w, y\}$, $\{x, y\}$, $\{w, x, y\}$, and $\{\ \}$ (the empty subset). How many subsets of the set $\{w, x, y, z\}$ contain w?

(A) Four
(B) Five
(C) Seven
(D) Eight
(E) Sixteen

155. There are 5 cars to be displayed in 5 parking spaces, with all the cars facing the same direction. Of the 5 cars, 3 are red, 1 is blue, and 1 is yellow. If the cars are identical except for color, how many different display arrangements of the 5 cars are possible?

(A) 20
(B) 25
(C) 40
(D) 60
(E) 125

156. The number $\sqrt{63 - 36\sqrt{3}}$ can be expressed as $x + y\sqrt{3}$ for some integers x and y. What is the value of xy?

(A) –18
(B) –6
(C) 6
(D) 18
(E) 27

157. There are 10 books on a shelf, of which 4 are paperbacks and 6 are hardbacks. How many possible selections of 5 books from the shelf contain at least one paperback and at least one hardback?

(A) 75
(B) 120
(C) 210
(D) 246
(E) 252

158. 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) $\frac{5}{6}$

159. The function f is defined for each positive three-digit integer n by $f(n) = 2^x 3^y 5^z$, where x, y, and z are the hundreds, tens, and units digits of n, respectively. If m and v are three-digit positive integers such that $f(m) = 9f(v)$, then $m - v =$

(A) 8

(B) 9

(C) 18

(C) 20

(E) 80

160. If $10^{50} - 74$ is written as an integer in base 10 notation, what is the sum of the digits in that integer?

(A) 424

(B) 433

(C) 440

(D) 449

(E) 467

161. A certain company that sells only cars and trucks reported that revenues from car sales in 1997 were down 11 percent from 1996 and revenues from truck sales in 1997 were up 7 percent from 1996. If total revenues from car sales and truck sales in 1997 were up 1 percent from 1996, what is the ratio of revenue from car sales in 1996 to revenue from truck sales in 1996 ?

(A) 1:2

(B) 4:5

(C) 1:1

(D) 3:2

(E) 5:3

162. Becky rented a power tool from a rental shop. The rent for the tool was $12 for the first hour and $3 for each additional hour. If Becky paid a total of $27, excluding sales tax, to rent the tool, for how many hours did she rent it?

(A) 5

(B) 6

(C) 9

(D) 10

(E) 12

163. If $4 < \frac{7 - x}{3}$, which of the following must be true?

I. $5 < x$

II. $|x + 3| > 2$

III. $-(x + 5)$ is positive.

(A) II only

(B) III only

(C) I and II only

(D) II and III only

(E) I, II, and III

164. A certain right triangle has sides of length x, y, and z, where $x < y < z$. If the area of this triangular region is 1, which of the following indicates all of the possible values of y ?

(A) $y > \sqrt{2}$

(B) $\frac{\sqrt{3}}{2} < y < \sqrt{2}$

(C) $\frac{\sqrt{2}}{3} < y < \frac{\sqrt{3}}{2}$

(D) $\frac{\sqrt{3}}{4} < y < \frac{\sqrt{2}}{3}$

(E) $y < \frac{\sqrt{3}}{4}$

165. On a certain day, a bakery produced a batch of rolls at a total production cost of $300. On that day, $\frac{4}{5}$ of the rolls in the batch were sold, each at a price that was 50 percent greater than the average (arithmetic mean) production cost per roll. The remaining rolls in the batch were sold the next day, each at a price that was 20 percent less than the price of the day before. What was the bakery's profit on this batch of rolls?

(A) $150
(B) $144
(C) $132
(D) $108
(E) $90

166. A set of numbers has the property that for any number t in the set, $t + 2$ is in the set. If -1 is in the set, which of the following must also be in the set?

I. -3
II. 1
III. 5

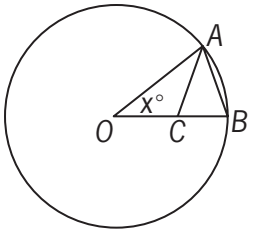
(A) I only
(B) II only
(C) I and II only
(D) II and III only
(E) I, II, and III

167. A couple decides to have 4 children. If they succeed in having 4 children and each child is equally likely to be a boy or a girl, what is the probability that they will have exactly 2 girls and 2 boys?

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

168. The closing price of Stock X changed on each trading day last month. The percent change in the closing price of Stock X from the first trading day last month to each of the other trading days last month was less than 50 percent. If the closing price on the second trading day last month was $10.00, which of the following CANNOT be the closing price on the last trading day last month?

(A) $3.00
(B) $9.00
(C) $19.00
(D) $24.00
(E) $29.00



169. In the figure above, point O is the center of the circle and $OC = AC = AB$. What is the value of x?

(A) 40
(B) 36
(C) 34
(D) 32
(E) 30

170. 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

171. 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

172. 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) $(x - y)(s - p)$

173. 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) $\frac{yz}{x}$

174. Running at their respective constant rates, Machine X takes 2 days longer to produce w widgets than Machine Y. At these rates, if the two machines together produce $\frac{5}{4}w$ widgets in 3 days, how many days would it take Machine X alone to produce $2w$ widgets?

(A) 4
(B) 6
(C) 8
(D) 10
(E) 12

175. A square wooden plaque has a square brass inlay in the center, leaving a wooden strip of uniform width around the brass square. If the ratio of the brass area to the wooden area is 25 to 39, which of the following could be the width, in inches, of the wooden 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. $\dfrac{2\frac{3}{5} - 1\frac{2}{3}}{\frac{2}{3} - \frac{3}{5}} =$

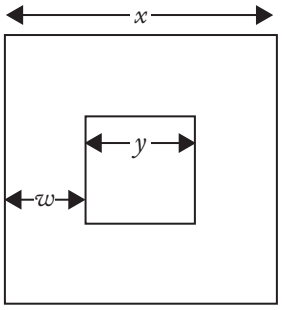
(A) 16
(B) 14
(C) 3
(D) 1
(E) –1

175. A square wooden plaque has a square brass inlay in the center, leaving a wooden strip of uniform width around the brass square. If the ratio of the brass area to the wooden area is 25 to 39, which of the following could be the width, in inches, of the wooden 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

Geometry Area



Note: Not drawn to scale.

Let x represent the side length of the entire plaque, let y represent the side length of the brass inlay, and w represent the uniform width of the wooden strip around the brass inlay, as shown in the figure above. Since the ratio of the area of the brass inlay to the area of the wooden strip is 25 to 39, the ratio of the area of the brass inlay to the area of the entire plaque is $\frac{y^2}{x^2}=\frac{25}{25+39}=\frac{25}{64}$. Then, $\frac{y}{x}=\sqrt{\frac{25}{64}}=\frac{5}{8}$ and $y=\frac{5}{8}x$. Also, $x=y+2w$ and $w=\frac{x-y}{2}$. Substituting $\frac{5}{8}x$ for y into this expression for w gives $w=\frac{x-\frac{5}{8}x}{2}=\frac{\frac{3}{8}x}{2}=\frac{3}{16}x$. Thus,

I. If the plaque were $\frac{16}{3}$ inches on a side, then the width of the wooden strip would be 1 inch, and so 1 inch is a possible width for the wooden strip.

II. If the plaque were 16 inches on a side, then the width of the wooden strip would be 3 inches, and so 3 inches is a possible width for the wooden strip.

III. If the plaque were $\frac{64}{3}$ inches on a side, then the width of the wooden strip would be 4 inches, and so 4 inches is a possible width for the wooden strip.

The correct answer is E.

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

(A) 16
(B) 14
(C) 3
(D) 1
(E) –1

Arithmetic Operations on rational numbers

Work the problem:

$$\frac{2\frac{3}{5}-1\frac{2}{3}}{\frac{2}{3}-\frac{3}{5}}=\frac{\frac{13}{5}-\frac{5}{3}}{\frac{2}{3}-\frac{3}{5}}=\frac{\frac{39-25}{15}}{\frac{10-9}{15}}=\frac{\frac{14}{15}}{\frac{1}{15}}=\frac{14}{15}\times\frac{15}{1}=14$$

The correct answer is B.

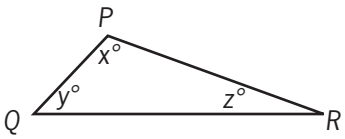
5.3 Sample Questions

Each data sufficiency problem consists of a question and two statements, labeled (1) and (2), which contain certain data. Using these data and your knowledge of mathematics and everyday facts (such as the number of days in July or the meaning of the word *counterclockwise*), decide whether the data given are sufficient for answering the question and then indicate one of the following answer choices:

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.

Note: In data sufficiency problems that ask for the value of a quantity, the data given in the statements are sufficient only when it is possible to determine exactly one numerical value for the quantity.

Example:



In ΔPQR, what is the value of x ?

(1) $PQ = PR$

(2) $y = 40$

Explanation: According to statement (1) $PQ = PR$; therefore, ΔPQR is isosceles and $y = z$. Since $x + y + z = 180$, it follows that $x + 2y = 180$. Since statement (1) does not give a value for y, you cannot answer the question using statement (1) alone. According to statement (2), $y = 40$; therefore, $x + z = 140$. Since statement (2) does not give a value for z, you cannot answer the question using statement (2) alone. Using both statements together, since $x + 2y = 180$ and the value of y is given, you can find the value of x. Therefore, BOTH statements (1) and (2) TOGETHER are sufficient to answer the questions, but NEITHER statement ALONE is sufficient.

Numbers: All numbers used are real numbers.

Figures:

- **Figures conform to the information given in the question, but will not necessarily conform to the additional information given in statements (1) and (2).**
- **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.**

177. What is the tenths digit of the number d when it is written as a decimal?

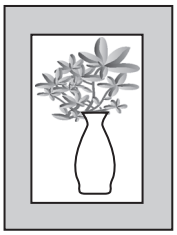
(1) $d = \frac{54}{25}$

(2) $1{,}000d = 2{,}160$

178. Rita's monthly salary is $\frac{2}{3}$ Juanita's monthly salary. What is their combined monthly salary?

(1) Rita's monthly salary is \$4,000.

(2) Either Rita's monthly salary or Juanita's monthly salary is \$6,000.



179. A framed picture is shown above. The frame, shown shaded, is 6 inches wide and forms a border of uniform width around the picture. What are the dimensions of the viewable portion of the picture?

(1) The area of the shaded region is 24 square inches.

(2) The frame is 8 inches tall.

180. What is the value of the integer x?

(1) x rounded to the nearest hundred is 7,200.

(2) The hundreds digit of x is 2.

181. Is $2x > 2y$?

(1) $x > y$

(2) $3x > 3y$

182. If p and q are positive, is $\frac{p}{q}$ less than 1?

(1) p is less than 4.

(2) q is less than 4.

183. In a certain factory, hours worked by each employee in excess of 40 hours per week are overtime hours and are paid for at $1\frac{1}{2}$ times the employee's regular hourly pay rate. If an employee worked a total of 42 hours last week, how much was the employee's gross pay for the hours worked last week?

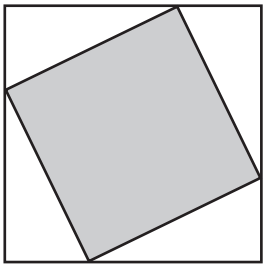
(1) The employee's gross pay for overtime hours worked last week was \$30.

(2) The employee's gross pay for all hours worked last week was \$30 more than for the previous week.

184. If $x > 0$, what is the value of x^5?

(1) $\sqrt{x} = 32$

(2) $x^2 = 2^{20}$



185. In the quilting pattern shown above, a small square has its vertices on the sides of a larger square. What is the side length, in centimeters, of the larger square?

(1) The side length of the smaller square is 10 cm.

(2) Each vertex of the small square cuts 1 side of the larger square into 2 segments with lengths in the ratio of 1:2.

186. Did Insurance Company K have more than \$300 million in total net profits last year?

(1) Last year Company K paid out \$0.95 in claims for every dollar of premiums collected.

(2) Last year Company K earned a total of \$150 million in profits from the investment of accumulated surplus premiums from previous years.

187. How many hours would it take Pump A and Pump B working together, each at its own constant rate, to empty a tank that was initially full?

(1) Working alone at its constant rate, Pump A would empty the full tank in 4 hours 20 minutes.

(2) Working alone, Pump B would empty the full tank at its constant rate of 72 liters per minute.

188. What is the value of the integer N?

(1) $101 < N < 103$

(2) $202 < 2N < 206$

189. Is zw positive?

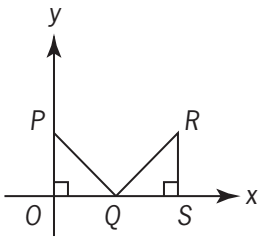
(1) $z + w^3 = 20$

(2) z is positive.

190. On the scale drawing of a certain house plan, if 1 centimeter represents x meters, what is the value of x?

(1) A rectangular room that has a floor area of 12 square meters is represented by a region of area 48 square centimeters.

(2) The 15-meter length of the house is represented by a segment 30 centimeters long.



191. In the rectangular coordinate system above, if ΔOPQ and ΔQRS have equal area, what are the coordinates of point R?

(1) The coordinates of point P are (0,12).

(2) $OP = OQ$ and $QS = RS$.

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

(1) $x > 75$

(2) $y - x = 10$

193. How much did credit-card fraud cost United States banks in year X to the nearest $10 million?

(1) In year X, counterfeit cards and telephone and mail-order fraud accounted for 39 percent of the total amount that card fraud cost the banks.

(2) In year X, stolen cards accounted for $158.4 million, or 16 percent, of the total amount that credit-card fraud cost the banks.

194. What is the average (arithmetic mean) of x and y?

(1) The average of x and $2y$ is 10.

(2) The average of $2x$ and $7y$ is 32.

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

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

(2) $r + s = 10$

196. Is the positive integer n odd?

(1) $n^2 + (n+1)^2 + (n+2)^2$ is even.

(2) $n^2 - (n+1)^2 - (n+2)^2$ is even.

197. For all x, the expression x^* is defined to be $ax + a$, where a is a constant. What is the value of 2^*?

(1) $3^* = 2$

(2) $5^* = 3$

198. Is $k + m < 0$?

(1) $k < 0$

(2) $km > 0$

199. 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) $x - y = 5$

200. If x and y are positive, is $xy > x + y$?

(1) $x < y$

(2) $2 < x$

201. What is the ratio of c to d?

(1) The ratio of $3c$ to $3d$ is 3 to 4.

(2) The ratio of $c + 3$ to $d + 3$ is 4 to 5.

202. A certain dealership has a number of cars to be sold by its salespeople. How many cars are to be sold?

(1) If each of the salespeople sells 4 of the cars, 23 cars will remain unsold.

(2) If each of the salespeople sells 6 of the cars, 5 cars will remain unsold.

203. A candle company determines that, for a certain specialty candle, the supply function is $p = m_1x + b_1$ and the demand function is $p = m_2x + b_2$, where p is the price of each candle, x is the number of candles supplied or demanded, and m_1, m_2, b_1, and b_2 are constants. At what value of x do the graphs of the supply function and demand function intersect?

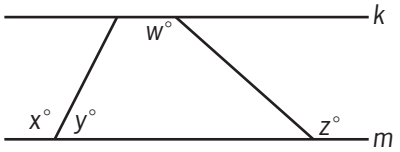
(1) $m_1 = -m_2 = 0.005$

(2) $b_2 - b_1 = 6$

204. Some computers at a certain company are Brand X and the rest are Brand Y. If the ratio of the number of Brand Y computers to the number of Brand X computers at the company is 5 to 6, how many of the computers are Brand Y ?

(1) There are 80 more Brand X computers than Brand Y computers at the company.

(2) There is a total of 880 computers at the company.



205. In the figure shown, lines k and m are parallel to each other. Is $x = z$?

(1) $x = w$

(2) $y = 180 - w$

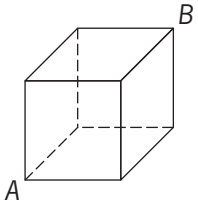
206. When the wind speed is 9 miles per hour, the wind-chill factor w is given by

$$w = -17.366 + 1.19t,$$

where t is the temperature in degrees Fahrenheit. If at noon yesterday the wind speed was 9 miles per hour, was the wind-chill factor greater than 0 ?

(1) The temperature at noon yesterday was greater than 10 degrees Fahrenheit.

(2) The temperature at noon yesterday was less than 20 degrees Fahrenheit.



207. What is the volume of the cube above?

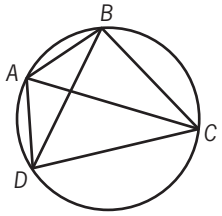
(1) The surface area of the cube is 600 square inches.

