

Set 3

1. The population of City X is 50 percent of the population of City Y . The population of City X is what percent of the total population of City X and City Y ?

- A. 25%
- B. $33\frac{1}{3}\%$
- C. 40%
- D. 50%
- E. $66\frac{2}{3}\%$

2. 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.

3. Each participant in a certain study was assigned a sequence of 3 different letters from the set $\{A, B, C, D, E, F, G, H\}$. If no sequence was assigned to more than one participant and if 36 of the possible sequences were not assigned, what was the number of participants in the study? (Note, for example, that the sequence A, B, C is different from the sequence C, B, A .)

- A. 20
- B. 92
- C. 300
- D. 372
- E. 476

4. 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%

5. If x and y are positive, is $x^3 > y$?

- (1) $\sqrt{x} > y$
- (2) $x > y$

6. The infinite sequence $a_1, a_2, \dots, a_n$, 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

7. For a certain race, 3 teams were allowed to enter 3 members each. A team earned $6 - n$ points whenever one of its members finished in n th place, where $1 \leq n \leq 5$. There were no ties, disqualifications, or withdrawals. If no team earned more than 6 points, what is the least possible score a team could have earned?

- A. 0
- B. 1
- C. 2
- D. 3
- E. 4

8. At a certain food stand, the price of each apple is ₱40 and the price of each orange is ₱60. 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 is ₱ 56. How many oranges must Mary put back so that the average price of the pieces of fruit that she keeps is ₱ 52?

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5

9. Professor Vasquez gave a quiz to two classes. Was the range of scores for the first class equal to the range of scores for the second class?

- (1) In each class, the number of students taking the quiz was 26, and the lowest score in each class was 70.
- (2) In each class, the average (arithmetic mean) score on the quiz was 85.

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

- (1) $3^x 5^y = 1,125$
- (2) $y = 3$

11. If $|d - 9| = 2d$, then $d =$

- A. -9
- B. -3
- C. 1
- D. 3
- E. 9

12. There are 11 women and 9 men in a certain club. If the club is to select a committee of 2 women and 2 men, how many different such committees are possible?

- A. 120
- B. 720
- C. 1,060
- D. 1,520
- E. 1,980

13. Is the measure of one of the interior angles of quadrilateral ABCD equal to 60 degrees?

- (1) Two of the interior angles of ABCD are right angles.
- (2) The degree measure of angle ABC is twice the degree measure of angle BCD.

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

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

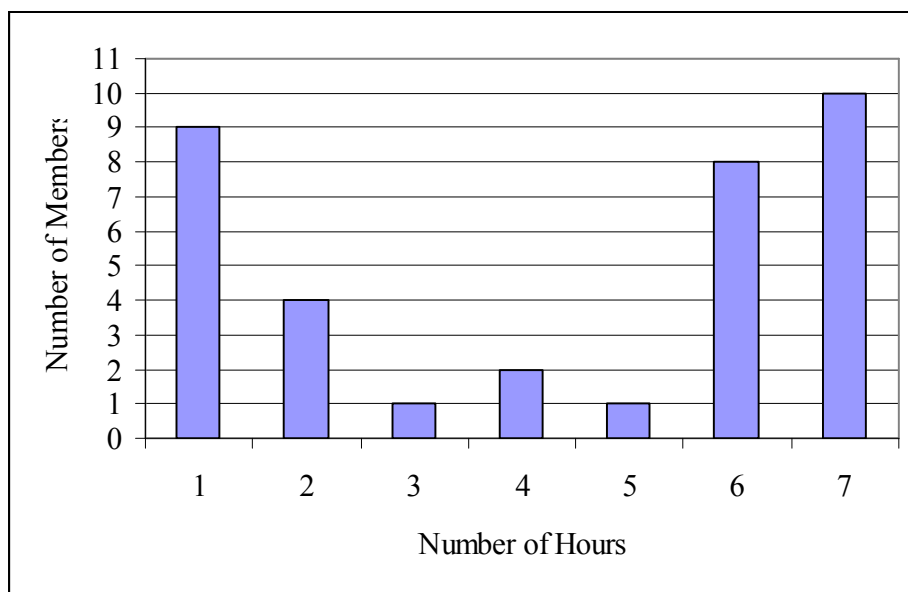
15. The area of square S is equal to the area of rectangle R . What is the perimeter of square S ?

- (1) The length of one of the sides of rectangle R is twice the length of a side of square S .
- (2) The area of rectangle R is 36.

