

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

- A. $x - 40$
- B. $x - 24$
- C. $40 - x$
- D. $24 - x$
- E. $24 + x$

Explanation:

Since Mario was 32 years old 8 years ago, his age now is $32 + 8 = 40$. x years ago, Mario was x years younger, so his age then was $40 - x$. The correct answer is C.

2. Running at the same constant rate, 6 identical machine can produce a total of 270 bottles per minute. At this rate, how many bottles could 10 such machines produce in 4 minutes?

- A. 648
- B. 1,800
- C. 2,700
- D. 10,800
- E. 64,800

Explanation:

The production rate of each machine is $\frac{270}{6} = 45$ bottles per minute. The production rate for 10 machines is $45(10) = 450$ bottles per minute. Therefore, the 10 machines can produce $450(4) = 1,800$ bottles in 4 minutes. The correct answer choice is B.

3. 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,

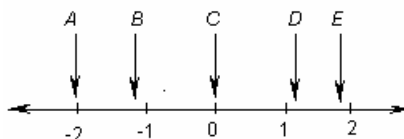
what was the total profit of the business partners for the year?

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

Explanation:

Based on the ratio 2:5:8, the total profit T was divided as follows:

$\frac{2}{15}T$ was given to Q , $\frac{5}{15}T$ was given to R , and $\frac{8}{15}T$ was given to S . Since $\frac{2}{15}T = \$4,000$, $T = \frac{15}{2}(\$4,000) = \$30,000$. So the correct answer choice is B.



4. Of the five coordinates associated with points A , B , C , D , and E on the number line above, which has the greatest absolute value?

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

Explanation:

The absolute value of a number x may be thought of as the distance between x and 0 on the number line. By inspection of the five points, the coordinate of point A is farthest from 0 and thus has the greatest absolute value. The correct answer is A.

5. A restaurant meal cost \$35.50 and there was no tax. If the tip was more than 10 percent but less than 15 percent of the cost of the meal then the total amount paid must have been between

- (A) \$40 and \$42
- (B) \$39 and \$41
- (C) \$38 and \$40
- (D) \$37 and \$39
- (E) \$36 and \$37

Explanation:

If P is the total amount paid, then P must be greater than \$ 35.50 (1.1) but less than \$ 35.50 (1.15). That is, P is between \$ 39.05 and \$ 40.825. It follows that P must be between \$ 39 and \$ 41. Each of the other choices excludes a possible value of P. So B is the correct answer.

6. Harriet wants to put up fencing around three sides of her rectangular yard and leave a side of 20 feet unfenced. If the yard has an area of 680 square feet, how many feet of fencing does she need?

- (A) 34
- (B) 40
- (C) 68
- (D) 88
- (E) 102

Explanation:

The area of the yard is $20w = 680$ square feet, so $w = 680/20 = 34$ feet. The length of fencing needed is then $34 + 20 + 34 = 88$ feet. So D is the correct answer.

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

- . $u > s$
- . $s > q$
- . $u > r$

- (A) only

- (B) only
- (C) only
- (D) and
- (E) and

Explanation:

From the given inequalities, we can conclude that $q < r < t < u$, and it is helpful to know $s > u$ or $t < s < u$. Thus, II and III must be true, but I may be untrue. So, E is the correct answer.

8. Increasing the original price of an article by 15 percent and then increasing the new price by 15 percent is equivalent to increasing the original price by

- (A) 32.25%
- (B) 31.00%
- (C) 30.25%
- (D) 30.00%
- (E) 22.50%

Explanation:

A is the correct answer. If p is the original price, then the 15 percent increase in price results in a price of $1.15p$. the next 15 percent increase in price results in a price of $1.15(1.15p)$, or $1.3225p$. Thus, the price increased by $1.3225p - p = 0.3225p$, or 32.25% of p.