(2) The length of diagonal AB is $10\sqrt{3}$ inches.

208. 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.



209. In the figure shown, quadrilateral $ABCD$ is inscribed in a circle of radius 5. What is the perimeter of quadrilateral $ABCD$?

(1) The length of AB is 6 and the length of CD is 8.

(2) AC is a diameter of the circle.

210. If x is a positive integer, what is the value of x ?

(1) $x^2 = \sqrt{x}$

(2) $\frac{n}{x} = n$ and $n \neq 0$.

211. Is the median of the five numbers a, b, c, d, and e equal to d?

(1) $a < c < e$

(2) $b < d < c$

212. During a certain bicycle ride, was Sherry's average speed faster than 24 kilometers per hour? (1 kilometer = 1,000 meters)

(1) Sherry's average speed during the bicycle ride was faster than 7 meters per second.

(2) Sherry's average speed during the bicycle ride was slower than 8 meters per second.

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

(1) $xy = 1$

(2) $x \neq -1$

214. If p, s, and t are positive, is $|ps - pt| > p(s - t)$?

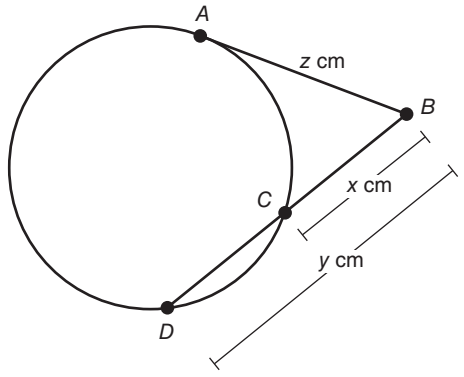
(1) $p < s$

(2) $s < t$

215. Is $x > y$?

(1) $x + y > x - y$

(2) $3x > 2y$



216. In the figure above, $\overline{AB}$, which has length z cm, is tangent to the circle at point A, and $\overline{BD}$, which has length y cm, intersects the circle at point C. If $BC = x$ cm and $z = \sqrt{xy}$, what is the value of x?

(1) $CD = x$ cm

(2) $z = 5\sqrt{2}$

217. The total cost of an office dinner was shared equally by k of the n employees who attended the dinner. What was the total cost of the dinner?

(1) Each of the k employees who shared the cost of the dinner paid \$19.

(2) If the total cost of the dinner had been shared equally by $k + 1$ of the n employees who attended the dinner, each of the $k + 1$ employees would have paid \$18.

218. What is the value of x?

(1) $x + 1 = 2 - 3x$

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

219. Is the integer n a prime number?

(1) $24 \leq n \leq 28$

(2) n is not divisible by 2 or 3.

220. What is the sum of the first four terms of sequence S?

(1) After the first two terms of S, the value of each term of S is equal to the average (arithmetic mean) of the last two preceding terms.

(2) The average (arithmetic mean) of the first three terms of S is 10.

221. If x and y are positive integers, what is the remainder when $10^x + y$ is divided by 3?

(1) $x = 5$

(2) $y = 2$

222. 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.

223. In a certain order, the pretax price of each regular pencil was \$0.03, the pretax price of each deluxe pencil was \$0.05, and there were 50% more deluxe pencils than regular pencils. All taxes on the order are a fixed percent of the pretax prices. The sum of the total pretax price of the order and the tax on the order was \$44.10. What was the amount, in dollars, of the tax on the order?

(1) The tax on the order was 5% of the total pretax price of the order.

(2) The order contained exactly 400 regular pencils.

224. If m is an integer greater than 1, is m an even integer?

(1) 32 is a factor of m.

(2) m is a factor of 32.

225. If the set S consists of five consecutive positive integers, what is the sum of these five integers?

(1) The integer 11 is in S, but 10 is not in S.

(2) The sum of the even integers in S is 26.

226. If $x > 0$, what is the value of x?

(1) $x^3 - x = 0$

(2) $\sqrt[3]{x} - x = 0$

227. Which of the positive numbers x or y is greater?

(1) $y = 2x$

(2) $2x + 5y = 12$

228. A total of 20 amounts are entered on a spreadsheet that has 5 rows and 4 columns; each of the 20 positions in the spreadsheet contains one amount. The average (arithmetic mean) of the amounts in row i is R_i $(1 \le i \le 5)$. The average of the amounts in column j is C_j $(1 \le j \le 4)$. What is the average of all 20 amounts on the spreadsheet?

(1) $R_1 + R_2 + R_3 + R_4 + R_5 = 550$

(2) $C_1 + C_2 + C_3 + C_4 = 440$

229. Was the range of the amounts of money that Company Y budgeted for its projects last year equal to the range of the amounts of money that it budgeted for its projects this year?

(1) Both last year and this year, Company Y budgeted money for 12 projects and the least amount of money that it budgeted for a project was \$400.

(2) Both last year and this year, the average (arithmetic mean) amount of money that Company Y budgeted per project was \$2,000.

230. If a, b, c, and d are numbers on the number line shown and if the tick marks are equally spaced, what is the value of $a + c$?

(1) $a + b = -8$

(2) $a + d = 0$

231. Is $xm < ym$?

(1) $x > y$

(2) $m < 0$

232. If $y = x^2 - 6x + 9$, what is the value of x?

(1) $y = 0$

(2) $x + y = 3$

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

(1) $r + s = 4rs$

(2) $r = s$

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

(1) $z - x = 2$

(2) $x < y < z$

235. A collection of 36 cards consists of 4 sets of 9 cards each. The 9 cards in each set are numbered 1 through 9. If one card has been removed from the collection, what is the number on that card?

(1) The units digit of the sum of the numbers on the remaining 35 cards is 6.

(2) The sum of the numbers on the remaining 35 cards is 176.

236. In the xy-plane, point (r,s) lies on a circle with center at the origin. What is the value of $r^2 + s^2$?

(1) The circle has radius 2.

(2) The point $\left(\sqrt{2},-\sqrt{2}\right)$ lies on the circle.

237. If r, s, and t are nonzero integers, is $r^5s^3t^4$ negative?

(1) rt is negative.

(2) s is negative.

238. Each Type A machine fills 400 cans per minute, each Type B machine fills 600 cans per minute, and each Type C machine installs 2,400 lids per minute. A lid is installed on each can that is filled and on no can that is not filled. For a particular minute, what is the total number of machines working?

(1) A total of 4,800 cans are filled that minute.

(2) For that minute, there are 2 Type B machines working for every Type C machine working.

239. If a and b are constants, what is the value of a ?

(1) $a < b$

(2) $(t - a)(t - b) = t^2 + t - 12$, for all values of t.

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

(1) $\sqrt{4x}$ is an integer.

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

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

(1) $p + x < q$

(2) $y < z$

242. 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.

243. If $abc \neq 0$, is $\dfrac{\dfrac{a}{b}}{c} = \dfrac{a}{\dfrac{b}{c}}$?

(1) $a = 1$

(2) $c = 1$

244. The arithmetic mean of a collection of 5 positive integers, not necessarily distinct, is 9. One additional positive integer is included in the collection and the arithmetic mean of the 6 integers is computed. Is the arithmetic mean of the 6 integers at least 10 ?

(1) The additional integer is at least 14.

(2) The additional integer is a multiple of 5.

245. A certain list consists of 400 different numbers. Is the average (arithmetic mean) of the numbers in the list greater than the median of the numbers in the list?

(1) Of the numbers in the list, 280 are less than the average.

(2) Of the numbers in the list, 30 percent are greater than or equal to the average.

246. In a two-month survey of shoppers, each shopper bought one of two brands of detergent, X or Y, in the first month and again bought one of these brands in the second month. In the survey, 90 percent of the shoppers who bought Brand X in the first month bought Brand X again in the second month, while 60 percent of the shoppers who bought Brand Y in the first month bought Brand Y again in the second month. What percent of the shoppers bought Brand Y in the second month?

(1) In the first month, 50 percent of the shoppers bought Brand X.

(2) The total number of shoppers surveyed was 5,000.

247. If m and n are positive integers, is $m + n$ divisible by 4 ?

(1) m and n are each divisible by 2.

(2) Neither m nor n is divisible by 4.

248. What is the area of rectangular region R?

(1) Each diagonal of R has length 5.

(2) The perimeter of R is 14.

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

(1) $s - r = 5$

(2) r and s are not integers.

250. 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.

251. If n is positive, is $\sqrt{n} > 100$?

(1) $\sqrt{n-1} > 99$

(2) $\sqrt{n+1} > 101$

252. Is $xy > 5$?

(1) $1 \le x \le 3$ and $2 \le y \le 4$.

(2) $x + y = 5$

253. 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.

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

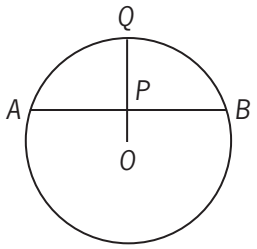
(1) $p = q$

(2) $x = 3$

255. 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.



256. 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.

257. If a and b are positive integers, what is the value of the product ab?

(1) The least common multiple of a and b is 48.

(2) The greatest common factor of a and b is 4.

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

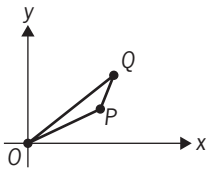
(1) The diameter of the bicycle wheel, including the tire, was 0.5 meter.

(2) The wheel made twenty 360-degree rotations per minute.

259. 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 $x^2 + bx + 12 = 0$.



260. In the figure above, line segment OP has slope $\frac{1}{2}$ and line segment PQ has slope 2. What is the slope of line segment OQ?

(1) Line segment OP has length $2\sqrt{5}$.

(2) The coordinates of point Q are (5,4).

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

(1) The length of XY is 3.

(2) The length of XZ is 5.

262. If the average (arithmetic mean) of n consecutive odd integers is 10, what is the least of the integers?

(1) The range of the n integers is 14.

(2) The greatest of the n integers is 17.

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

(1) $xz > yz$

(2) $yx > yz$

264. K is a set of numbers such that

(i) if x is in K, then $-x$ is in K, and

(ii) if each of x and y is in K, then xy is in K.

Is 12 in K?

(1) 2 is in K.

(2) 3 is in K.

265. If $x^2 + y^2 = 29$, what is the value of $(x - y)^2$?

(1) $xy = 10$

(2) $x = 5$

266. 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.

267. Is x between 0 and 1?

(1) x^2 is less than x.

(2) x^3 is positive.

268. If m and n are nonzero integers, is m^n an integer?

(1) n^m is positive.

(2) n^m is an integer.

269. What is the value of xy?

(1) $x + y = 10$

(2) $x - y = 6$

270. If n is the least of three different integers greater than 1, what is the value of n?

(1) The product of the three integers is 90.

(2) One of the integers is twice one of the other two integers.

271. Is x^2 greater than x?

(1) x^2 is greater than 1.

(2) x is greater than -1.

272. Michael arranged all his books in a bookcase with 10 books on each shelf and no books left over. After Michael acquired 10 additional books, he arranged all his books in a new bookcase with 12 books on each shelf and no books left over. How many books did Michael have before he acquired the 10 additional books?

(1) Before Michael acquired the 10 additional books, he had fewer than 96 books.

(2) Before Michael acquired the 10 additional books, he had more than 24 books.

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

(1) $x + y = xy$

(2) $x = y$

274. Last year in a group of 30 businesses, 21 reported a net profit and 15 had investments in foreign markets. How many of the businesses did not report a net profit nor invest in foreign markets last year?

(1) Last year 12 of the 30 businesses reported a net profit and had investments in foreign markets.

(2) Last year 24 of the 30 businesses reported a net profit or invested in foreign markets, or both.

275. 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.

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

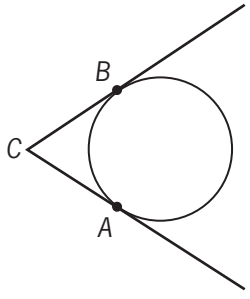
(1) $z > x + y + 1$

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

277. For all z, $\lceil z \rceil$ denotes the least integer greater than or equal to z. Is $\lceil x \rceil = 0$?

(1) $-1 < x < -0.1$

(2) $\lceil x + 0.5 \rceil = 1$



278. 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.

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

(1) $x - y = 5$

(2) $xy^2 = 18$

280. $[y]$ denotes the greatest integer less than or equal to y. Is $d < 1$?

(1) $d = y - [y]$

(2) $[d] = 0$

281. If N is a positive odd integer, is N prime?

(1) $N = 2^k + 1$ for some positive integer k.

(2) $N + 2$ and $N + 4$ are both prime.

282. If m is a positive integer, then m^3 has how many digits?

(1) m has 3 digits.

(2) m^2 has 5 digits.

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

(1) $(x - y)^2 = 9$

(2) $x + y = 6$

284. For each landscaping job that takes more than 4 hours, a certain contractor charges a total of r dollars for the first 4 hours plus $0.2r$ dollars for each additional hour or fraction of an hour, where $r > 100$. Did a particular landscaping job take more than 10 hours?

(1) The contractor charged a total of \$288 for the job.

(2) The contractor charged a total of $2.4r$ dollars for the job.

285. If $x^2 = 2^x$, what is the value of x?

(1) $2x = \left(\frac{x}{2}\right)^3$

(2) $x = 2^{x-2}$

286. The sequence $s_1, s_2, s_3, \ldots, s_n, \ldots$ is such that $s_n = \frac{1}{n} - \frac{1}{n+1}$ for all integers $n \geq 1$. If k is a positive integer, is the sum of the first k terms of the sequence greater than $\frac{9}{10}$?

(1) $k > 10$

(2) $k < 19$

287. In the sequence S of numbers, each term after the first two terms is the sum of the two immediately preceding terms. What is the 5th term of S?

(1) The 6th term of S minus the 4th term equals 5.

(2) The 6th term of S plus the 7th term equals 21.

288. If 75 percent of the guests at a certain banquet ordered dessert, what percent of the guests ordered coffee?

(1) 60 percent of the guests who ordered dessert also ordered coffee.

(2) 90 percent of the guests who ordered coffee also ordered dessert.

289. A tank containing water started to leak. Did the tank contain more than 30 gallons of water when it started to leak? (Note: 1 gallon = 128 ounces)

(1) The water leaked from the tank at a constant rate of 6.4 ounces per minute.

(2) The tank became empty less than 12 hours after it started to leak.

290. In the xy-plane, lines k and ℓ intersect at the point (1,1). Is the y-intercept of k greater than the y-intercept of ℓ?

(1) The slope of k is less than the slope of ℓ.

(2) The slope of ℓ is positive.

291. A triangle has side lengths of a, b, and c centimeters. Does each angle in the triangle measure less than 90 degrees?

(1) The 3 semicircles whose diameters are the sides of the triangle have areas that are equal to 3 cm^2, 4 cm^2, and 6 cm^2, respectively.

(2) $c < a + b < c + 2$

292. Each of the 45 books on a shelf is written either in English or in Spanish, and each of the books is either a hardcover book or a paperback. If a book is to be selected at random from the books on the shelf, is the probability less than $\frac{1}{2}$ that the book selected will be a paperback written in Spanish?

(1) Of the books on the shelf, 30 are paperbacks.

(2) Of the books on the shelf, 15 are written in Spanish.

293. A small school has three foreign language classes, one in French, one in Spanish, and one in German. How many of the 34 students enrolled in the Spanish class are also enrolled in the French class?

(1) There are 27 students enrolled in the French class, and 49 students enrolled in either the French class, the Spanish class, or both of these classes.

(2) One-half of the students enrolled in the Spanish class are enrolled in more than one foreign language class.

294. 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.

295. Last year $\frac{3}{5}$ of the members of a certain club were males. This year the members of the club include all the members from last year plus some new members. Is the fraction of the members of the club who are males greater this year than last year?

(1) More than half of the new members are male.

(2) The number of members of the club this year is $\frac{6}{5}$ the number of members last year.

296. If a, b, and c are consecutive integers and $0 < a < b < c$, is the product abc a multiple of 8?

(1) The product ac is even.

(2) The product bc is a multiple of 4.

297. M and N are integers such that $6 < M < N$. What is the value of N?

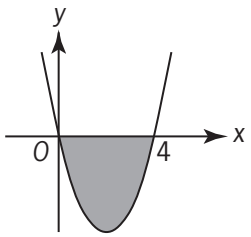
(1) The greatest common divisor of M and N is 6.

(2) The least common multiple of M and N is 36.

298. Stations X and Y are connected by two separate, straight, parallel rail lines that are 250 miles long. Train P and train Q simultaneously left Station X and Station Y, respectively, and each train traveled to the other's point of departure. The two trains passed each other after traveling for 2 hours. When the two trains passed, which train was nearer to its destination?

(1) At the time when the two trains passed, train P had averaged a speed of 70 miles per hour.