16. 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

17.



Yesterday each of the 35 members of a certain task force spent some time working on project *P*. The graph shows the number of hours and the number of members who spent that number of hours working on project *P* yesterday. What was the median number of hours that the members of the task force spent working on project *P* yesterday?

- A. 2
- B. 3
- C. 4
- D. 5
- E. 6

18. A certain list consists of 21 different numbers. If n is in the list and n is 4 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. $\frac{1}{5}$
- D. $\frac{4}{21}$
- E. $\frac{5}{21}$

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

- A. 8
- B. 10
- C. 12
- D. 15
- E. 20

20. When tossed, a certain coin has equal probability of landing on either side. If the coin is tossed 3 times, what is the probability that it will land on the same side each time?

- A. $\frac{1}{8}$
- B. $\frac{1}{4}$
- C. $\frac{1}{3}$
- D. $\frac{3}{8}$
- E. $\frac{1}{2}$

21. 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 to 4
- B. 1 to 3
- C. 1 to 2
- D. 2 to 3
- E. 2 to 1

22. 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. 13
- B. $\sqrt{34}$
- C. $\sqrt{43}$
- D. $7 + 6\sqrt{2}$
- E. $12 + 3\sqrt{2}$

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

- (1) n^2 is not equal to 0.
- (2) $n^2 + 10n = 0$

24. A store's selling price of \$2,240 for a certain computer would yield a profit of 40 percent of the store's cost for the computer. What selling price would yield a profit of 50 percent of the computer's cost?

- A. \$2,400
- B. \$2,464
- C. \$2,650
- D. \$2,732
- E. \$2,800

25. If the volume of a small container is 14,520 cubic millimeters, what is the volume of the container in cubic centimeters? (1 millimeter = 0.1 centimeter)

- A. 0.1452
- B. 1.452
- C. 14.52
- D. 145.2
- E. 1,452

26. If $xyz \neq 0$, is $x(y + z) \geq 0$?

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

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

- (1) $x = 3$
- (2) $5x - 2y = 0$

28. 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 each other, which train was nearer to its destination?

- (1) At the time when the two trains passed each other, 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.

29. Of the following, which is greatest?

- A. $(1/5)^{-2}$
- B. $(1/3)^{-2}$
- C. 3^{-2}
- D. 5^{-2}
- E. 2^3

30. Which of the following is equal to $5^{17}4^9$?

- A. 2×10^{13}
 - B. 2×10^{17}
 - C. 2×10^{20}
 - D. 2×10^{26}
 - E. 2×10^{36}
-

31. If x and y are positive integers and $y = \sqrt{9-x}$, what is the value of y ?

- (1) $x < 8$
 - (2) $y > 1$
-

32. Sue's monthly earnings consist of a monthly salary and a 4 percent commission on the portion of her monthly sales that is in excess of \$2,000. If Sue's monthly salary was the same in July as in August, how much greater were her sales in July than in August?

- (1) Sue's monthly earnings were \$3,620 in July and \$3,580 in August.
 - (2) Sue's monthly salary was \$3,500 in July and in August.
-

33. In an art gallery, 25 percent of the art pieces on display were photographs. If 12 percent of the photographs were black-and-white photographs, what percent of the art pieces on display were black-and-white photographs?

- A. 3%
- B. 7%
- C. 13%
- D. 30%
- E. 37%

34. The average (arithmetic mean) of the 5 positive integers k , m , r , s , and t is 16, and $k < m < r < s < t$. If t is 40, what is the greatest possible value of the median of the 5 integers?

- A. 16
- B. 18
- C. 19
- D. 20
- E. 22

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

- I. 20.
 - II. 50.
 - III. 80.
- A. I only
 - B. III only
 - C. I and II only
 - D. II and III only
 - E. I, II, and III

36. 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 sold were for adults?

- (1) Revenue from ticket sales for this performance totaled \$10,500.
- (2) The average (arithmetic mean) price per ticket sold was \$21.

37. What is the remainder when the positive integer x is divided by 8?

- (1) When x is divided by 12, the remainder is 5.
- (2) When x is divided by 18, the remainder is 11.

Answers for set 3

1. The best answer is B.

Let X be the population of city X → The population of city Y is 2X. → The population of city X is $\frac{X}{X+2X} * 100 = 33\frac{1}{3}\%$ of the total population

2. The best answer is E.

(1) Insufficient. There is no information about the change in deductions.

(2) Insufficient. There is no information about the change in gross profit.