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

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

Explanation:

Since 0.0010101 is being multiplied by the k th power of 10, k is the number

of decimal places that the decimal point in 0.0010101 will move to the right (if $k > 0$) in the product 0.0010101×10^k . By inspection, 6 is the least number of decimal places that the decimal point must move to the right in order for the product to be greater than 1,000. Therefore, E is the correct answer.

10. If $(b-3)(4+\frac{2}{b})=0$ and $b \neq 3$, then $b =$
- (A) -8
(B) -2
(C) $-\frac{1}{2}$
(D) $\frac{1}{2}$
(E) 2

Explanation:

Since $(b-3)(4+\frac{2}{b})=0$, it follows that

either $b-3=0$ or $4+\frac{2}{b}=0$.

That is, either $b=3$ or $b=-\frac{1}{2}$.

But $b \neq 3$ is given, so $b=-\frac{1}{2}$. C is the correct answer.

11. In a weight-lifting competition, the total weight of Joe's two lifts was 750 pounds. If twice the weight of his first lift was 300 pounds more than the weight of his second lift, what was the weight, in pounds, of his first lift?
- (A) 225
(B) 275
(C) 325
(D) 350
(E) 400

Explanation:

Let F and S be the weights, in pounds, of Joe's first and second lifts, respectively. Then $F+S=750$ and $2F=S+300$. The second equation may be written as $S=2F-300$, and $2F=300$ may be substituted for S in the first equation to get $F+(2F-300)=750$. Thus, $3F=1,050$, or $F=350$ pounds. D is the correct answer.

12. One hour after Yolanda started walking from X to Y, a distance of 45 miles, Bob started walking along the same road from Y to X. If Yolanda's walking rate was 3 miles per hour and Bob's was 4 miles per hour, how many miles had Bob walked when they met?
- (A) 24
(B) 23
(C) 22
(D) 21
(E) 19.5

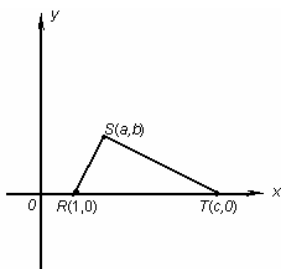
Explanation:

Let t be the number of hours that Bob had walked when he met Yolanda. Then, when they met, Bob had walked $4t$ miles and Yolanda had walked $3(t+1)$ miles. These distances must sum to 45 miles, so $4t+3(t+1)=45$, which may be solved for t as follows. $4t+3(t+1)=45$, $4t+3t+3=45$, $7t=42$, so $t=6$ (hours). Therefore, Bob had walked $4t=4(6)=24$ miles when they met. A is the correct answer.

13. The average (arithmetic mean) of 6 numbers is 8.5. When one number is discarded, the average of the remaining numbers becomes 7.2. What is the discarded number?
- (A) 7.8
(B) 9.8
(C) 10.0
(D) 12.4
(E) 15.0

Explanation:

The sum of the 6 numbers is $6(8.5) = 51.0$; the sum of the 5 remaining numbers is $5(7.2) = 36.0$. Thus, the discarded number must be $51.0 - 36.0 = 15.0$. E is the correct answer.



14. In the rectangular coordinate system above, the area of RST is

- (A) $\frac{bc}{2}$
 (B) $\frac{b^2(c-1)}{2}$
 (C) $\frac{c(b-1)}{2}$
 (D) $\frac{a(c-1)}{2}$
 (E) $\frac{c(a-1)}{2}$

Explanation:

If segment RT is chosen as the base of RST , then the height is b , the y -coordinate of point S . Since $RT = c - 1$ (the difference between the x -coordinate of R and T), the area of RST is $0.5(RT)b = 0.5(c-1)b$. So, B is the correct answer.

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

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

Explanation:

Since $x^2 - 6x + 5 = (x-5)(x-1)$, the roots of $x^2 - 6x + 5 = 0$ are 1 and 5. When these two values are substituted in each of the five choices to determine whether or not they satisfy the equation, only in D does a value satisfy the equation, namely, $2(1)^2 - 2 = 0$. So, D is the correct answer.