(2) Train Q averaged a speed of 55 miles per hour for the entire trip.



299. In the *xy*-plane shown, the shaded region consists of all points that lie above the graph of $y = x^2 - 4x$ and below the *x*-axis. Does the point (a,b) (not shown) lie in the shaded region if $b < 0$?

(1) $0 < a < 4$

(2) $a^2 - 4a < b$

300. If a and b are positive integers, is $\sqrt[3]{ab}$ an integer?

(1) $\sqrt{a}$ is an integer.

(2) $b = \sqrt{a}$

DRILL 1

Identify the answer choices that are too obvious for each of the following questions, and then figure out the correct answers. The answers can be found on this page.

1. If Alex drives 80 miles per hour from her house to work and 100 miles per hour from work to her house, and drives along the same route both ways, which of the following is the closest approximation of her average speed, in miles per hour, for the round trip?

   ◯ 80.0
   ◯ 88.9
   ◯ 90.0
   ◯ 91.1
   ◯ 100.0

2. For which of the following values of n is $(-0.5)^n$ the greatest?

   ◯ 5
   ◯ 4
   ◯ 3
   ◯ 2
   ◯ 1

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

   ◯ 27
   ◯ 18
   ◯ 9
   ◯ $3\sqrt{3}$
   ◯ 3

- ◯ $2,160
- ◯ $3,180
- ◯ $3,185
- ◯ $5,160
- ◯ $6,037

2. If Steve's original salary is increased by 5 percent and then, 3 months later, his salary is increased again by 20 percent, then Steve's raises are what percent of his original salary?

- ◯ 25%
- ◯ 26%
- ◯ 27%
- ◯ 30%
- ◯ 32%

DRILL 1

The answers can be found on this page.

Remember!

For Data Sufficiency problems in this book, we do not supply the answer choices. The five possible answer choices are the same every time.

1. If Mike buys a bicycle and a helmet for a total cost of $315, how much does the helmet cost?

   (1) The bicycle costs twice as much as the helmet.
   (2) The bicycle costs $210.

2. Carol and Joe went apple picking. Who picked more apples?

   (1) Joe picked $\frac{3}{4}$ as many apples as Carol did.
   (2) After Carol stopped picking apples, Joe continued to pick apples until he had picked 15 apples.

3. If each child in a group of children received either one or two pieces of candy, how many of the children received two pieces of candy?

   (1) Of the children in the group, 25 percent received two pieces of candy.
   (2) The children in the group received a total of 15 pieces of candy.

4. If the rents for both Doug's and Magda's apartments were increased, which tenant paid the greater dollar increase in rent?

   (1) Doug's rent increased 2 percent.
   (2) Magda's rent increased 8 percent.

5. If x is an integer, is $x + 2$ even?

   (1) $x + 3$ is an even integer.
   (2) $x - 2$ is an odd integer.

Types of Data Sufficiency

Comprehensive Data Sufficiency 1 Drill

The answers can be found on this page.

Remember!

For Data Sufficiency problems in this book, we do not supply the answer choices. The five possible answer choices are the same every time.

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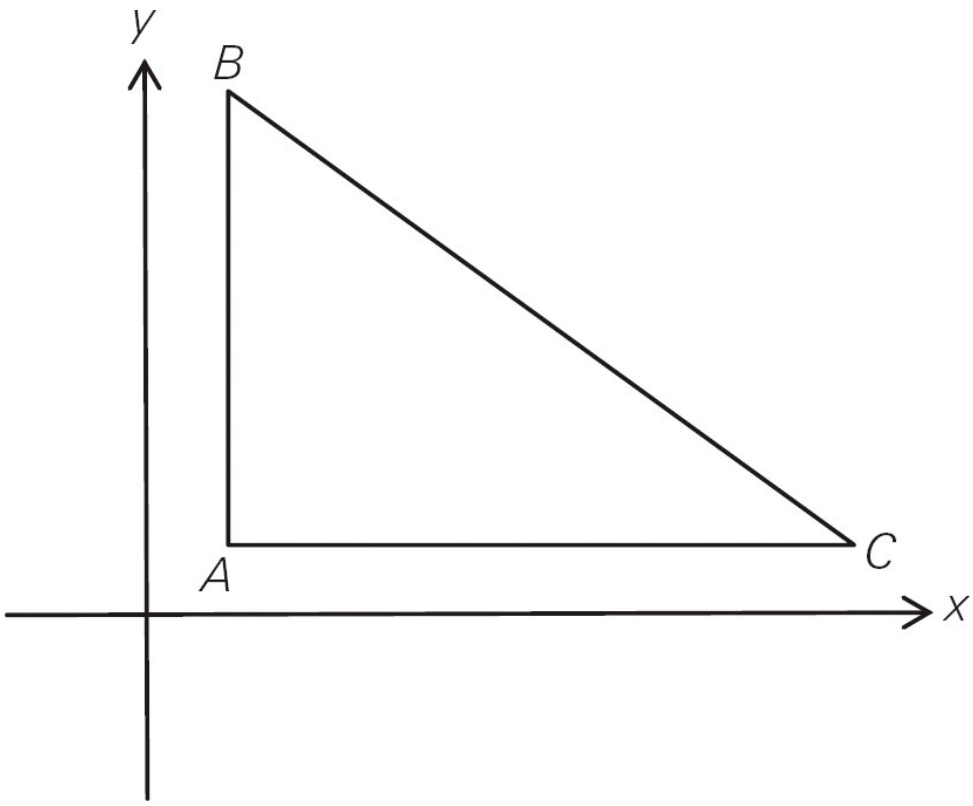
1. What is the total cost to make 7 long distance telephone calls?

   (1) The length of each call was at least 2 minutes.
   (2) The rate for long distance calls is $0.32 per minute.

2. If s and t are positive, what is the value of s ?

   (1) $t = 2.7$
   (2) $s = 3.1t$



3. In the xy-plane above, is angle BAC greater than 90 degrees?

   (1) Points A and B have different x-coordinates.
   (2) The measure of angle B is twice the measure of angle C.

4. Of the first three dozen cookies baked at a bake shop on a certain day, $\frac{1}{3}$ were chocolate chip cookies. If $\frac{1}{2}$ of the remaining cookies that were baked that day were chocolate chip cookies, how many chocolate chip cookies were baked that day?

   (1) The bakery made five dozen cookies that day.
   (2) Of all the cookies made that day, $\frac{2}{5}$ were chocolate chip.

5. The usual price of a bagel was reduced during a sale. How much money could be saved by purchasing 10 bagels at the sale price rather than at the usual price?

   (1) The usual price for a bagel is $0.50 per bagel.
   (2) The sale price for a bagel is $0.40 per bagel.

6. Does $3^{r+s} = 27^6$?

   (1) $r - s = 8$
   (2) $5r = 13s$

7. If a total of 30 puppies is displayed in the two windows of a pet store, how many of the puppies are female?

   (1) $\frac{3}{4}$ of the puppies in the left window are male.
   (2) $\frac{1}{3}$ of the puppies in the right window are female.

8. If f denotes a decimal, is $f < 0.5$?

   (1) When f is squared, the result is less than 0.5.
   (2) When f is rounded to the nearest integer, the result is 1.

9. Jim and Nancy each provide the same service at a different original price. If both Jim and Nancy discount their original price, is Nancy's discount price less than Jim's discount price?

   (1) Jim's discount price is 20 percent less than his original price and Nancy's discount price is 30 percent less than her original price.
   (2) Jim's discount price is $10 less than his original price and Nancy's

discount price is $12 less than her original price.

10. Is $abc = 1$?

(1) $a = \frac{1}{b}$

(2) $b = \frac{1}{c}$

11. If a certain parking lot contains 40 motor vehicles, how many of the vehicles are red trucks?

(1) Of the motor vehicles in the parking lot, 20 percent are painted red.
(2) Of the motor vehicles in the parking lot, 15 are trucks.

12. Bruce, John, Linda, and Mark stand, in that order, in a straight line. If Linda stands 7 feet away from Mark, what is the distance from Bruce to John?

(1) Bruce stands 7 feet away from Linda.
(2) John stands 11 feet away from Mark.

13. Is the number of workers required to create w_1 widgets at r_1 widgets per minute less than the number of workers required to create w_2 widgets at r_2 widgets per minute?

(1) w_1 is 20 less than w_2.
(2) r_1 is 20 less than r_2.

14. At a certain school, is the number of biology students greater than the number of chemistry students?

(1) Of the biology students, 30 percent are also chemistry students.
(2) Of the chemistry students, 40 percent are also biology students.

15. Mike bought a computer system for $4,000 and later sold it. For what price did Mike sell the computer system?

(1) Mike sold the computer system for 60% of the price he paid for it.
(2) Mike advertised the computer system in a newspaper at a price of $3,000, which was 25% more than the price for which he actually sold it.

16. How old, rounded to the nearest year, was Jim in May 1989 ?

(1) Jim's friend Steve, who is exactly 2 years older than Jim, turned 25 years old in 1972.
(2) In March 1982, Jim turned 33 years old.

17. Of the 3,000 cars manufactured in Factory Q last year, how many were still in operation at the end of the year?

(1) Of all of the cars manufactured in Factory Q, 60% were still in operation at the end of last year.
(2) A total of 48,000 cars manufactured in Factory Q were still in operation at the end of last year.

18. Is $q < 0$?

(1) $\frac{p^2}{q^3} > 0$

(2) $q^2 - \frac{p^3}{q} < 0$

19. If a and b are integers, is ab odd?

(1) $b = a + 2$

(2) $\frac{b}{a}$ is an odd integer.

Challenge!

Take a crack at this high-level GMAT question.

20. A terminating decimal is a number with a finite number of nonzero digits. For example, 35, 14.07, and 5.341 are three terminating decimals. For positive integers p and q, when $\frac{p}{q}$ is expressed as a decimal, is $\frac{p}{q}$ a terminating decimal?

DRILL 1

Answers can be found on this page.

1. Which of the following numbers has the greatest value?

   ◯ −8.3
   ◯ |−7.7|
   ◯ 2
   ◯ |4.5|
   ◯ 6.8

Remember!

For Data Sufficiency problems in this book, we do not supply the answer choices. The five possible answer choices are the same every time.

2. What is the value of x ?

   (1) $|x| = 7$
   (2) When x is divided by a negative number, the result is negative.

Integers

An integer is what you commonly think of as a positive or negative "counting number." All of the numbers marked on the number line are integers. The numbers between the marks are not integers. More formally, integers include all positive whole numbers, all negative whole numbers, and 0. For example, numbers such as 1, 2, 3, 0, -1, and -2 are all integers. Numbers such as $\frac{1}{2}$, 0.072, $-\frac{2}{3}$, and $\sqrt{3}$ are not integers.

Even integers are divisible by 2 with no remainder. Odd integers are not divisible by 2. It's important to realize that the terms "even" and "odd" apply only to integers. Note that zero is an even integer. There are some rules for multiplying (but not dividing) even and odd integers. If you forget these rules, you can recreate them by trying out some simple numbers.

DRILL 2

Answers can be found on this page.

1. If m and n are negative integers, which of the following must be true?

   I. $m + n < 0$
   II. $mn > 0$
   III. $mn > n$

   ◯ I only
   ◯ II only
   ◯ I and II
   ◯ I and III
   ◯ I, II, and III

2. If both v and w are odd integers, which of the following could be an even integer?

   ◯ vw
   ◯ $v + w + 1$
   ◯ $\frac{v}{w}$
   ◯ $2(v + w)$
   ◯ $2v + w$

3. If a, b, and c are consecutive integers, which of the following must be an odd integer?

   ◯ $a + b + c$
   ◯ abc
   ◯ $a + b + c + 1$
   ◯ $ab(c - 1)$
   ◯ $abc - 1$

MANIPULATING NUMBERS

A sum is the result obtained from addition, and a difference is the result from subtraction. A product is the result of multiplication, and a quotient is the result of division.

Whenever you see one of these terms in a problem, you know to perform that operation (add, subtract, multiply, divide).

A remainder is the integer left over from division. This is the way you did division in third grade—no decimals or fractions allowed. Just keep dividing until you get down to something smaller than the number you're dividing by. That something is the remainder.

For example, let's divide 7 by 2. Set up the long division like this: $2\overline{)7}$. You know that 2 goes into 7 three times (because $2 \times 3 = 6$).

However, there's still 1 left over. 1 is smaller than 2, so you can't continue without getting into decimals. That means 1 is the remainder.

The reciprocal of a number is the number you multiply it by to get 1. In other words, if the product of two numbers, *m* and *n*, is 1, then the numbers are reciprocal. If you're not quite sure what that means, consider some actual numbers. What is the reciprocal of 2? Well, what number can 2 be multiplied by in order to yield a product of 1? $2 \times \frac{1}{2} = 1$. So, the reciprocal of 2 is $\frac{1}{2}$. If the number you're starting with is a fraction, the reciprocal can be determined by simply swapping the numerator and denominator in the original fraction. For example, the reciprocal of $\frac{3}{4}$ is $\frac{4}{3}$.

DRILL 3

Answers can be found on this page.

1. When 12 is divided by the positive integer *k*, the remainder is $k - 3$. Which of the following could be the value of *k* ?

   ◯ 3
   ◯ 4
   ◯ 6
   ◯ 9
   ◯ 10

2. If the product xy is negative, which of the following must be true?

- ◯ $x < 0$
- ◯ $y < 0$
- ◯ $\frac{x}{y} > 0$
- ◯ $\frac{x}{y} < 0$
- ◯ $x + y < 0$

5	t	16	2
16			

3. In the figure above, the product of the two numbers in the vertical column equals the sum of the four numbers in the horizontal row. What is the value of t?

- ◯ 0.5
- ◯ 3
- ◯ 21
- ◯ 57
- ◯ 80

ZERO

Zero is a special number because it is unique in a lot of ways. Some of the trickier questions require that you be aware of some of these special characteristics. Zero is an integer, but it is neither positive nor negative. It's usually referred to as neutral. However, zero does qualify as even.

You can't divide anything by zero. Division by zero is said to be undefined. Multiplying anything by zero is always zero. Also, zero divided by anything else equals zero.

- A number is divisible by 9 if the sum of its digits is a number divisible by 9. This is very similar to the "divisible by 3" rule. For example, see whether 902,178 is divisible by 9. The sum of the digits is $9 + 0 + 2 + 1 + 7 + 8 = 27$. Since 27 is divisible by 9 (use the rule again if you're not sure), the number 902,178 is also divisible by 9.
- A number is divisible by 10 if it ends in 0.

Some tougher problems may require you to break a number into its prime factors, which can be thought of as the building blocks of the number. These prime factors play a big role in determining the divisibility of a number and in finding its multiples. You'll learn more about these concepts later in this chapter.

DRILL 4

Answers can be found on this page.

1. How many multiples of 3 are there between 10 and 90, inclusive?

   ◯ 26
   ◯ 27
   ◯ 28
   ◯ 29
   ◯ 30

2. Which of the following is the least positive integer that is divisible by each of the integers from 2 through 5, inclusive?

   ◯ 30
   ◯ 60
   ◯ 120
   ◯ 180
   ◯ 240

3. How many of the factors of 42 are divisible by 3 ?

   ◯ 2
   ◯ 3
   ◯ 4
   ◯ 6
   ◯ 8

Answers can be found on this page.

1. If *a* and *b* are distinct prime numbers, which of the following could be the product of *a* and *b* ?

   ◯ 4
   ◯ 5
   ◯ 10
   ◯ 11
   ◯ 25

2. What is the greatest integer that is a sum of four different prime numbers, each less than 30 ?

   ◯ 67
   ◯ 88
   ◯ 98
   ◯ 104
   ◯ 126

3. If *x* is a prime number greater than 3, what is the remainder when x^2 is divided by 8 ?

   ◯ 0
   ◯ 1
   ◯ 3
   ◯ 4
   ◯ 5

ORDER OF OPERATIONS

There is an order you want to follow when you're solving a mathematical expression that contains more than one operation. The mnemonic to help you remember the order of operations is **P E M D A S**. It stands for **P**arentheses, **E**xponents, **M**ultiplication, **D**ivision, **A**ddition, and **S**ubtraction.

Parentheses are the first step. If you have several operations within a set of parentheses, just apply the order of operations to them. If you have parentheses inside parentheses, start with the innermost ones and work your way out.

Exponents are the next step. Handle all of the exponents before you move on to the other operations. The one exception is if you have operations within an exponent. For example, if you see 3^{2+3}, you need to turn that into 3^5 before you go any further.

Multiplication and division are the next step. They're really the same thing, so you won't necessarily do all the multiplication before you do division. Treat them as though they are at the same level and just work from left to right.