(1+2) Insufficient. E.g. (1) Original Gross Income=10 Original Deductions=5,

(2) Original Gross Income=1000 Original Deductions=995.

3. The best answer is C.

The number of sequences possible from these 8 letters is $8*7*6=336$. It is given that 36 of the possible sequences were not assigned → $336-36=300$ participants.

4. The best answer is C.

We have to find the average of the taxes percent she paid:

$$\text{The average} = \frac{4 * 50 + 0 * 20 + 8 * 30}{50 + 20 + 30} = \frac{440}{100} = 4.4$$

5. The best answer is E.

(1) Insufficient. If we take $x=64, y=4$ then $\sqrt{x} > y$ and also $x^3 > y$. On the other hand, if $0 < x, y < 1$, for example: $x=\frac{1}{4}, y=\frac{1}{3}$ then $\sqrt{x} > y$ but $x^3 < y$.

(2) Insufficient. . If we take $x=64, y=4$ then $x > y$ and also $x^3 > y$. On the other hand, if $0 < x, y < 1$, for example, $x=\frac{1}{2}, y=\frac{1}{4}$ then $x > y$ but $x^3 < y$.

(1+2) Insufficient. The reason is the same as in (2).

6. The best answer is B.

$a_1 = 2, a_2 = -3, a_3 = 5, a_4 = -1, a_5 = 2, a_6 = -3 \dots$ the sum of every four terms is 3. Since $97:4 = 24(1)$, the sum of the first 97 terms is $24 \cdot 3 + 2 = 74$

7. The best answer is D.

The total number of points is $5+4+3+2+1=15$. The least possible score for one team will be when the other 2 teams earn maximal score, which is 6 (one team can get 6 points for positions 1 and 5, and the other team can get 6 points for positions 2 and 4) $\rightarrow$ the least score a team may earn $= 15 - 2 \cdot 6 = 3$.

8. The best answer is E.

At the beginning: $\begin{cases} \text{Oranges} + \text{Apples} = 10 \\ \frac{\text{Oranges} \cdot 60 + \text{Apples} \cdot 40}{10} = 56 \end{cases} \rightarrow$ there are 8 oranges and 2 apples

After returning X oranges: $\frac{(8 - X) \cdot 60 + 2 \cdot 40}{10 - X} = 52 \rightarrow X = 5$

9. The best answer is E.

(1) Insufficient. The highest score in each class is unknown, so the range can't be found.

(2) Insufficient. The lowest and the highest score in each class is unknown, so the range can't be found.

(1+2) Insufficient. There are many ways to reach an average of 85 with 26 students when the lowest score is 70 $\rightarrow$ we can't determine the range.

10. The best answer is A.

(1) Sufficient. $1,125 = 3^2 5^3$. x and y are positive integers $\rightarrow x=2$ (and $y=3$).

(2) Insufficient. x can be any positive integer.

11. The best answer is D.

The easiest way is to plug in the answers: $d=3$ will give us: $|3-9| = 2*3$ which is true.

12. The best answer is E.

We have to choose 2 women out of 11 women when order is not important, so the number of possibilities to do that is: $\frac{11!}{2! \cdot 9!} = \frac{10 \cdot 11}{2} = 55$. We also have to choose 2 men out of 9 men when order is not important, so the number of possibilities to do that is: $\frac{9!}{2! \cdot 7!} = \frac{8 \cdot 9}{2} = 36$. We have to choose 2 women and 2 men $\rightarrow 55 \cdot 36 = 1,980$.

13. The best answer is E.

(1) Insufficient

(2) Insufficient

(1+2) Insufficient. E.g. 90, 90, 45, 135 or 90, 90, 60, 120

14. The best answer is C.

(1) Insufficient. $4b$ is even, (whether b is even or odd) and since $3a+4b$ is even, $3a$ has to be even $\rightarrow a$ is even.

(2) Insufficient. a and b can be both even or both odd.

(1+2) Sufficient. Using both statements together a and b are both even.

15. The best answer is B.

(1) Insufficient. No quantitative measure is given.

(2) Sufficient. If the area of the rectangle is 36, the area of the square is also 36 $\rightarrow$ each side of the square is 6 $\rightarrow$ The perimeter of the square is $4 \cdot 6 = 24$.

16. The best answer is A.

Let C and T be revenues from cars and trucks respectively in 1996. $\rightarrow$ revenues from cars in 1997 = $\frac{89C}{100}$, and revenues from trucks in 1997 = $\frac{107T}{100}$.