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

Explanation:

Since the first pipe fills $\frac{1}{5}$ of the tank in one hour and the second pipe fills $\frac{1}{3}$ of the tank in one hour, together they fill $\frac{1}{5} + \frac{1}{3} = \frac{8}{15}$ of the tank in one hour. At this rate, if t is the number of hours needed to fill $\frac{2}{3}$ of the tank, then $\frac{8}{15}t = \frac{2}{3}$, or $t = \frac{2}{3}(\frac{15}{8}) = \frac{5}{4}$ hours. So, C is the correct answer.

1. During the first week of September, a shoe retailer sold 10 pairs of a certain style of oxfords at \$35.00 a pair. If,

during the second week of September, 15 pairs were sold at the sale price of \$27.50 a pair, by what amount did the revenue from weekly sales of these oxfords increase during the second week?

- (A) \$62.50
- (B) \$75.00
- (C) \$112.50
- (D) \$137.50
- (E) \$175.00

Explanation:

The total sales revenue from the oxfords during the first week was $10(\$35.00) = \350.00 , and during the second week it was $15(\$27.50) = \412.50 . Thus, the increase in sales revenue was $\$412.50 - \$350.00 = \$62.50$. The first answer choice, therefore, is the correct answer.

2. 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

Explanation:

C is the correct answer. Since $2 - 0.5 = 1.5$ and $1 - 0.5 = 0.5$, the number $2 - 0.5$ is $1.5/0.5 = 3$ times the number $1 - 0.5$.

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

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

Explanation:

$-((-1)^4 + (-1)^3 + (-1)^2 + (-1)) = -(1 - 1 + 1 - 1) = -0 = 0$, so C is the correct

answer.

4. Coins are dropped into a toll box so that the box is being filled at the rate of approximately 2 cubic feet per hour. If the empty rectangular box is 4 feet long, 4 feet wide, and 3 feet deep, approximately how many hours does it take to fill the box?

- (A) 4
- (B) 8
- (C) 16
- (D) 24
- (E) 48

Explanation:

The volume of the toll box is $(4)(4)(3) = 48$ cubic feet. Since the box is filled at the rate of 2 cubic feet per hour, it takes $48/2 = 24$ hours to fill the box. Therefore, D is the correct answer.

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

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

Explanation:

$(\frac{1}{5})^2 - (\frac{1}{5})(\frac{1}{4}) = \frac{1}{25} - \frac{1}{20} = \frac{4}{100} - \frac{5}{100} = -\frac{1}{100}$, so B is the correct answer.

6. A club collected exactly \$599 from its members. If each member contributed

at least \$12, what is the greatest number of members the club could have?

- (A) 43
- (B) 44
- (C) 49
- (D) 50
- (E) 51

Explanation:

If n is the number of members in the club, then at least $12n$ dollars, but perhaps more, was contributed. Thus, $12n \leq 599$, or

$n \leq \frac{599}{12} = 49\frac{11}{22}$. Since n is a whole number, the greatest possible value of n is 49. Therefore, the third answer choice is the correct answer.

7. A union contract specifies a 6 percent salary increase plus a \$450 bonus for each employee. For a certain employee, this is equivalent to an 8 percent salary increase. What was this employee's salary before the new contract?

- (A) \$21,500
- (B) \$22,500
- (C) \$23,500
- (D) \$24,300
- (E) \$25,000

Explanation:

If S is the employee's salary before the new contract, then the increase in the employee's earnings is \$450 plus 6 percent of S , or $450 + 0.06S$. Since the increase is 8 percent of S , it follows that $450 + 0.06S = 0.08S$, or $0.02S = 450$, so that $S = \frac{450}{0.02} = \$22,500$. B is the correct answer.