Addition and subtraction are the last step. Just as multiplication and division are at the same level, so are addition and subtraction. Just work from left to right.

A Helpful Mnemonic

The sentence Please Excuse My Dear Aunt Sally is a helpful mnemonic tool to remember the order of operations.

DRILL 6

Answers can be found on this page.

1. $24-12+\frac{36}{6}-3=$

   ◯ 3
   ◯ 5
   ◯ 12
   ◯ 15
   ◯ 24

2. $(1+5)-3^2+8\div 2\times 2=$

   ◯ −5
   ◯ −1
   ◯ 1
   ◯ 5
   ◯ 15

Comprehensive Number Properties Drill

Answers can be found on this page.

Remember!

For Data Sufficiency problems in this book, we do not supply the answer choices. The five possible answer choices are the same every time.

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1. If x is a positive integer, then $x(x - 1)$ is

   - ◯ divisible by 5 whenever x is even.
   - ◯ divisible by 9 whenever x is odd.
   - ◯ odd only when x is odd.
   - ◯ always odd.
   - ◯ always even.

2. Which of the following CANNOT result in an integer?

   - ◯ The product of two integers divided by the reciprocal of a different integer
   - ◯ An even integer divided by 7
   - ◯ The quotient of two distinct prime numbers
   - ◯ A multiple of 11 divided by 3
   - ◯ The sum of two odd integers divided by 2

3. If $a + b + c = 36$, what is the value of abc ?

   (1) a, b, and c are consecutive even integers.

   (2) a, b, and c are distinct positive integers.

4. How many positive integers less than 28 are prime numbers, odd multiples of 5, or the sum of a positive multiple of 2 and a positive multiple of 4 ?

   - ◯ 27
   - ◯ 25
   - ◯ 24
   - ◯ 22
   - ◯ 20

5. If a positive integer q is divisible by both 3 and 11, then q must also be

divisible by which of the following?

I. 14
II. 33
III. 66

- ◯ I only
- ◯ II only
- ◯ III only
- ◯ I and II
- ◯ II and III

6. If positive integers q and r are both even, which of the following must be odd?

- ◯ $q - r$
- ◯ $\frac{q}{r}$
- ◯ $\frac{q}{r} + 1$
- ◯ $qr - 1$
- ◯ $q(r - 1)$

7. What is the value of the two-digit integer n ?

(1) n is divisible by 9.
(2) The tens digit of n is 4.

8. In a decreasing sequence of seven consecutive even integers, the sum of the first four integers is 68. What is the product of the last three integers in the sequence?

- ◯ 1,000
- ◯ 960
- ◯ 925
- ◯ 30
- ◯ 25

9. What is the value of the integer p ?

(1) p is a prime factor of 33.
(2) $3 \leq p \leq 15$

10. If m is an odd integer and $n = 5m + 4$, which of the following could be a divisor of n ?

- 2
- 3
- 4
- 5
- 6

11. $(3 + 1)^2 + (5 - 4 \times 2) =$

- 7
- 12
- 13
- 18
- 19

12. If positive integer n is less than or equal to 20, what is the value of n ?

(1) n is divisible by 2 and 5.
(2) n has 2 distinct prime factors.

13. If x is a member of the set {12, 15, 18, 24, 36, 45}, what is the value of x ?

(1) x is divisible by 6.
(2) x is a multiple of 9.

14. What is the value of the sum of a sequence of x consecutive even integers?

(1) $x = 5$
(2) The least integer in the sequence is 6.

15. If x and z are integers, how many even integers y are there such that $x < y < z$?

(1) $z - x = 4$
(2) x is odd.

16. What is the value of q ?

(1) $q = \sqrt{9}$

(2) $|q| = 3$

17. What is the value of the three-digit integer t if t is divisible by 9 ?

(1) The tens digit and the hundreds digit of t are both 7.
(2) The units digit of t is less than both the tens digit and the hundreds digit.

18. If x is a factor of positive integer y, then which of the following must be positive?

- ◯ $x - y$
- ◯ $y - x$
- ◯ $2x - y$
- ◯ $x - 2y$
- ◯ $y - x + 1$

19. What is the remainder when n is divided by 3 ?

(1) n is divisible by 5.
(2) n is divisible by 6.

Challenge!

Take a crack at this high-level GMAT question.

20. In a certain game, scoring plays result in 2, 5, or 7 points only. How many times did a team playing this game score 2 points on a play?

(1) The team scored 7 points on a scoring play exactly 3 times.
(2) The product of the point values from all of the team's scoring plays is 6,860.

- If the question mentions “increase” or “greater,” you’re going from a smaller number to a larger number. So the original number is the smaller one.
- If the question says “decrease” or “less,” you’re going from a larger number to a smaller number. So the original number is the larger one.

DRILL 3

Answers can be found on this page.

1. In a group of 20 tourists, 12 brought cameras. If one half of the tourists with cameras brought disposable cameras, what percent of all the tourists brought disposable cameras?

   ◯ 12%
   ◯ 20%
   ◯ 30%
   ◯ 40%
   ◯ 60%

2. Lenny can bench press 320 pounds. Ollie can bench press 400 pounds. The weight Ollie can bench press is what percent greater than the weight Lenny can bench press?

   ◯ 20%
   ◯ 25%
   ◯ 32%
   ◯ 40%
   ◯ 80%

3. The original price of a model X200 laptop computer is reduced by $1,000 to the new price of $2,000. What is the percentage change in the price of the X200 laptop computer?

- $12\frac{1}{2}\%$
- 20%
- $33\frac{1}{3}\%$
- 40%
- 50%

Comprehensive Fractions, Decimals, and Percents Drill

Answers can be found on this page.

Remember!

For Data Sufficiency problems in this book, we do not supply the answer choices. The five possible answer choices are the same every time.

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1. In an engineering class that contained 50 students, the final exam consisted of two questions. Three fifths of the students answered the first question correctly. If four fifths of the remainder answered the second question correctly, how many students answered both questions incorrectly?

   ◯ 4
   ◯ 6
   ◯ 10
   ◯ 12
   ◯ 24

2. Forty percent of $\frac{1}{8}$ of what is 20 ?

   ◯ 400
   ◯ 320
   ◯ 100
   ◯ 4
   ◯ 1

3. After a performance review, Steve's salary is increased by 5%. After a second performance review, Steve's new salary is increased by 20%. This series of raises is equivalent to a single raise of

   ◯ 25%
   ◯ 26%
   ◯ 27%
   ◯ 30%
   ◯ 32%

4. Of the 2,400 animals at the zoo, $\frac{1}{4}$ are primates. If the number of primates were to be reduced by $\frac{1}{4}$, what percent of the remaining animals would then be primates?

- ◯ 50%
- ◯ $33\frac{1}{3}\%$
- ◯ 25%
- ◯ 20%
- ◯ 6.25%

5. If each of the following fractions were written as a decimal, which would have the fewest number of digits to the right of the decimal point?

- ◯ $\frac{1}{8}$
- ◯ $\frac{1}{5}$
- ◯ $\frac{1}{3}$
- ◯ $\frac{2}{3}$
- ◯ $\frac{3}{4}$

6. Poetry books make up what percent of the books on Beth's bookshelf?

(1) Of the 60 books on Beth's bookshelf, 15 are novels.
(2) There are 12 poetry books on Beth's bookshelf.

7. $\dfrac{3\frac{1}{2}-2\frac{1}{3}}{\frac{2}{3}-\frac{3}{4}} =$

- ◯ -14
- ◯ $-\frac{1}{14}$
- ◯ $\frac{1}{14}$
- ◯ $1\frac{1}{3}$
- ◯ 14

8. During one day, a door-to-door brick salesman sold three fourths of his bricks for \$0.25 each. If he had 150 bricks left at the end of the day, how much money did he collect for brick sales that day?

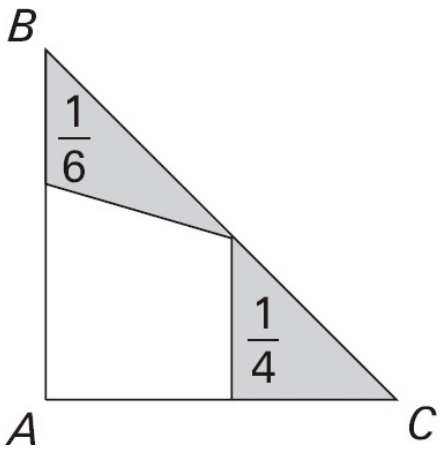
- ◯ \$12.50
- ◯ \$37.50
- ◯ \$50.00
- ◯ \$112.50
- ◯ \$150.00

9. In a group of 24 musicians, some are pianists and the rest are violinists. Exactly $\frac{1}{2}$ of the pianists and exactly $\frac{2}{3}$ of the violinists belong to a union. What is the least possible number of union members in the group?

- ◯ 12
- ◯ 13
- ◯ 14
- ◯ 15
- ◯ 16

10. Which of the following fractions is equal to the decimal 0.375 ?

- ○ $\frac{1}{6}$
- ○ $\frac{2}{7}$
- ○ $\frac{3}{8}$
- ○ $\frac{4}{9}$
- ○ $\frac{5}{11}$



Note: Figure not drawn to scale.

11. In the triangle *ABC* shown above, the two shaded regions make up $\frac{1}{4}$ and $\frac{1}{6}$ of the area of the triangle. The unshaded region makes up what fractional part of the area of the triangle?

- ◯ $\frac{1}{24}$
- ◯ $\frac{5}{12}$
- ◯ $\frac{7}{12}$
- ◯ $\frac{9}{10}$
- ◯ $\frac{23}{24}$

12. Justin, Max, and Paul each have a collection of marbles. Justin has 50% fewer marbles than Max has. Max has 30% more marbles than Paul has. If Paul's collection contains 80 marbles, how many marbles does Justin's collection contain?

- ◯ 32
- ◯ 48
- ◯ 52
- ◯ 56
- ◯ 64

13. By what percent did the population of Belleville increase from 2001 to 2003 ?

(1) The population of Belleville was 72,000 people in 2003.
(2) The population of Belleville doubled from 2001 to 2003.

14. $\dfrac{1}{2+\dfrac{2}{1+\dfrac{1}{4}}} =$

- ○ $\frac{5}{18}$
- ○ $\frac{5}{9}$
- ○ $\frac{13}{18}$
- ○ $\frac{18}{13}$
- ○ $\frac{18}{5}$

15. If 12 is 20% of 40% of a certain number, what is the number?

- ○ 20
- ○ 24
- ○ 72
- ○ 96
- ○ 150

16. The fuel efficiency of a certain make of car was increased from 30 miles per gallon for last year's model to 45 miles per gallon for this year's model. By what percent was the fuel efficiency of the car increased?

- ○ 15%
- ○ $33\frac{1}{2}\%$
- ○ 50%
- ○ $66\frac{2}{3}\%$
- ○ 75%

17. In 2002, 30% of the students at Maxwell State University were engineering majors. The number of engineering majors at the university increased by what percent between 2002 and 2003 ?

(1) In 2003, 45% of the students at the university were engineering majors.
(2) The number of engineering majors at the university increased by 750

between 2002 and 2003.

18. $\frac{(4)(0.06)}{(0.12)} =$

- ◯ 0.18
- ◯ 0.2
- ◯ 1.8
- ◯ 2.0
- ◯ 20

19. If Kim makes a $30,000 down payment on a house, which represents 20% of the sale price of the house, how much money does Kim still owe on the house?

- ◯ $90,000
- ◯ $120,000
- ◯ $140,000
- ◯ $150,000
- ◯ $170,000

20. If the fractions $\frac{1}{2}, \frac{2}{5}, \frac{3}{8}, \frac{4}{11}$ and $\frac{5}{7}$ were ordered from least to greatest, the second smallest fraction in the resulting sequence would be

- ◯ $\frac{1}{2}$
- ◯ $\frac{2}{5}$
- ◯ $\frac{3}{8}$
- ◯ $\frac{4}{11}$
- ◯ $\frac{5}{7}$

21. In 1991, the price of a house was 80% of its original price. In 1992, the price

of the house was 60% of its original price. By what percent did the price of the house decrease from 1991 to 1992 ?

- ◯ 20%
- ◯ 25%
- ◯ $33\frac{1}{3}\%$
- ◯ 40%
- ◯ 60%

22. $1+\frac{5}{10}+\frac{3}{1{,}000}+\frac{9}{10{,}000}=$

- ◯ 1.539
- ◯ 1.5309
- ◯ 1.5039
- ◯ 1.50309
- ◯ 1.05039

23. Of the 400 people in an auditorium, $\frac{1}{4}$ are wearing hats. Of those, $\frac{1}{5}$ are wearing fedoras. How many people in the auditorium are not wearing fedoras?

- ◯ 20
- ◯ 80
- ◯ 180
- ◯ 220
- ◯ 380

24. What fraction of the cookies in a certain bakery's window display contains nuts?

(1) Of the cookies in the display, 22 contain nuts.

(2) Of the cookies in the display, 90% do not contain nuts.

Challenge!

Take a crack at this high-level GMAT question.

25. A process manager in a plant wishes to decrease the hours logged by his workforce by 20%, while still retaining the exact same production. If all of the workers in the workforce produce at the same constant rate, by what percent would the workforce need to increase its production?

- 10%
- 20%
- 25%
- $33\frac{1}{3}\%$
- 50%

Comprehensive Assorted Topics 1 Drill

Answers can be found on this page.

Remember!

For Data Sufficiency problems in this book, we do not supply the answer choices. The five possible answer choices are the same every time.

---

1. Three hungry children, Sharon, Carol, and Elinor, agree to divide a batch of cookies in the ratio 3 : 5 : 7, respectively. If Sharon's share was 15 cookies, how many cookies were in that batch?

   ◯ 60
   ◯ 75
   ◯ 120
   ◯ 150
   ◯ 750

2. A company consists of two departments: sales and production. If 30 percent of the 150 employees in the sales department received a holiday bonus and 70 percent of the 250 employees in the production department received a holiday bonus, what percent of all employees did not receive a holiday bonus?

   ◯ 40%
   ◯ 45%
   ◯ 50%
   ◯ 55%
   ◯ 60%

3. What is the ratio of a to b ?

   (1) $a = b + 7$
   (2) $3a = 4b$

4. All working at the same constant rate, 8 bartenders can pour 96 shots per minute. At this rate, how many shots could 3 bartenders pour in 2 minutes?

- ◯ 12
- ◯ 24
- ◯ 36
- ◯ 48
- ◯ 72

5. The average (arithmetic mean) of 2, 4, 6, and 8 equals the average of 1, 3, 5, and

- ◯ 7
- ◯ 9
- ◯ 10
- ◯ 11
- ◯ 12

6. The latest model of space shuttle can achieve a maximum speed of 25 miles per second. This maximum speed is how many miles per hour?

- ◯ 1,500
- ◯ 3,600
- ◯ 9,000
- ◯ 15,000
- ◯ 90,000

7. How many of the employees at Company X have life insurance?

(1) There are 300 employees at Company X.
(2) The ratio of employees with life insurance to employees without life insurance is 1 : 5.

8. What is x ?

(1) The ratio of x : y is 1 : 3.
(2) The ratio of y : z is 1 : 2.

9. The five starting players on a basketball team score points in the ratio of 1 : 1 : 2 : 3 : 4. If the starters score a total of 77 points in a particular game, how many points did the highest-scoring starter score?

- ◯ 7
- ◯ 11
- ◯ 14
- ◯ 21
- ◯ 28

10. If $1 was invested at 4% interest, compounded quarterly, the total value of the investment, in dollars, at the end of three years would be

- ◯ $(1.4)^3$
- ◯ $(1.04)^{12}$
- ◯ $(1.04)^3$
- ◯ $(1.01)^{12}$
- ◯ $(1.01)^3$

11. Among a group of teenagers taking a driving test, 40% took a driver's education course. If 70% of the teenagers pass the driving test and all of those who took a driver's education course passed the test, what percent of the teenagers who did not take a driver's education course failed the test?

- ◯ 0%
- ◯ 30%
- ◯ 40%
- ◯ 50%
- ◯ 60%

12. If a laser printer can print 2 pages in 10 seconds, how many pages can it print in 3 minutes at the same rate?

- ◯ 5
- ◯ 12
- ◯ 18
- ◯ 36
- ◯ 60

13. If the average (arithmetic mean) of three positive integers is 35, how many of the numbers are greater than 10 ?

(1) The sum of two of the numbers is 75.
(2) None of the numbers is greater than 40.

14. Greg is training for a marathon by running to and from work each day, a distance of 12 miles each way. He runs from home to work at an average speed of 6 miles per hour and returns at an average speed of 4 miles per hour. What is Greg's average speed, in miles per hour, for the round trip?