The total revenues from car sales and truck sales in 1996 is C+T, and the total revenues from car sales and truck sales in 1997 is $\frac{89C}{100} + \frac{107T}{100} \rightarrow \frac{101(C+T)}{100} = \frac{89C}{100} + \frac{107T}{100} \rightarrow$
 $101C+101T=89C+107T \rightarrow 12C=6T \rightarrow \frac{C}{T} = \frac{1}{2}$

17. The best answer is E.

There are 35 members, therefore the median will be the member who is the center of the pack, if the members are arranged in ascending order $\rightarrow$ the median will be the 18th member. Arrange the members according to the ascending order of the number of hours. There are 9 member who work 1 hour, then 4 members who work 2 hours, then 1 member who works 3 hours, then 2 members who work 4 hours, then one member who works 5 hours and 8 members who work 6 hours. So the 18th member works 6 hours $\rightarrow$ 6 is the median.

18. The best answer is B.

The average of the 20 numbers is $\frac{n}{4}$ and the sum of the 20 numbers is $20 * \frac{n}{4} = 5n \rightarrow$ The sum of the 21 numbers is $5n+n=6n$. $\rightarrow$ The fraction of n out of the sum of the 21 numbers is $\frac{n}{6n} = \frac{1}{6}$

19. The best answer is E.

We know that $\frac{1}{R} + \frac{1}{S} + \frac{1}{T} = \frac{1}{4}$, and $\frac{1}{S} + \frac{1}{T} = \frac{1}{5} \rightarrow \frac{1}{R} = \frac{1}{4} - \frac{1}{5} \rightarrow \frac{1}{R} = \frac{1}{20} \rightarrow R=20$

20. The best answer is B.

In the first toss it can land on either side, in the second toss we need it to land on the same side as in the first toss, and the third must also land on the same side as the first two →

$$1 * \frac{1}{2} * \frac{1}{2} = \frac{1}{4}$$

21. The best answer is C.

Let G, B and T, be the number of girls, the number of boys, and the total number,

respectively. $\frac{1}{4}G = \frac{1}{6}T \Rightarrow 3G = 2T \Rightarrow G = \frac{2}{3}T \Rightarrow B = T - \frac{2}{3}T = \frac{1}{3}T \Rightarrow$ the number of

girls $\left(\frac{2}{3}T\right)$ is twice the number of boys $\left(\frac{1}{3}T\right)$.

22. The best answer is E.

The length of one side of the triangle is the distance between (0,0) and (3,3) which is:

$$\sqrt{(3-0)^2 + (3-0)^2} = \sqrt{18} = 3\sqrt{2}$$

The length of another side of the triangle is the distance between (0,0) and (7,0) which is:

$$\sqrt{(7-0)^2 + (0-0)^2} = 7$$

The length of another side of the triangle is the distance between (3,3) and (7,0) which is:

$$\sqrt{(7-3)^2 + (0-3)^2} = 5$$

→ The perimeter of the triangle is: $3\sqrt{2} + 7 + 5 = 12 + 3\sqrt{2}$

23. The best answer is A.

If $n+5$ is positive, the equation is: $n+5=5$ and then $n=0$. If $n+5$ is negative, the equation is $n-5=5$ and then $n=10 \Rightarrow n=0$ or $n=10$

(1) Sufficient. The only possibility is $n=10$.

(2) Insufficient. Both 0 and 10 are possible solutions to this equation.

24. The best answer is A.

Let C, P and S, be the cost, profit and selling price, respectively. $2,240 - C = \frac{40}{100}C$

$\Rightarrow 2,240 = \frac{7}{5}C \Rightarrow C = 1600$. After increasing the price: $S - C = \frac{50}{100}C \Rightarrow$

$$S = \frac{3}{2}C \Rightarrow S = \frac{3}{2} * 1,600 = 2,400$$

25. The best answer is C.

Since cubic millimeters is actually (millimeters)*(millimeters)*(millimeters), we have to divide 14,520 3 times by 10 in order to reach to the volume in cubic centimeters $\Rightarrow$

$$\frac{14,520}{1,000} = 14.52$$

26. The best answer is C.

$$xyz \neq 0 \Rightarrow x, y, z \neq 0$$

(1) Insufficient. We have no information about x.

(2) Insufficient. We have no information about z.

(1+2) Sufficient. $|y + z| = |y| + |z|$ can be true only if y and z have the same sign. The second statement is true when x and y have the same sign.