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

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

Explanation:

As each of the choices is substituted for k , the sum $k + 2$ can be examined to determine whether or not it is a power of 3. The sums corresponding to the answer choices are 3, 6, 9, 27, and 81, respectively. Note that $3 = 3^1$, $9 = 3^2$, $27 = 3^3$, and $81 = 3^4$, but 6 is not a power of 3. So 4 cannot be a value of k , whereas 1, 7, 25, and 79 can be values of k . The second answer choice, therefore, is the correct answer. Alternatively, since any power of 3 must be odd, $k = 3^n - 2$ must also be odd and $k = 4$ is not possible.

9. Elena purchased brand X pens for \$4.00 apiece and brand Y pens for \$2.80 apiece. If Elena purchased a total of 12 of these pens for \$42.00, how many brand X pens did she purchase?

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

Explanation:

Let x denote the number of brand X pens Elena purchased. Then the number of brand Y pens she purchased was $12 - x$ and the total cost of the pens was $4x + 2.80(12 - x) = 42.00$ dollars. This equation can be solved as follows. $4x + 2.80(12 - x) = 42.00$, $4x + 33.60 - 2.80x = 42.00$, $1.20x = 8.40$, so $x = 7$

and D is the correct answer.

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

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

Explanation:

If the length and width are L and W , respectively, then the increased length and width are $1.2L$ and $1.2W$, respectively. Thus, the increased area is $(1.2L)(1.2W) = 1.44LW$, and the percent increase in area is 44%. The last answer choice is the correct answer.

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

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

Explanation:

After each successive 2-minute period, the bacteria population is 2,000, 4,000, 8,000, 16,000, 32,000, 64,000, 128,000, 256,000, and then 512,000. Therefore, after eight 2-minute periods, or 16 minutes, the population is only 256,000; and after nine 2-minute periods, or 18 minutes, the population is just over 500,000. The last answer choice, therefore, is the correct answer. Alternatively, if n denotes the number of 2-minute

periods it takes for the population to grow from 1,000 to 500,000 then $2^n(1,000) = 500,000$, or $2^n = 500$. Since $2^4 = 16$, $2^8 = 16^2 = 256$, and $2^9 = 2(256) = 512$, the value of n is approximately 9. thus, the approximate time is $2(9) = 18$ minutes.

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

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

Explanation:

One way to answer the question is to examine each option to see which one satisfies the specified divisibility conditions. If $n = 3$, then $n - 4 = -1$; but 10 divided by 3 has remainder 1. if $n = 4$, then $n - 4 = 0$; but 10 divided by 4 has remainder 2. if $n = 7$, then $n - 4 = 3$, which does equal the remainder when 10 is divided by 7. that neither 8 nor 12 is a possible value of n can be shown in the manner used for $n = 3$ and $n = 4$. The correct answer is C. An alternative solution, which does not involve extensive checking of each option, is to first write the divisibility condition as the equation $10 = nq + (n - 4)$, where q denotes the quotient. Then, $14 = nq + n = n(q + 1)$, so n must be a divisor of 14. Also, $n - 4 \geq 0$, or $n \geq 4$. Thus, $n = 7$ or $n = 14$.

13. 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) $1\frac{1}{3}$ candles
 (D) 2 candles
 (E) 3 candles

Explanation:

In order to compute $s = \frac{60k}{d^2}$ when $d =$

20, the value of the constant k must be determined. Since $s = 30$ candles when $d = 2$ feet, substituting these values into the formula yields

$$30 = \frac{60k}{d^2}, \text{ or } k = 2. \text{ Therefore, when}$$

$d = 20$ feet, the intensity is

$$s = \frac{60(2)}{20^2} = \frac{120}{400} = \frac{3}{10} \text{ candle. A}$$

is the correct answer.