- ◯ 5.5
- ◯ 5.0
- ◯ 4.8
- ◯ 2.5
- ◯ 2.4

15. Each baseball team in a league has a roster of players in the ratio of 2 pitchers for every 3 fielders. If each team has a total of 25 players on its roster and there are 12 teams in the league, the number of pitchers in the league is how much less than the number of fielders in the league?

- ◯ 10
- ◯ 15
- ◯ 60
- ◯ 120
- ◯ 180

16. The first-year MBA class at XYZ University is composed of 60 male students and 40 female students. How many male students from the first-year class are taking economics?

(1) Fifty percent of the first-year class is taking economics.
(2) 10 female students from the first-year class are not taking economics.

17. If the current population of country Z is 200,000 people and the population grows by 3% every year, which of the following expresses the population of Country Z in 5 years?

- ◯ $200{,}000 \times (1.03)^5$
- ◯ $200{,}000 \times 5 \times (1.03)$
- ◯ $200{,}000 \times (0.03)^5$
- ◯ $200{,}000 \times (1.3)^5$
- ◯ $200{,}000 \times (1.05)^3$

18. The 250 students enrolled at ABC University are taking undergraduate courses, graduate courses, or both. How many students are taking graduate courses?

(1) 200 students are taking undergraduate courses.
(2) 50 students are taking both undergraduate and graduate courses.

19. A total of 120 investment advisors work at a particular financial services firm, 30 in bonds and the rest in equities. Fifty percent of the investment advisors are board-certified. If one third of the equities advisors are board-certified, how many bonds advisors are not board-certified?

- ◯ 0
- ◯ 10
- ◯ 15
- ◯ 20
- ◯ 30

20. How many people contributed to the Charity Y ?

(1) The average contribution to Charity Y was $100.
(2) Charity Y collected a total of $47,000 in contributions.

21. The average of two numbers is 108. What is the value of the greater number?

(1) The lesser number is 72.
(2) The ratio of the two numbers is 1 : 2.

Challenge!

Take a crack at this high-level GMAT question.

22. A certain compound X has a ratio of 2 oxygen for every 5 carbon. Another compound Y has a ratio of 1 oxygen for every 4 carbon. If a mixture of X and Y has a ratio of 3 oxygen for every 10 carbon, what is the ratio of compound X to compound Y in the mixture?

- ◯ 1 to 10
- ◯ 1 to 3
- ◯ 1 to 2
- ◯ 2 to 5
- ◯ 2 to 3

Comprehensive Solutions Beyond Algebra Drill

Answers can be found on this page.

Remember!

For Data Sufficiency problems in this book, we do not supply the answer choices. The five possible answer choices are the same every time.

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1. If Joe Bob was 25 years old 5 years ago, how old was he x years ago?

   - ◯ $x - 30$
   - ◯ $x - 20$
   - ◯ $30 - x$
   - ◯ $20 - x$
   - ◯ $20 + x$

2. Increasing the original length of a racetrack by 15% and then increasing the new length by 10% is equivalent to increasing the original length by

   - ◯ 30.0%
   - ◯ 27.5%
   - ◯ 26.5%
   - ◯ 25.0%
   - ◯ 12.5%

3. At a certain bakery, $\frac{1}{4}$ of the cookies sold in one week were chocolate chip and $\frac{1}{5}$ of the remaining cookies sold were oatmeal raisin. If x of the cookies sold were oatmeal raisin, how many were chocolate chip?

- ◯ $\frac{1}{20}x$
- ◯ $\frac{9}{20}x$
- ◯ $\frac{4}{5}x$
- ◯ $\frac{5}{4}x$
- ◯ $\frac{5}{3}x$

4. If 50% of the money in a certain portfolio was invested in stocks, 20% in bonds, 15% in real estate, and the remaining $37,500 in a money market fund, what was the total amount invested in the portfolio?

- ◯ $100,000
- ◯ $125,000
- ◯ $175,000
- ◯ $250,000
- ◯ $375,000

5. Of all the pies baked in a certain bakery, $\frac{1}{2}$ are apple pies, $\frac{1}{7}$ are cherry pies, $\frac{1}{4}$ are pecan pies, and the rest are coconut cream pies. If the combined number of pecan pies and coconut cream pies is 40, how many pies total did the bakery bake?

- ◯ 56
- ◯ 84
- ◯ 91
- ◯ 105
- ◯ 112

6. Bill buys two types of soda. He buys *m* bottles of Brand A at $0.50 each. He buys *n* bottles of Brand B at $0.60 each. What is Bill's average cost in cents for a bottle of soda, in terms of *m* and *n* ?

- ◯ $\frac{0.5m+0.6n}{m+n}$
- ◯ $\frac{m+n}{110}$
- ◯ $\frac{1.10}{m+n}$
- ◯ $\frac{50m+60n}{m+n}$
- ◯ $\frac{50m+60n}{mn}$

7. If a, b, and c are nonzero integers, which of the following must be an integer?

- ◯ $\frac{a+b}{c} + 1$
- ◯ $abc - 1$
- ◯ $\frac{ab}{c} - 1$
- ◯ $\frac{a}{b+c} + 1$
- ◯ $\frac{1}{a} + \frac{1}{b} + \frac{1}{c}$

8. In a certain school, $\frac{3}{5}$ of the students are boys and the rest are girls. Of the boys, $\frac{1}{4}$ play soccer. If the number of girls who play soccer equals the number of boys who play soccer, what fraction of the girls play soccer?

- ◯ $\frac{1}{10}$
- ◯ $\frac{3}{20}$
- ◯ $\frac{1}{4}$
- ◯ $\frac{1}{3}$
- ◯ $\frac{3}{8}$

9. Jason has a handful of dimes and quarters. There are a total of 22 coins. If the total value of the coins is $3.25, how many dimes does Jason have?

- ◯ 7
- ◯ 8
- ◯ 11
- ◯ 12
- ◯ 15

10. If both a and b are nonzero integers, which of the following must be positive?

I. $a^2 + b^2$
II. $a^2 - b^2$
III. $(a - b)^2$

- ◯ I only
- ◯ II only
- ◯ III only
- ◯ I and II
- ◯ I, II, and III

11. If $y \neq -7$, then $\frac{y^3 + 5y^2 - 15y - 7}{y + 7} =$

- ◯ $y^2 - 5y + 1$
- ◯ $y^2 - 2y - 1$
- ◯ $y^2 + 5y - 15$
- ◯ $2y^2 - 3y - 1$
- ◯ $2y^2 - 5y + 1$

12. Anjeanette inserts light bulbs in a row of light sockets in the repeating pattern red bulb, white bulb, white bulb, red bulb, white bulb, and white bulb. If she inserts a total of n red bulbs in the row, including the first and last bulbs, how many white bulbs did she insert in the row?

- ◯ $2n - 2$
- ◯ $2n - 1$
- ◯ $2n + 1$
- ◯ $3n - 2$
- ◯ $3n + 1$

13. Alex paid a $12 fee to receive a 10% discount off of the list price on all books he bought in a six-month period. Victor paid a $15 fee to receive a 15% discount off of the list price on all books he bought in the same period. If each bought books with a total list price of b during that period and each paid the same net amount, including the discount and the fee, what is b ?

- ◯ $54
- ◯ $60
- ◯ $66
- ◯ $100
- ◯ $120

14. If $n > 6$ and $3m + 5n = 0$, then which of the following must be true?

- ◯ $m > 10$
- ◯ $m < -10$
- ◯ $m = 10$
- ◯ $n < 10$
- ◯ $n > 10$

15. If x is a multiple of 5, y is a factor of 16, and z is a factor of 40, which of the following must be true?

I. xy is a multiple of z.

II. xy is not a factor of z.
III. xy is a factor of z.

- None of the above
- I only
- II only
- III only
- I and II only

16. If p and q are consecutive even integers and $p < q$, which of the following must be divisible by 3 ?

- $p^2 + pq$
- $pq^2 + pq$
- $p^2q - pq$
- p^2q^2
- $pq^2 - pq$

17. A tank holds x gallons of a saltwater mixture that is 20% salt by volume. One fourth of the water is evaporated, leaving all of the salt. When 10 gallons of water and 20 gallons of salt are added, the resulting mixture is $33\frac{1}{3}$% salt by volume. What is the value of x ?

- 37.5
- 75
- 100
- 150
- 175

18. Emma's piggy bank contains 12 cents more than Robert's piggy bank does, and x is the sum, in cents, of the money in their piggy banks. If half of the money in Emma's piggy bank is moved to Robert's and then x cents is added to each piggy bank, how much money, in cents, will Robert's piggy bank then contain?

- $\frac{3}{4}x - 3$
- $\frac{3}{4}x + 3$
- $\frac{7}{4}x - 3$
- $\frac{7}{4}x + 3$
- $\frac{3}{2}x + 6$

19. If u and v are distinct prime numbers, which of the following CANNOT be a prime number?

- $uv + 3v - 2$
- $uv - u + 2v - 2$
- $uv + 2u - v - 2$
- $uv + 3u - 2v - 6$
- $uv + u + v + 1$

Challenge!

Take a crack at this high-level GMAT question.

20. If $a = x - b$ and $b = a - y$, what is the value of ab ?

- $\frac{x^2 + y^2}{4}$
- $\frac{xy}{4}$
- $\frac{(x - y)}{4}$
- $\frac{x^2 - y^2}{4}$
- $\frac{y^2 - x^2}{4}$

Comprehensive Facing Algebra Drill

Answers can be found on this page.

Remember!

For Data Sufficiency problems in this book, we do not supply the answer choices. The five possible answer choices are the same every time.

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1. Which one of the following equations has a root in common with $m^2 + 4m + 4 = 0$?

   ◯ $m^2 - 4m + 4 = 0$
   ◯ $m^2 + 4m + 3 = 0$
   ◯ $m^2 - 4 = 0$
   ◯ $m^2 + m - 6 = 0$
   ◯ $m^2 + 5m + 4 = 0$

2. If $\dfrac{3}{1+\dfrac{3}{x}} = 2$, then $x =$

   ◯ -6
   ◯ $-\dfrac{3}{2}$
   ◯ $\dfrac{1}{2}$
   ◯ $\dfrac{3}{2}$
   ◯ 6

3. If $3^{n+1} = 9^{n-1}$, then $n =$

   ◯ -1
   ◯ 0
   ◯ 1
   ◯ 2
   ◯ 3

4. If $7 < m < 11$ and $-2 < n < 5$, then which of the following expresses the possible values of mn ?

- ◯ $-14 < mn < 35$
- ◯ $-14 < mn < 55$
- ◯ $-22 < mn < 35$
- ◯ $-22 < mn < 55$
- ◯ $5 < mn < 16$

5. Which of the following most closely approximates $\sqrt{\frac{(3.97)(50.02)}{1.84}}$?

- ◯ 1
- ◯ 5
- ◯ 10
- ◯ 20
- ◯ 100

6. If $x + 3y = 15$ and $y - x = 5$, then $y =$

- ◯ −5
- ◯ 0
- ◯ 3
- ◯ 5
- ◯ 15

7. If $n = \frac{n-6}{n+6}$, what is the value of $n^2 + 5n + 6$?

- ◯ −3
- ◯ −2
- ◯ 0
- ◯ 2
- ◯ 3

8. If $\frac{2.25\times10^{a}}{0.15\times10^{b}} = 1.5 \times 10^3$, then $a - b =$

- 1
- 2
- 3
- 4
- 5

9. $\left(3+\sqrt{11}\right)\left(3-\sqrt{11}\right) =$

- −2
- $6 - 2\sqrt{11}$
- 2
- $9 - 2\sqrt{11}$
- 8

10. If $(x - 2)^2 = 100$, which of the following could be the value of $x + 2$?

- −10
- −8
- −6
- 10
- 12

11. What is the value of z ?

(1) $6z = z^2 + 9$
(2) $z^2 = -z + 12$

12. If $y^c = y^{d+1}$, what is the value of y ?

(1) $y < 1$
(2) $d = c$

13. If 3 is one value of x for the equation $x^2 - 7x + k = -5$, where k is a constant, what is the other solution?

- 2
- 4
- 5
- 6
- 12

14. $\frac{19^2+19}{20}$ =

- ◯ $\frac{19}{10}$
- ◯ $\frac{57}{20}$
- ◯ 19
- ◯ 38
- ◯ 361

15. $\frac{(0.2)^2}{(0.2)^4}$ =

- ◯ 0.04
- ◯ 0.25
- ◯ 0.4
- ◯ 4.0
- ◯ 25.0

16. $\sqrt{25+25}$ =

- ◯ $2\sqrt{5}$
- ◯ $5\sqrt{2}$
- ◯ 10
- ◯ 20
- ◯ 25

17. What is the value of t ?

(1) $2t - 1 \geq 5$
(2) $3t - 2 \leq 11$

18. Which of the following expresses $3^4 \times 25^6 \times 2^{12}$ in scientific notation?

- ◯ 1.2×10^{12}
- ◯ 8.1×10^{12}
- ◯ 8.1×10^{13}
- ◯ 1.5×10^{22}
- ◯ 1.2×10^{24}

19. What is the value of $x - y$?

(1) $x = y + 3$
(2) $x^2 - 2xy + y^2 = 9$

Challenge!

Take a crack at this high-level GMAT question.

20. If $\frac{4^7 + 4^8 + 4^9 + 4^{10}}{5}$ is x times 4^7, what is the value of x ?

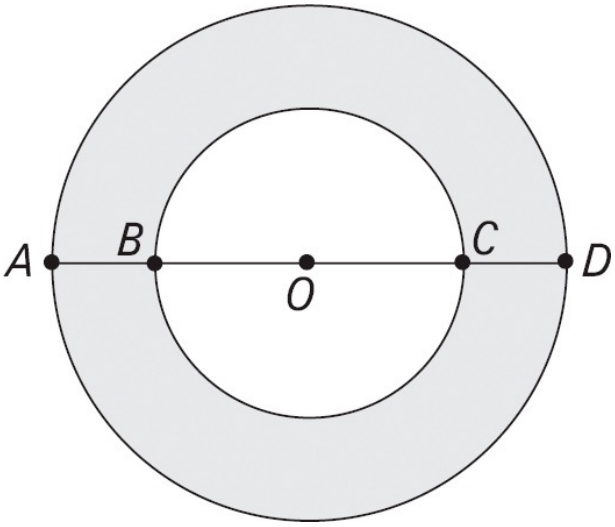
- ◯ $\frac{1}{5}$
- ◯ $\frac{4}{5}$
- ◯ 5
- ◯ 13
- ◯ 17

Comprehensive Geometry Drill

Answers can be found on this page.

Remember!

For Data Sufficiency problems in this book, we do not supply the answer choices. The five possible answer choices are the same every time.



Note: Figure not drawn to scale.

1. The figure above contains two circles with center O. If $OD = 10$ and the area of the shaded region is 36π, what is the area of the smaller circle?

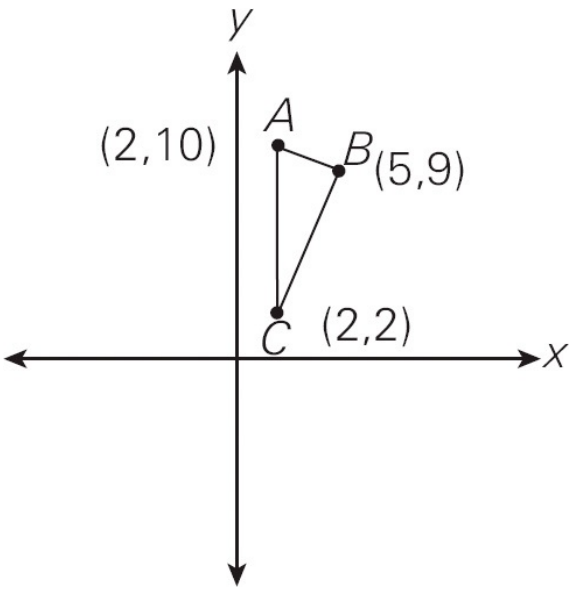
   - ◯ 6π
   - ◯ 10π
   - ◯ 36π
   - ◯ 64π
   - ◯ 100π

2. If the length of a rectangle is decreased by 10% and its width is decreased by 20%, by what percent does its area decrease?

   - ◯ 30%
   - ◯ 28%
   - ◯ 25%
   - ◯ 23%
   - ◯ 15%

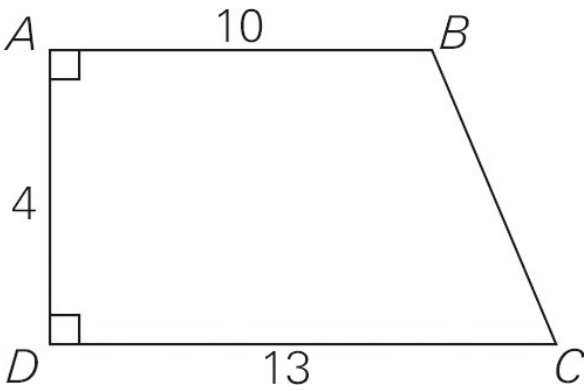
3. Freddy has a piece of string that is 20 inches long. He wants to use the string as the perimeter of a rectangle. What is the greatest area that rectangle could have?