Combining (1) and (2) we know that x, y and z have the same sign $\Rightarrow x(y+z) \geq 0$

27. The best answer is B.

(1) Insufficient. We have no information about y.

(2) Sufficient. $5x - 2y = 0 \Rightarrow 5x = 2y \Rightarrow 25x^2 = (5x)^2 \Rightarrow 25x^2 = (2y)^2 = 4y^2 \Rightarrow \frac{25x^2}{y^2} =$

$$\frac{4y^2}{y^2} = 4$$

28. The best answer is A.

- (1) Sufficient. If train P had an average speed of 70 m/h when it crosses train Q and the train passed each other after 2 hours, then train P made $2 \times 70 = 140$ miles when it passed train Q $\rightarrow$ train Q made $250 - 140 = 110$ miles $\rightarrow$ train P is closer to its destination.
- (2) Insufficient. We don't know train's Q average speed till the meeting point.

29. The best answer is A.

A. $\left(\frac{1}{5}\right)^{-2} = \frac{1}{\left(\frac{1}{5}\right)^2} = \frac{1}{\frac{1}{25}} = 25$

B. Similarly, $\left(\frac{1}{3}\right)^{-2} = 3^2 = 9$

C. $3^{-2} = \frac{1}{3^2} = \frac{1}{9}$

D. $5^{-2} = \frac{1}{5^2} = \frac{1}{25}$

E. $2^3 = 8$

30. The best answer is B.

$$5^{17}4^9 = 5^{17}(2^2)^9 = 5^{17} \cdot 2^{18} = 2(2^{17}5^{17}) = 2 \cdot (2 \cdot 5)^{17} = 2 \cdot 10^{17}$$

31. The best answer is D.

- (1) Sufficient. x can be one of these numbers: 1,2,3,4,5,6,7 but since y also has to be a positive integer, the only possibility is $x=5$ which gives us $y=2$.
- (2) Sufficient. $\sqrt{9-x}$ must be greater than 0 $\rightarrow x$ can be 1,2,3,4,5,6,7,8 or 9, but since y has to be a positive integer greater than 1, the only possibility is $x=5$ which gives us $y=2$.

32. The best answer is A.

- (1) Sufficient. The difference in the earnings between the two months, is the difference in the commission $\rightarrow 3620 - 3580 = 40 \rightarrow$ the difference in sales between the two months equal $40 = \frac{4}{100} \text{ Diff} \rightarrow$ Difference in sales = 1000
- (2) Insufficient. We have no information about the sales.

33. The best answer is A.

Let 100 be the number of the art pieces in the art gallery $\rightarrow$ the number of photograph is 25 $\rightarrow$ The number of black-and-white photographs is $\frac{12}{100} * 25 = 3 \rightarrow$ 3% of the pieces are black-and-white photographs.

34. The best answer is B.

The median is $r \rightarrow$ we are trying to find the value of r :

$$\begin{cases} k + m + r + s + t = 16 * 5 = 80 \\ t = 40 \end{cases} \rightarrow k + m + r + s = 40. \text{ The maximum value of } r \text{ will be when}$$

k and m will have the minimum possible values; 1 and 2 respectively, and when s is only 1 greater than r ; $r + 1 = s. \rightarrow 1 + 2 + r + (r + 1) = 40 \rightarrow r = 18$

35. The best answer is E.

- I. If $P=80$ and $R=20$, then $Q=80 \rightarrow$ isosceles triangle.
- II. If $P=80$ and $R=50$, then $Q=50 \rightarrow$ isosceles triangle.
- III. If $P=80$ and $R=80$, then $Q=20 \rightarrow$ isosceles triangle.

36. The best answer is D.

Let A be the number of tickets sold for adults $\rightarrow 500-A$ is the number of tickets sold for children.

(1) Sufficient. The equation is: $25A+15(500-A)=10,500 \rightarrow 10A=3,000 \rightarrow A=300$.

(2) Sufficient. The equation is: $\frac{25A+15(500-A)}{500} = 21 \Rightarrow \frac{A+750}{50} = 21 \Rightarrow A = 30$

37. The best answer is E.

(1) Insufficient. $X=12K+5$ we can not know what is the remainder when $12K$ is divided by 8. E.g. $x=5$ or $x=17$

(2) Insufficient. $X=18L+11$ we can not know what is the remainder when $18L$ is divided by 8. E.g. $x=11$ or $x=29$

(1+2) Insufficient. E.g. $x=29$ or $x=65$