14. If x and y are prime numbers, which of the following CANNOT be the sum of x and y ?

- (A) 5 (B) 9 (C) 13
 (D) 16 (E) 23

Explanation:

Note that $5 = 2 + 3$, $9 = 2 + 7$, $13 = 2 + 11$, and $16 = 5 + 11$, so that each of these choices may be expressed as a sum of two prime numbers. However, if $23 = x + y$, then either x or y (but not both) must be even. Since 2 is the only even prime number, either $x = 2$ and $y = 21$, or $x = 21$ and $y = 2$. Since 21 is not prime, 23 cannot be expressed as the sum of two prime numbers. Therefore, E is the correct answer.

15. Of the 3,600 employees of Company

X , $\frac{1}{3}$ are

clerical. If the clerical staff were to be

reduced by $\frac{1}{3}$, what percent of the

total number of the remaining employees would then be clerical?

- (A) 25%
 (B) 22.2%
 (C) 20%
 (D) 12.5%
 (E) 11.1%

Explanation:

A is the correct answer. The number of clerical employees is

$$\frac{1}{3}(3,600) = 1,200. \text{ As a result of}$$

the proposed reduction, the number of clerical employees would be reduced

$$\text{by } \frac{1}{3}(1,200) = 400 \text{ and}$$

consequently would equal $1,200 - 400 = 800$. The total number of employees would then be $3,600 - 400 = 3,200$.

Hence, the percent of clerical employees would then be $800/3,200 = 1/4 = 25\%$.

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

. 3 and $\frac{1}{3}$

. $\frac{1}{17}$ and $-\frac{1}{17}$

. $\sqrt{3}$ and $\frac{\sqrt{3}}{3}$

- (A) only
 (B) only
 (C) and
 (D) and
 (E) and

Explanation:

Two numbers are reciprocals of each other if and only if their product is 1. Since

$$3\left(\frac{1}{3}\right) = 1, \left(\frac{1}{17}\right)\left(-\frac{1}{17}\right) = -\frac{1}{289} \neq 1, \text{ and}$$

$$\sqrt{3}\left(\frac{\sqrt{3}}{3}\right) = \frac{3}{3} = 1, \text{ only in I and III are}$$

the two numbers reciprocals of each other. Thus, I and III must be true. D is the correct answer.

1. What is 45 percent of $\frac{7}{12}$ of 240?

- (A) 63 (B) 90 (C) 108
(D) 140 (E) 311

Explanation:

A is the correct answer. Since 45 percent

$$\text{is } \frac{45}{100} = \frac{9}{20}, \text{ 45 percent of } \frac{7}{12} \text{ of}$$

$$240 \text{ is } \left(\frac{9}{20}\right)\left(\frac{7}{12}\right)(240) = 63.$$

2. If x books cost \$5 each and y books cost \$8 each, then the average (arithmetic mean) cost, in dollars per book, is equal to

- (A) $\frac{5x+8y}{x+y}$ (B) $\frac{5x+8y}{xy}$
(C) $\frac{5x+8y}{13}$ (D) $\frac{40xy}{x+y}$
(E) $\frac{40xy}{13}$

Explanation:

A is the correct answer. The total number of books is $x + y$, and their total cost is $5x + 8y$ dollars. Therefore, the average cost

$$\text{per book is } \frac{5x+8y}{x+y} \text{ dollars.}$$

3. If $\frac{1}{2}$ of the money in a certain trust

fund was invested in stocks, $\frac{1}{4}$ in

bonds, $\frac{1}{5}$ in a mutual fund, and the

remaining \$10,000 in a government certificate, what was the total amount of the trust fund?

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

Explanation:

$$\text{Since } \frac{1}{2} + \frac{1}{4} + \frac{1}{5} = \frac{19}{20}, \text{ then } \frac{19}{20} \text{ of}$$

the trust fund was invested in stocks, bonds and a mutual fund. Thus, if F is the dollar amount of the trust fund, the

remaining $\frac{1}{20}$ of F is \$ 10,000. That is,

$$\frac{1}{20}F = \$10,000, \text{ or } F = \$200,000. \text{ The}$$

third answer choice, therefore, is the correct answer.