- 5
- 10
- 20
- 25
- 40



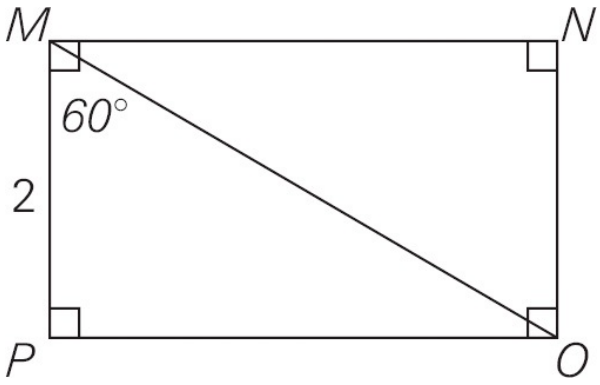
4. In the coordinate system above, what is the area of triangle *ABC* ?

- 10
- 12
- 24
- 25
- 50



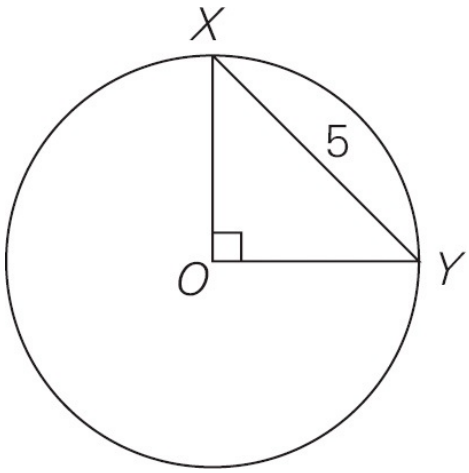
5. What is the area of quadrilateral *ABCD* above?

- 52
- 46
- 40
- 26
- 20



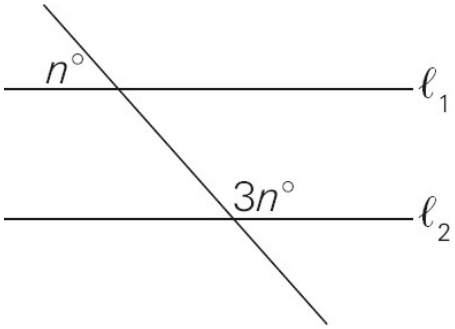
6. In rectangle *MNOP* above, if *MP* = 2, what is the length of *MO* ?

- $2\sqrt{2}$
- $2\sqrt{3}$
- 4
- 5
- 6



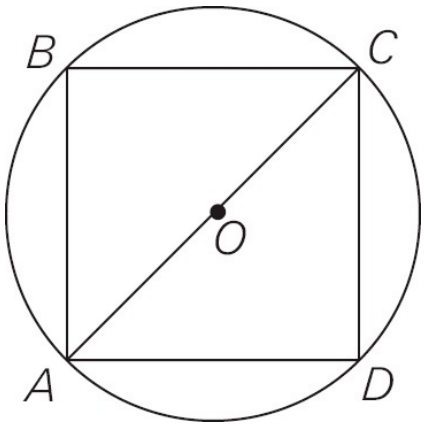
7. In the figure above, if *XY* = 5, what is the area of the circle with center *O* ?

- ◯ $\frac{5\sqrt{2}}{2}\pi$
- ◯ $\frac{25}{4}\pi$
- ◯ $5\sqrt{2}\pi$
- ◯ $\frac{25}{2}\pi$
- ◯ 25π



8. If ℓ_1 is parallel to ℓ_2 in the figure above, what is the value of n ?

- ◯ 30
- ◯ 45
- ◯ 60
- ◯ 105
- ◯ 135

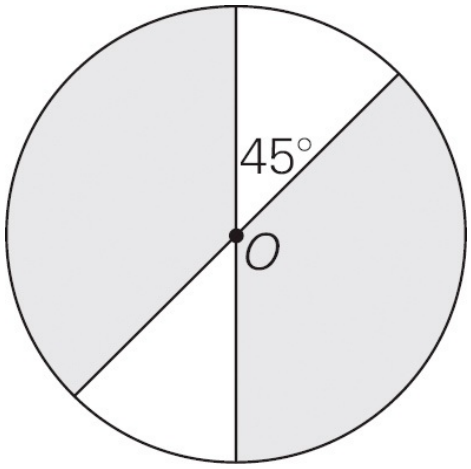


9. In the figure above, square $ABCD$ has an area of 25. What is the area of the circle with center O ?

- ◯ $\frac{5\sqrt{2}}{2}\pi$
- ◯ $\frac{25}{4}\pi$
- ◯ $\frac{25}{2}\pi$
- ◯ 25π
- ◯ $25\sqrt{2}\pi$

10. The hypotenuse of an isosceles right triangle has a length of h, and the triangle has an area of a. Which of the following must be true?

- ◯ $a = 4h^2$
- ◯ $a = 2h^2$
- ◯ $a = h^2$
- ◯ $4a = h^2$
- ◯ $2a = h^2$

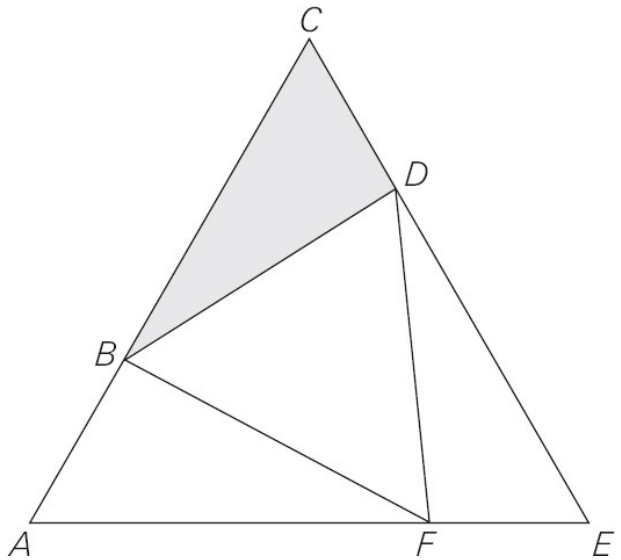


11. In the figure above, what fraction of the circle with center O is shaded?

- ○ $\frac{1}{8}$
- ○ $\frac{1}{4}$
- ○ $\frac{2}{3}$
- ○ $\frac{3}{4}$
- ○ $\frac{5}{6}$

12. A cylinder has a volume of 180π cubic inches and the radius of its circular base is 6 inches. What is the length of the longest line segment that can be drawn from one point on the cylinder to another?

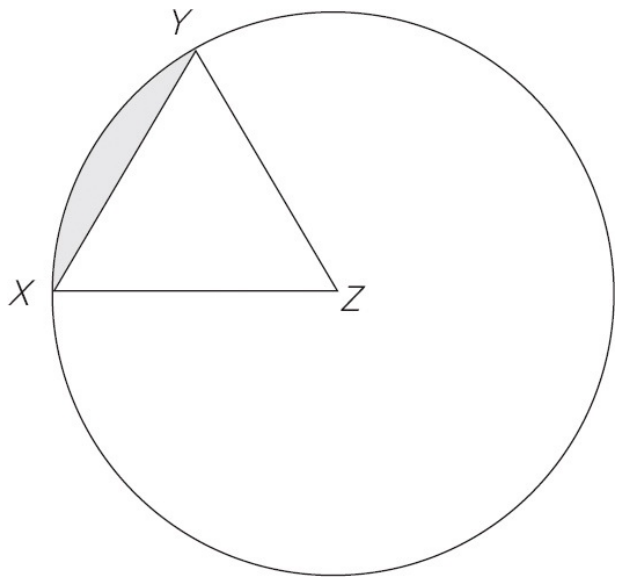
- ○ $\frac{30}{\pi}$
- ○ 12
- ○ 13
- ○ 5π
- ○ 6π



13. Equilateral triangle *BDF* is inscribed in equilateral triangle *ACE*, as shown in the figure above. The shaded region is what fraction of the area of triangle *ACE* ?

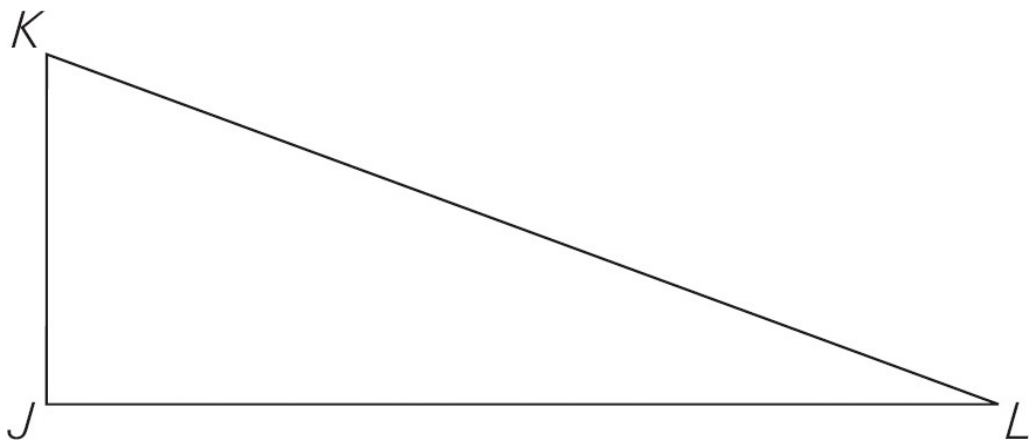
(1) $\angle DFE = 90°$

(2) The length of AF is $10\sqrt{3}$.



14. In the figure above, triangle XYZ is equilateral and has an area of $9\sqrt{3}$. Points X and Y are on the circle with center Z. What is the area of the shaded region?

- $6\pi - 9\sqrt{3}$
- $12\pi - 9\sqrt{3}$
- $(9\sqrt{3} - 6)\pi$
- $9\sqrt{3}\pi$
- $36\pi - 9\sqrt{3}$

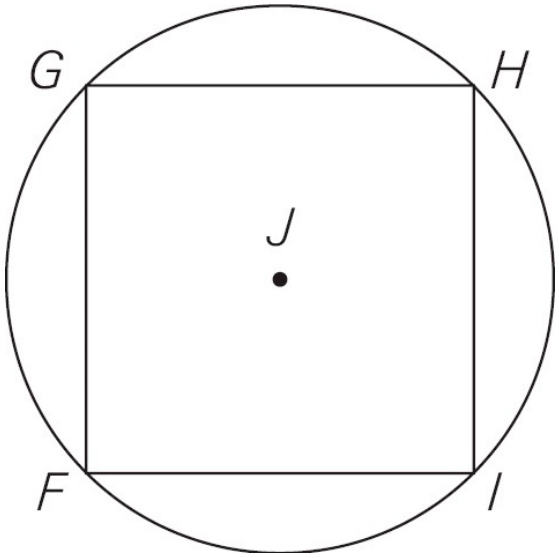


15. In the figure above, *JKL* is a right triangle. What is the area of triangle *JKL* ?

(1) The length of *JK* is 3.
(2) The length of *KL* is 6.

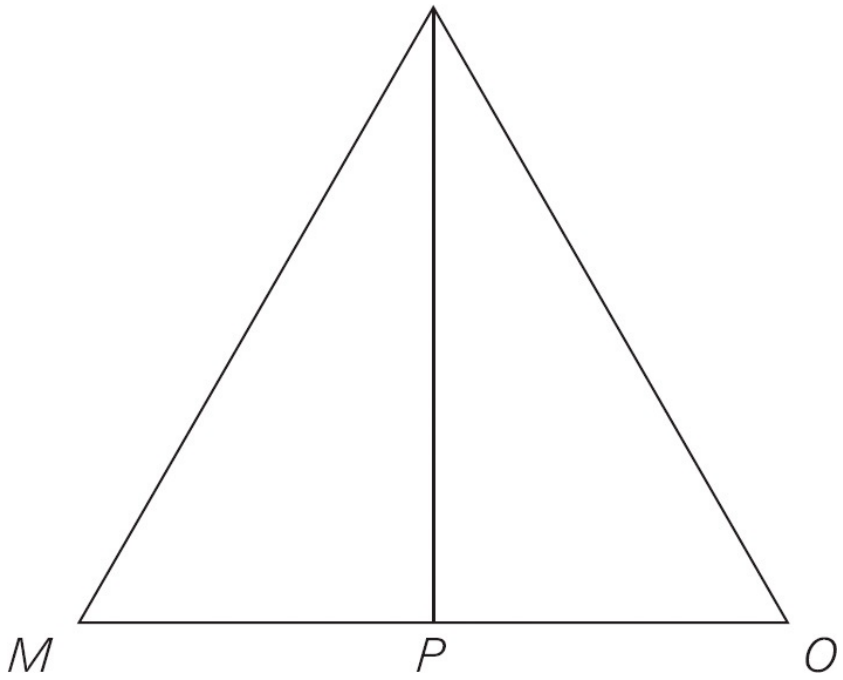
16. What is the slope of line *m* ?

(1) The points (1,5) and (5,−7) lie on line *m*.
(2) Line *m* is parallel to the line described by $3x + y = 17$.



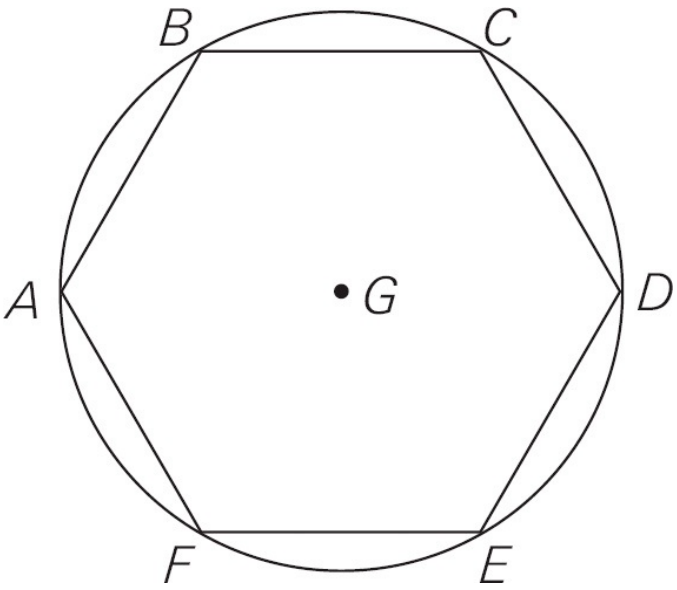
17. In the figure above, *FGHI* is inscribed in the circle with center *J*. What is the ratio of the area of *FGHI* to the area of the circle?

(1) *FGHI* is a square.
(2) The area of the circle is 8π.



18. In the figure above, triangle *MNO* is equilateral. What is the area of triangle *MNO* ?

(1) *NP* has a length of $5\sqrt{3}$.
(2) *MN* has a length of 10.



19. In the figure above, equilateral hexagon *ABCDEF* is inscribed in the circle with center *G*, which has a diameter of 16. What is the length of *AB* ?

- 16
- $8\sqrt{3}$
- $6\sqrt{3}$
- 8
- $4\sqrt{3}$

Challenge!
Take a crack at this high-level GMAT question.

20. If circle *O* is inscribed inside of equilateral triangle *T*, which of the following expresses the ratio of the radius of circle *O* to one of the sides of triangle *T* ?

- 1 to 2
- 1 to $\sqrt{2}$
- 1 to $\sqrt{3}$
- 1 to $2\sqrt{2}$
- 1 to $2\sqrt{3}$

Comprehensive Data Sufficiency 2 Drill

Answers can be found on this page.

Remember!

For Data Sufficiency problems in this book, we do not supply the answer choices. The five possible answer choices are the same every time.

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1. What is the value of n ?