4. Marion rented a car for \$18.00 plus \$0.10 per mile driven. Craig rented a car for \$25.00 plus \$0.05 per mile driven. If each drove d miles and each was charged exactly the same amount for the rental, then d equals

- (A) 100 (B) 120 (C) 135
(D) 140 (E) 150

Explanation:

Marion's total rental charge was $18.00 +$

0.10d dollars, and Craig's total rental charge was $25.00 + 0.05d$ dollars. Since these amounts are the same, $18.00 + 0.01d = 25.00 + 0.05d$, which implies $0.05d = 7.00$, or $d = \frac{7.00}{0.05} = 140$ miles. The third answer choice, therefore, is the correct answer.

5. Machine A produces bolts at a uniform rate of 120 every 40 seconds, and machine B produces bolts at a uniform rate of 100 every 20 seconds. If the two machines run simultaneously, how many seconds will it take for them to produce a total of 200 bolts?

- (A) 22 (B) 25 (C) 28
(D) 32 (E) 56

Explanation:

Machine A produces $\frac{120}{40} = 3$ bolts per second and machine B produces $\frac{100}{20} = 5$ bolts per second. Running simultaneously, they produce 8 bolts per second. At this rate, they will produce 200 bolts in $\frac{200}{8} = 25$ seconds. B is the correct answer.

6. $\frac{3.003}{2.002} =$

- (A) 1.05 (B) 1.50015
(C) 1.501 (D) 1.5015
(E) 1.5

Explanation:

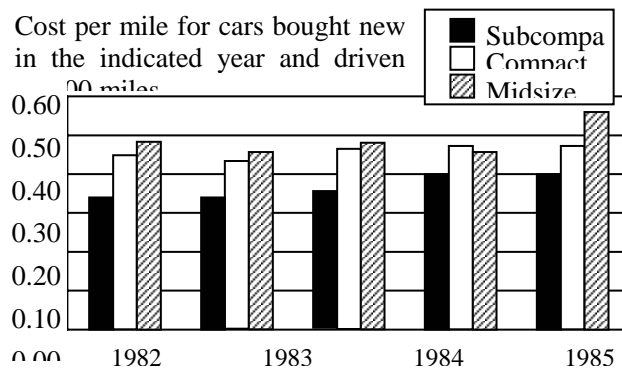
$$\frac{3.003}{2.002} = \frac{3(1.001)}{2(1.001)} = \frac{3}{2} = 1.5, \text{ so E}$$

is the correct answer.

Questions 8-10 refer to the following graph.

PROBLEM SOLVING

AVERAGE COSTS OF OPERATING SUBCOMPACT, COMPACT, AND
MIDSIZE CARS IN THE UNITED STATES, 1982-1986



7. In 1982 the approximate average cost of operating a subcompact car for 10,000 miles was

- (A) \$360
- (B) \$3,400
- (C) \$4,100
- (D) \$4,500
- (E) \$4,900

Explanation:

According to the bar graph, the average cost per mile of operating a subcompact car in 1982 was about \$ 0.34. Thus, the cost of operating the car for 10,000 miles was approximately \$ $0.34(10,000) = \$ 3,400$. The second answer choice, therefore, is the correct answer.

8. In 1984 the average cost of operating a subcompact car was approximately what percent less than the average cost of operating a midsize car?

- (A) 12%
- (B) 20%
- (C) 25%
- (D) 33%
- (E) 48%

Explanation:

According to the bars shown for 1984, the average operating cost per mile for a subcompact car was approximately \$ 0.36, or \$ 0.12 less than the \$ 0.48 per mile for a midsize car. Thus, in 1984 the operating cost for a subcompact car was approximately $\frac{0.12}{0.48} = 25\%$ less than the operating cost for a midsize car. C is the correct answer.

9. For each of the years shown, the average cost per mile of operating a compact car minus the average cost per mile of operating a subcompact car was between

- (A) \$0.12 and \$0.18
- (B) \$0.10 and \$0.15
- (C) \$0.09 and \$0.13
- (D) \$0.06 and \$0.12
- (E) \$0.05 and \$0.08

Explanation:

The differences in the average operating cost per mile between a subcompact car and a compact car may be estimated from the bar graph. For the consecutive years 1982-1986, the differences were approximately \$ 0.11, \$ 0.09, \$ 0.10, \$ 0.07, and \$ 0.07, respectively. Only D gives a range that includes all of these amounts. Alternatively, inspection of the bar graph reveals that the largest difference was about \$ 0.11 (in 1982) and the smallest difference was about \$ 0.07 (in 1985 or 1986). Only D gives a range that includes these extreme values, and thus the differences for all five years.

10. What is the decimal equivalent of $(\frac{1}{5})^5$?

- (A) 0.00032
- (B) 0.0016
- (C) 0.00625
- (D) 0.008
- (E) 0.03125

Explanation:

$(\frac{1}{5})^5 = (0.2)^5 = (0.2)(0.2)(0.2)(0.2)(0.2) = 0.00032$, so A is the correct answer.

11. Two hundred gallons of fuel oil are purchased at \$0.91 per gallon and are consumed at a rate of \$0.70 worth of fuel per hour. At this rate, how many hours are required to consume the 200 gallons of fuel oil?

(A) 140 (B) 220 (C) 260
(D) 322 (E) 330

Explanation:

The total worth of the 200 gallons of fuel oil is $\$0.91(200) = \182.00 . The time required to consume the \$182.00 worth of fuel at a rate of \$0.70 worth of fuel per hour is

$\frac{\$182.00}{\$0.70} = 260$ hours. Therefore, C is the correct answer.

12. If $\frac{4-x}{2+x} = x$, what is the value of $x^2 + 3x - 4$?

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

Explanation:

Multiplying both sides of $\frac{4-x}{2+x} = x$ by $2+x$ yields $4-x = x(2+x) = 2x+x^2$, or $x^2+3x-4=0$. thus, the value of x^2+3x-4 is 0. so, C is the correct answer.

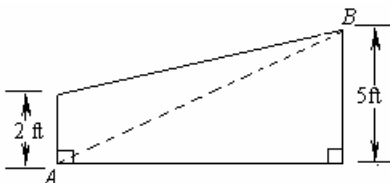
13. If $b < 2$ and $2x - 3b = 0$, which of the following must be true?

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

Explanation:

It follows from $2x - 3b = 0$ that $b = \frac{2}{3}x$. So $b < 2$ implies $\frac{2}{3}x < 2$, or $x < 2(\frac{3}{2})$, which

means $x < 3$ (this choice). None of the other choices must be true (although $x > -3$ and $x < 2$ could be true.). So, D is the correct answer.



14. The trapezoid shown in the figure above represents a cross section of the rudder of a ship. If the distance from A to B is 13 feet, what is the area of the cross section of the rudder in square feet?

(A) 39
(B) 40

- (C) 42
(D) 45
(E) 46.5

Explanation:

From the figure above, the area of the trapezoidal cross section is

$$\frac{1}{2}(AP + BQ)(AQ) = \frac{1}{2}(2 + 5)(AQ) = \frac{7}{2}(AQ). \text{ Since } AB = 13 \text{ feet, using the Pythagorean}$$

theorem, $AQ = \sqrt{13^2 - 5^2} = \sqrt{144} = 12$ feet. Thus, the area is $(7/2)(12) = 42$ square feet.