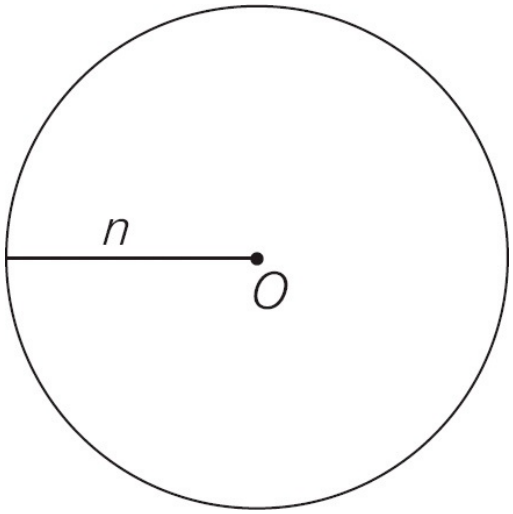
   (1) $n^2 + 5n + 6 = 0$
   (2) $n^2 - n - 6 = 0$

2. If x and y are integers, does $x = y$?

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

3. Kevin buys beer in bottles and cans. He pays $1.00 for each can of beer and $1.50 for each bottle of beer. If he buys a total of 15 bottles and cans of beer, how many bottles of beer did he buy?

   (1) Kevin spent a total of $18.00 on beer.
   (2) Kevin bought 3 more cans of beer than bottles of beer.



4. What is the area of the circle with center O above?

   (1) The circumference of the circle is 12π.
   (2) $n = 6$

5. Pete works at three part-time jobs to make extra money. What are his

average earnings per hour?

(1) Pete earned $500 for 20 hours at the first job, $150 for 10 hours at the second job, and $100 for 5 hours at the third job.
(2) Pete earned an average of $25 per hour at the first job, $15 per hour at the second job, and $20 per hour at the third job.

6. If p is an integer, is p positive?

(1) $pq > 0$ and $qr < 0$
(2) $pr < 0$

7. If x is an integer, what is the value of x ?

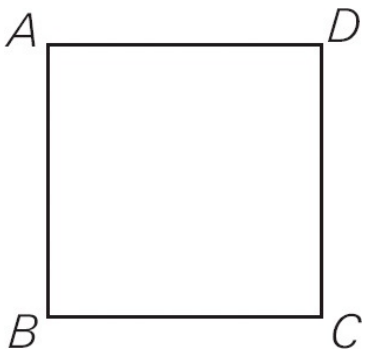
(1) x is the square of an integer.
(2) $0 < x < 5$

8. If m and n are integers, is $mn \leq 6$?

(1) $m + n = 5$
(2) $1 \leq m \leq 3$ and $2 \leq n \leq 4$

9. If $2x + 3y = 11$, what is the value of x ?

(1) $5x - 2y = 18$
(2) $6y - 22 = -4x$



10. Is quadrilateral $ABCD$ above a square?

(1) $AB = BC$
(2) Angle ABC is a right angle.

11. At a certain baseball game, each of the spectators is either a Bullfrogs fan or a Chipmunks fan, and no one is both. What is the ratio of Bullfrogs fans to Chipmunks fans among spectators at the baseball game?

(1) The number of Chipmunks fans among the spectators is 20% greater

than the number of Bullfrogs fans.
(2) The total number of spectators at the baseball game is 4,400.

12. What is the value of $x + y$?

(1) $x - y = 70$
(2) $x = 170 - y$

13. A pizzeria serves pizzas in three sizes: small, medium, and large. On Tuesday, the pizzeria served a total of 280 pizzas. How many large pizzas did the pizzeria serve on Tuesday?

(1) On Tuesday, the pizzeria served 25% more small pizzas than medium pizzas.
(2) On Tuesday, the number of medium pizzas served by the pizzeria was 80% of the number of large pizzas.

14. If $ab \neq 0$, is $\frac{1}{a} < \frac{1}{b+1}$?

(1) $a = b$
(2) $b > 0$

15. If x is a positive integer, is $x^2 - 1$ divisible by 3 ?

(1) x is even.
(2) x is divisible by 3.

16. If m and n are positive integers and $mn = 30$, what is the value of $m + n$?

(1) $\frac{m}{5}$ is an integer.

(2) $\frac{n}{2}$ is an integer.

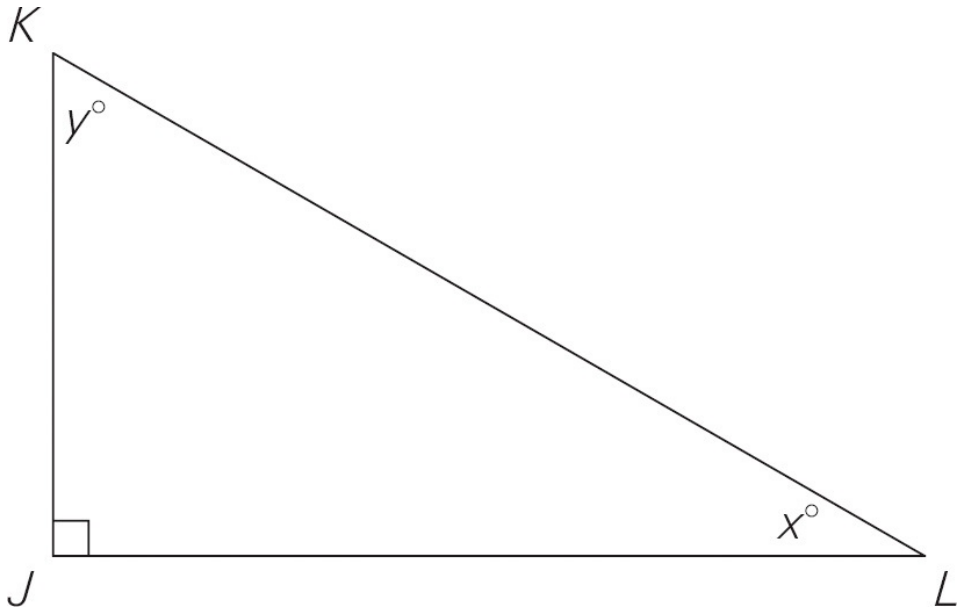
17. What is the value of $\frac{a^2b}{c}$?

(1) $a = \frac{1}{b}$ and $c = \frac{1}{a}$.

(2) $b = c$ and $a = 4c$.

18. Is 3^{p-2} greater than 1,000 ?

(1) $3^{p+1} < 54{,}000$
(2) $3^{p} < 3^{p-1} + 2{,}000$



19. In right triangle *JKL*, shown above, what is the length of *KL* ?

(1) The length of *JK* is 5.
(2) $y = 2x$

Challenge!

Take a crack at this high-level GMAT question.

20. If f is a positive integer, is $\sqrt{f+1}$ an integer?

(1) g is an integer and $f = (g + 1)(g - 1)$.

(2) g is an integer and $\frac{f+1}{g}$ is an integer.

Comprehensive Assorted Topics 2 Drill

Answers can be found on this page.

Remember!

For Data Sufficiency problems in this book, we do not supply the answer choices. The five possible answer choices are the same every time.

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1. Alex drives to and from work each day along the same route. If he drives at a speed of 80 miles per hour on the way to work and he drives at a speed of 100 miles per hour on the way from work, which of the following most closely approximates his average speed in miles per hour for the round trip?

   - ◯ 80.0
   - ◯ 88.9
   - ◯ 90.0
   - ◯ 91.1
   - ◯ 100.0

2. When a certain coin is flipped, the probability that it will land on heads is $\frac{1}{2}$ and the probability that it will land on tails is $\frac{1}{2}$. If the coin is flipped three times, what is the probability that all three results are the same?

   - ◯ $\frac{1}{8}$
   - ◯ $\frac{1}{4}$
   - ◯ $\frac{3}{8}$
   - ◯ $\frac{1}{2}$
   - ◯ $\frac{7}{8}$

3. Joe is choosing books at the bookstore. He has a list of 7 books that he would like to buy, but he can afford to buy only 3 books. How many different

groups of books could Joe buy?

- ◯ 210
- ◯ 155
- ◯ 70
- ◯ 35
- ◯ 21

$$\begin{array}{r} \# \\ +\ @ \\ \hline \& \end{array}$$

4. In the addition above, #, @, and & each represent a distinct, positive digit. If & is even, what is the value of # ?

   (1) # and @ are even and & = 6
   (2) # < @

5. If Max can complete a job in 4 hours and Nick can complete the same job in 6 hours, how many fewer hours do Max and Nick working together need to complete the job than Max alone needs to complete the job?

- ◯ 1.6
- ◯ 2.4
- ◯ 3.2
- ◯ 3.4
- ◯ 5.0

6. If a set of numbers consists of 10, 15, 0, 3, and *x*, and the range of the set is 30, what are the possible values for the median of the set?

- ◯ −15 and 30
- ◯ 15 and 10
- ◯ 0 and 3
- ◯ 3 and 15
- ◯ 3 and 10

7. If the area of a number is defined as the difference between that number's greatest and least prime factors, what is the area of 100 ?

- ◯ 0
- ◯ 2
- ◯ 3
- ◯ 5
- ◯ 9

8. Carol is having friends over to watch home movies. She has 6 reels of home movies, but she and her friends have time to watch only 3 of them. Carol must decide which reels to watch and in what order. How many different orderings does Carol have from which to choose?

- ◯ 120
- ◯ 96
- ◯ 60
- ◯ 36
- ◯ 20

9. A jar contains 5 marbles: 3 red and 2 blue. If two marbles are drawn randomly from the jar, what is the probability that they will be different colors?

- ◯ $\frac{3}{25}$
- ◯ $\frac{6}{25}$
- ◯ $\frac{2}{5}$
- ◯ $\frac{3}{10}$
- ◯ $\frac{3}{5}$

10. Oscar is running in a straight line away from Nancy at the rate of 20 feet per second. Nancy is chasing Oscar at the rate of 25 feet per second. If Oscar has a 100-foot head start, how long, in seconds, will it take Nancy to catch Oscar?

- ◯ 4
- ◯ 5
- ◯ 10
- ◯ 20
- ◯ 100

11. A cupboard holds 10 cans, of which 3 contain pumpkin puree. If a group of 4 cans is randomly selected from the cupboard, what is the probability that the group includes the 3 cans containing pumpkin puree?

- ◯ $\frac{1}{120}$
- ◯ $\frac{1}{30}$
- ◯ $\frac{1}{21}$
- ◯ $\frac{3}{10}$
- ◯ $\frac{4}{10}$

12. Mo is planning a dinner party and must create a menu consisting of 1 soup, 1 entree, 3 different side dishes, and 2 different desserts. If Mo has 3 possible choices for the soup, 2 for the entree, 5 for the side dishes, and 3 for the desserts, how many different menus can Mo create?

- ◯ 2,160
- ◯ 180
- ◯ 120
- ◯ 90
- ◯ 7

13. From a group of 10 students, 7 girls and 3 boys, a teacher must choose 2 girls and 2 boys to present book reports. How many different arrangements of students, in order, are possible?

- ◯ 252
- ◯ 504
- ◯ 1,008
- ◯ 1,512
- ◯ 5,040

14. Each candle in a particular box is either round or square and either scented or unscented. If 60% of the candles are round, what is the probability that a candle selected randomly from the box will be unscented?

    (1) If a candle is scented, it has an 80% chance of being round.
    (2) If a candle is square, it has a 25% chance of being scented.

15. The greatest number in a set of 4 numbers is 70. What is the average (arithmetic mean) of the set?

    (1) The median of the set is 25.
    (2) The range of the set is 70.

16. Anthony, Brad, and Cris are inviting 2 friends each to a party. If Anthony has 4 friends from which to choose, Brad has 2, and Cris has 5, how many different groups of 6 invitees are possible?

- ◯ 40
- ◯ 60
- ◯ 66
- ◯ 462
- ◯ 720

17. Ric begins walking up a mountain trail, ascending at a constant rate of 200 feet per hour. Sixty minutes later, Josie begins walking down the same trail, starting at a point 1,700 feet higher than Ric's starting point. If Josie descends at a constant rate of 300 feet per hour, how many feet will Ric have ascended when the two meet?

- ◯ 600
- ◯ 680
- ◯ 800
- ◯ 850
- ◯ 900

18. If $x \,\&\, y = x^2 - 2y$, what is the value of $a \,\&\, 2$?

(1) 3 & a = 13
(2) The value of a is either 2 or −2.

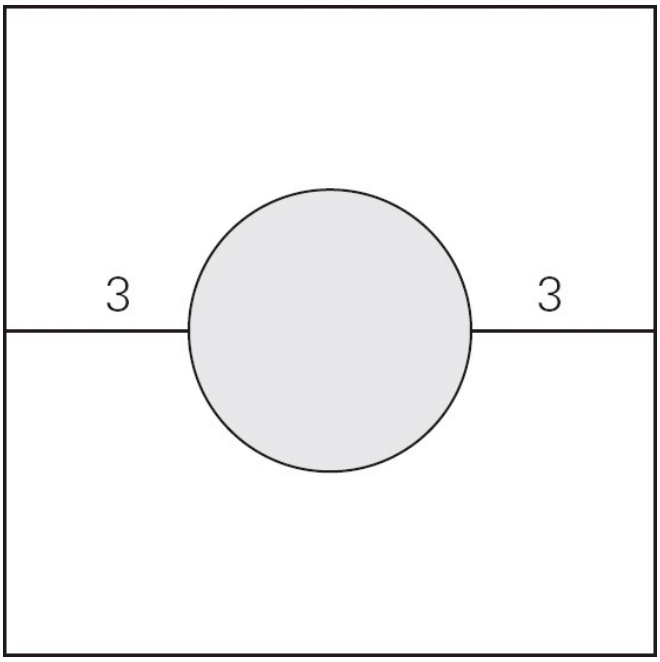
19. Jack is making a list of his 5 favorite cities. He will choose 3 cities in the United States from a list of 5 candidates. He will choose 2 cities in Europe from a list of 3 candidates. How many different lists of cities, ranked from first to fifth, can Jack make?

- 30
- 360
- 1,800
- 3,600
- 6,720

Challenge!
Take a crack at this high-level GMAT question.

20. If $f(n) = xa^n$, what is the value of $f(5)$?

(1) $f(0) = 3$
(2) $f(4) = 48$



1. In the figure above, a circular hole is cut in the center of a square sheet of metal. If the area of the sheet was 100 square centimeters before the hole was cut, what is the approximate area of the remainder of the sheet, in square centimeters, after the hole is cut?

- ◯ 12.57
- ◯ 49.73
- ◯ 50.27
- ◯ 71.73
- ◯ 87.43

2. If $a > b$, how much greater than b is a ?

(1) b is one-fourth the value of a.
(2) The sum of a and b is 100.

- ◯ Statement (1) ALONE is sufficient, but Statement (2) alone is not sufficient to answer the question asked.
- ◯ Statement (2) ALONE is sufficient, but Statement (1) alone is not sufficient to answer the question asked.
- ◯ BOTH Statements (1) and (2) TOGETHER are sufficient to answer the question asked; but NEITHER statement ALONE is sufficient.
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- ◯ Statements (1) and (2) TOGETHER are NOT sufficient to answer the question asked, and additional data specific to the problem are needed.

3. If $\frac{z^2+6z+9}{z^2-9} = 2$, what is the value of z ?

- ◯ 9
- ◯ 6
- ◯ 3
- ◯ −3
- ◯ −9

4. What is the value of j ?

(1) The product of 2 and j is between 10 and 32, exclusive.
(2) When j is divided by 2, the result is between 4 and 10, inclusive.

- ◯ Statement (1) ALONE is sufficient, but Statement (2) alone is not sufficient to answer the question asked.
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5. The monthly fee for a certain cellular telephone plan is $0.25 per minute for the first 200 minutes of calling time, plus $0.50 for each minute above 200 minutes. Was the fee for June less than $60 ?

(1) Calling time for June was 180 minutes.

(2) For 460 minutes of calling time, the fee would be four times as great as that for June.

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6. Of the pages produced by a printing press, 15% are unusable. How many pages must be produced per minute by the printing press to yield 1,020 usable pages in an hour?

- ◯ 17
- ◯ 20
- ◯ 23
- ◯ 24
- ◯ 25.5

7. In the equation $2x - cy = 18$, c is a constant. If the value of y is 2 when x is 6, what is the value of x when y is 3 ?

- ◯ $-\frac{9}{2}$
- ◯ -4
- ◯ -3
- ◯ 4
- ◯ $\frac{9}{2}$

8. If p is a price in whole cents, which of the following could NOT be the result of increasing p by 20%?

- ◯ \$1.20
- ◯ \$1.25
- ◯ \$1.38
- ◯ \$1.80
- ◯ \$2.52

9. If the total price for n copies of a book is \$31.50, what is the price per copy of the book?

(1) If twice as many copies were bought for the same total price, the price per copy would be \$1.75.

(2) If 4 fewer copies were bought for the same total price, the price per copy would be \$2.80 greater.

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10. Torry has submitted $\frac{2}{5}$ of his homework assignments, and he received an average grade of 75 for those assignments. If he wishes to receive an average grade of 90 for all of his homework assignments, the average grade for Torry's remaining homework assignments must be what percent greater than the average grade for the assignments he has already submitted?

- ◯ 15%
- ◯ 20%
- ◯ 25%
- ◯ $33\frac{1}{3}\%$
- ◯ 40%

11. For all numbers m and n, $m \,@\, n = (2m - n)(m + n)$. If $m = 3$ and $n = 4$, then $n \,@\, m =$

- ◯ 35
- ◯ 14
- ◯ 7
- ◯ −7
- ◯ −14

12. A certain school teaches fourth, fifth, and sixth grades only, with 150 students in each grade. During one day of a blizzard, 10% of the fourth-grade students, $\frac{1}{6}$ of the fifth-grade students, and 60 of the sixth-grade students do

not attend school. The student attendance on that day is approximately what percent less than full attendance?

- ◯ 11%
- ◯ 16%
- ◯ 22%
- ◯ 31%
- ◯ 33%

13. Before adding to her collection, Laura had 207 antique figurines stored in 9 boxes. After adding to her collection, she had 386 figurines in 12 boxes. What was the approximate percent increase in the average number of figurines per box?

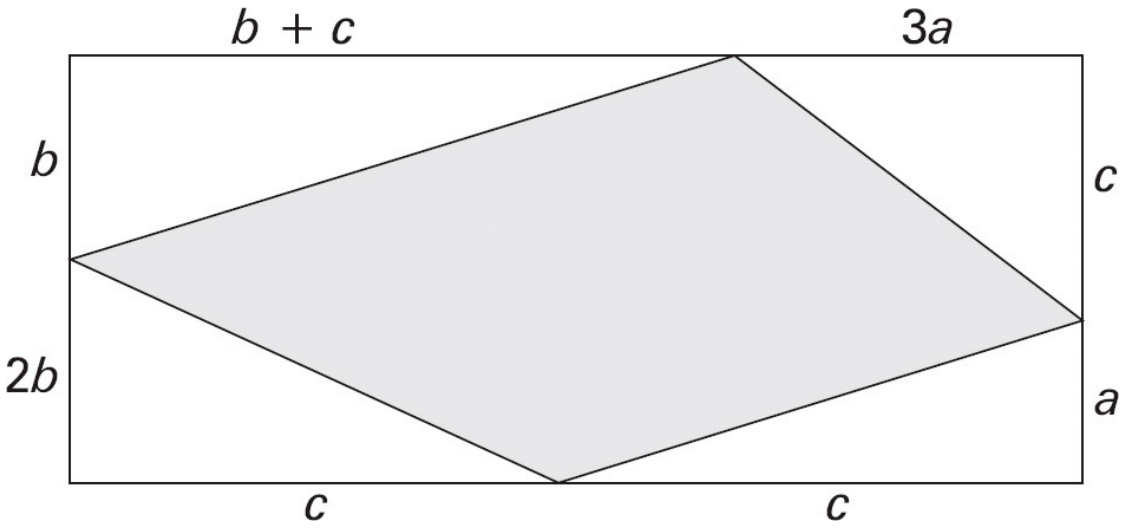
- ◯ 9%
- ◯ 33%
- ◯ 40%
- ◯ 50%
- ◯ 86%

14. The product of the sum of 3 consecutive prime numbers and the greatest integer less than the least of the prime numbers is 30. What is the largest of the 3 prime numbers?

- ◯ 2
- ◯ 3
- ◯ 5
- ◯ 7
- ◯ 11

15. A rectangular box, with dimensions of 12 inches by 18 inches by 10 inches, contains soup cans. If each can is a cylinder with a radius of 3 inches and a height of 5 inches, what is the maximum number of soup cans that the box can contain?

- ◯ 6
- ◯ 12
- ◯ 15
- ◯ 30
- ◯ 48



Note: Figure not drawn to scale.

16. In the rectangle shown above, $10a = 5b = 2c$. The shaded region covers what fraction of the area of the rectangle?

- ○ $\frac{3}{5}$
- ○ $\frac{11}{20}$
- ○ $\frac{1}{2}$
- ○ $\frac{9}{20}$
- ○ $\frac{2}{5}$

17. A jar contains only green pencils and red pencils. If the jar contains a total of 225 pencils, what percentage of the pencils are green?

(1) The jar contains 75 red pencils.
(2) The jar contains twice as many green pencils as red pencils.

- ◯ Statement (1) ALONE is sufficient, but Statement (2) alone is not sufficient to answer the question asked.
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18. If x and y are integers such that $x^2 = y$ and $xy = 125$, then $x - y =$

- ◯ −30
- ◯ −20
- ◯ −5
- ◯ 5
- ◯ 20

19. A circular hoop with a radius of 12.5 inches is rolled in a straight line on a flat surface. If each revolution of the hoop requires 10 seconds to complete, approximately how many minutes are necessary to roll the hoop 75 feet across the surface?

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

20. In the most recent mayoral election for City *Y*, 63% of all votes were cast for the winning candidate. How many votes were cast for the winning candidate?

(1) 500,000 people were eligible to vote in the election.
(2) 55,500 votes were cast for candidates other than the winning candidate.

- ⬭ Statement (1) ALONE is sufficient, but Statement (2) alone is not sufficient to answer the question asked.
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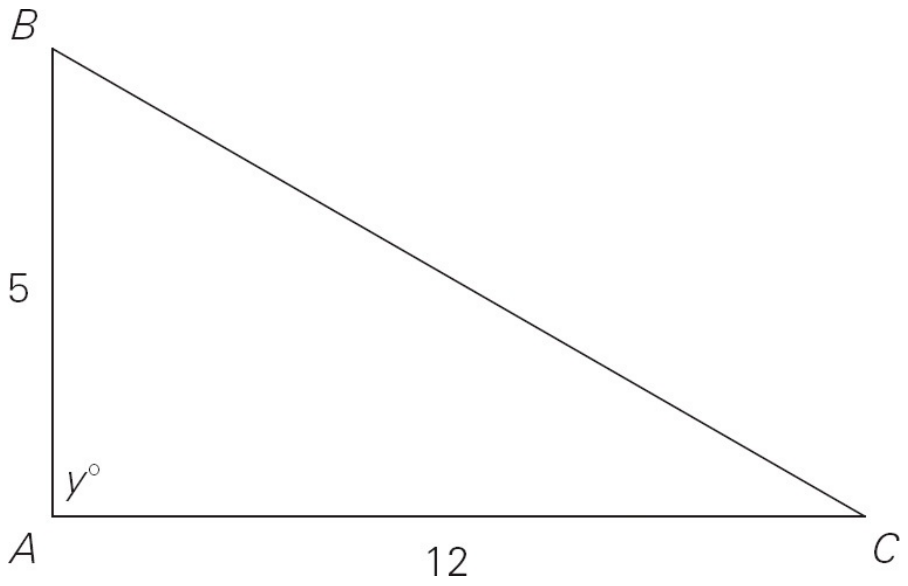

21. In the figure above, what is the area of triangle *ABC* ?

(1) The length of *BC* is 13.
(2) $y = 90$

- ⬭ Statement (1) ALONE is sufficient, but Statement (2) alone is not sufficient to answer the question asked.
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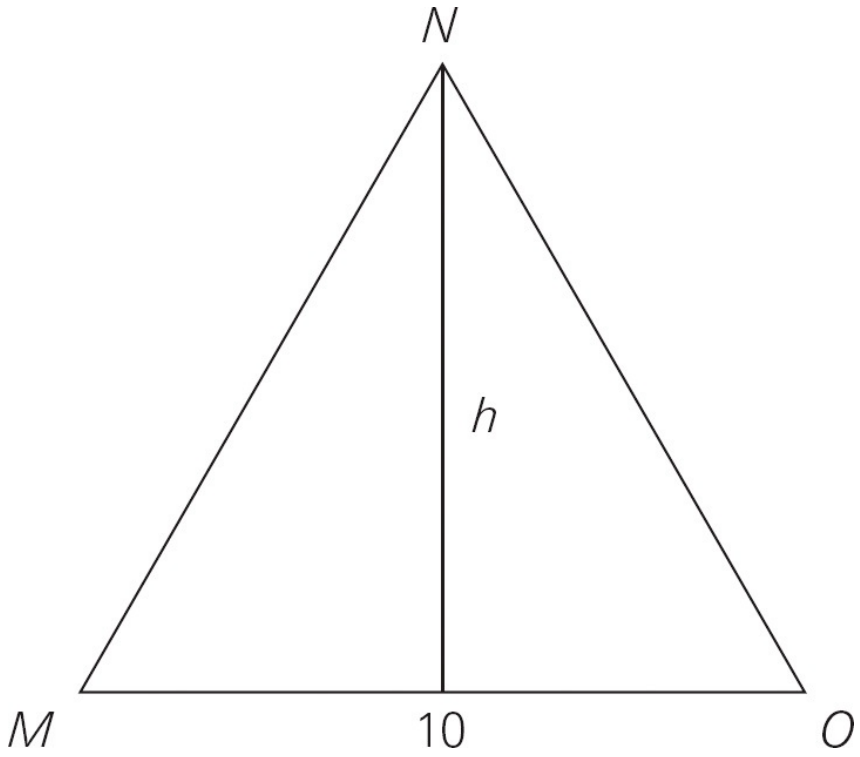

22. In the figure above, if the length of *MO* is 10, is *MNO* an equilateral triangle?

(1) The length of *MN* is 10.

(2) $h = 5\sqrt{3}$

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23. In each of five taste tests, each of 51 participants chose either Brand *X* or Brand *Y*. The brand chosen by the majority of participants in a taste test was the winner of that taste test, and the brand that won the majority of the taste tests was deemed the better brand. Which of the brands was deemed the better brand?

(1) Brand *X* was chosen by a total of 155 participants.

(2) One brand won three of the first four taste tests.

- ⬭ Statement (1) ALONE is sufficient, but Statement (2) alone is not sufficient to answer the question asked.
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24. How many prime numbers are less than integer k ?

(1) $18 < k < 27$
(2) $23 < k < 30$

- ⬭ Statement (1) ALONE is sufficient, but Statement (2) alone is not sufficient to answer the question asked.
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25. How many baseball cards do Keith, Pat, and Steve own in total?

(1) Keith and Pat together own half as many baseball cards as Steve does.
(2) Keith and Steve together own 109 baseball cards, and Pat and Steve together own 126 baseball cards.

- ⬭ Statement (1) ALONE is sufficient, but Statement (2) alone is not sufficient to answer the question asked.
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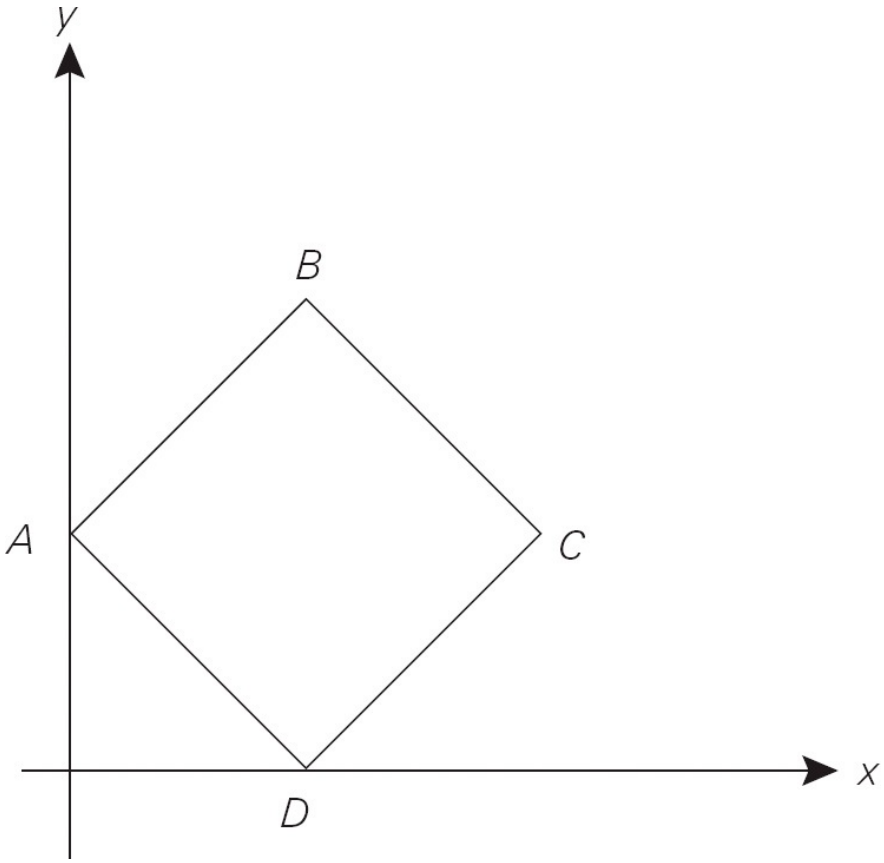

26. What is the area of square *ABCD*, as shown in the coordinate plane above?

(1) Point *A* has coordinates (0,4).
(2) Points *B* and *D* have coordinates (4,8) and (4,0), respectively.

- ⬭ Statement (1) ALONE is sufficient, but Statement (2) alone is not sufficient to answer the question asked.
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27. If x, y, and z are distinct integers, which integer is the median of the set $\{x, y, z\}$?

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

- ◯ Statement (1) ALONE is sufficient, but Statement (2) alone is not sufficient to answer the question asked.
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28. If both m and n are negative integers, which of the following must be positive?

- ◯ $\frac{m}{n} - 1$
- ◯ $m(n + 1)$
- ◯ $mn - 5$
- ◯ $m^2 + n^2 - 1$
- ◯ $mn + 3n$

29. Two bottles are partially filled with water. The larger bottle currently holds $\frac{1}{3}$ of its capacity. The smaller bottle, which has $\frac{2}{3}$ of the capacity of the larger bottle, currently holds $\frac{3}{4}$ of its capacity. If the contents of the smaller bottle are poured into the larger bottle, the larger bottle will be filled to what fraction of its capacity?

- ○ $\frac{5}{6}$
- ○ $\frac{3}{4}$
- ○ $\frac{2}{3}$
- ○ $\frac{7}{12}$
- ○ $\frac{1}{2}$

30. In a certain office, the ratio of men to women is $\frac{3}{4}$. If 10 men were added to the office, the ratio of men to women would be $\frac{7}{6}$. How many men and women total are currently in the office?

- ○ 18
- ○ 24
- ○ 28
- ○ 42
- ○ 52

31. If the radius of a cylinder is half the length of the edge of a cube, and the height of the cylinder is equal to the length of the edge of the cube, what is the ratio of the volume of the cube to the volume of the cylinder?

- ○ $\frac{2}{\pi}$
- ○ $\frac{\pi}{4}$
- ○ $\frac{4}{\pi}$
- ○ $\frac{\pi}{2}$
- ○ 4

32. If x and y are distinct prime numbers, which of the following could be true?

- $\frac{x^y}{y}$ is an odd integer.
- $x^2y^3 = x^2$
- $\frac{y^x}{4}$ is an even integer.
- $\frac{xy}{2}$ is an even integer.
- $xy = y^x$

33. Three men and 2 women will present 5 consecutive speeches, 1 by each person, at a conference. If the order of the speakers is determined randomly, what is the probability that at least 2 of the men's speeches will be consecutive?

- $\frac{3,124}{3,125}$
- $\frac{9}{10}$
- $\frac{4}{5}$
- $\frac{16}{25}$
- $\frac{1}{2}$

34. Three children, John, Paul, and Ringo, are playing a game. Each child will choose either the number 1 or the number 2. When one child chooses a number different from those of the other two children, he is declared the winner. If all of the children choose the same number, the process repeats until one child is declared the winner. If Ringo always chooses 2 and the other children select numbers randomly, what is the probability that Ringo is declared the winner?

- ⬭ $\frac{1}{6}$
- ⬭ $\frac{1}{4}$
- ⬭ $\frac{1}{3}$
- ⬭ $\frac{1}{2}$
- ⬭ $\frac{2}{3}$

35. Is q an integer?

(1) $3q$ is an integer.
(2) $5q$ is an integer.

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36. Line k passes through the points (6,2) and P and has a slope of $-\frac{3}{5}$. If the line that passes through the origin and point P has a slope of -2, which of the following are the xy-coordinates for point P ?

- ◯ $\left(-\frac{40}{7},\frac{80}{7}\right)$
- ◯ $(-4,8)$
- ◯ $(-3,6)$
- ◯ $\left(\frac{11}{5},-\frac{22}{5}\right)$
- ◯ $\left(\frac{28}{13},-\frac{56}{13}\right)$

37. Will must choose a 3-character computer password, consisting of 1 letter from the alphabet and 2 distinct digits, in any order. From how many different passwords can Will choose?

- ◯ 390
- ◯ 2,340
- ◯ 4,680
- ◯ 7,020
- ◯ 14,040