Therefore, C is the correct answer. Alternatively, the areas of the two triangles may be added together. If AQ is taken as the base of $\triangle APB$ and BQ is taken as the base of $\triangle BQA$, then the height of both triangles is AQ. Thus, the area of the trapezoid is

$$\frac{1}{2}(AP)(AQ) + \frac{1}{2}(BQ)(AQ) = \frac{1}{2}(2)(12) + \frac{1}{2}(5)(12) = 42 \text{ square feet.}$$

15. $\frac{(-1.5)(1.2) - (4.5)(0.4)}{30} =$

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

Explanation:

One way to reduce the expression is

$$\frac{(-1.5)(-1.2) - (4.5)(0.4)}{30} = \frac{-1.80 - 1.80}{30} = \frac{-3.60}{30} = -0.12. \text{ another way is}$$

$$\frac{(-1.5)(1.2) - (4.5)(0.4)}{30} = -\frac{15(12) + 45(4)}{3,000} = -\frac{12 + 3(4)}{200} = -\frac{24}{200} = -\frac{12}{100} = -0.12.$$

Therefore, B is the correct answer.

16. If n is a positive integer, then $n(n + 1)(n + 2)$ is

- (A) even only when n is even
(B) even only when n is odd
(C) odd whenever n is odd
(D) divisible by 3 only when n is odd
(E) divisible by 4 whenever n is even

Explanation:

If n is a positive integer, then either n is even or n is odd. If n is odd, then $n + 1$ is even. In either case, at least one of the factors is even, and the product $n(n + 1)(n + 2)$ is even. Thus, each of the first three choices is false. Since $n(n + 1)(n + 2)$ is divisible by 3 when n is 6 (or any even multiple of 3), the fourth choice is false. If n is even, then $n + 2$ is even as well; thus, $n(n + 1)(n + 2)$ is divisible by 4 since even numbers are divisible by 2. The last answer choice, therefore, is the correct answer.

1. If Jack had twice the amount of money that he has, he would have exactly the amount necessary to buy 3 hamburgers at \$0.96 apiece and 2 milk shakes at \$1.28 apiece. How much money does Jack have?

- (A) \$1.60
(B) \$2.24

- (C) \$2.72
- (D) \$3.36
- (E) \$5.44

Explanation:

C is the correct answer. Let J be the amount of money Jack has. Then $2J = 3 (\$ 0.96) + 2 (\$ 1.28)$
 $= \$ 5.44$. So $J = \frac{1}{2} (\$ 5.44) = \$ 2.72$.

2. If a photocopier makes 2 copies in $\frac{1}{3}$ second, then, at the same rate, how many copies does it make in 4 minutes?

- (A) 360
- (B) 480
- (C) 576
- (D) 720
- (E) 1,440

Explanation:

The photocopier makes copies at the rate of 2 copies in $\frac{1}{3}$ second, or 6 copies per second. Since 4 minutes equals 240 seconds, the photocopier makes $6(240) = 1,440$ copies in 4 minutes. The last answer choice, therefore, is the correct answer.

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

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

Explanation:

B is the correct answer. If P is the original price of the television set, then $0.9P$ is the price after the first discount, and $0.9(0.9P) = 0.81P$ is the price after the second discount. Thus, the original price is discounted by 19%(100% - 81%).

4. If $\frac{2}{1 + \frac{2}{y}} = 1$ then $y =$

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

Explanation:

Since $\frac{2}{1 + \frac{2}{y}} = 1$, $1 + \frac{2}{y} = 2$. Thus, $\frac{2}{y} = 1$, or $y = 2$. D is the correct answer.

5. If a rectangular photograph that is 10 inches wide by 15 inches long is to be enlarged so that the width will be 22 inches and the ratio of width to length will be unchanged, then the length, in inches, of the enlarged photograph will be

(A) 33
(B) 32
(C) 30
(D) 27
(E) 25

Explanation:

A is the correct answer. The ratio of width to length of the original photograph is $10/15=2/3$. If x is the length of the enlarged photograph, in inches, then $2/3=22/x$ since the ratio of width to length will be unchanged. Thus, $x = 33$ inches.

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

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

Explanation:

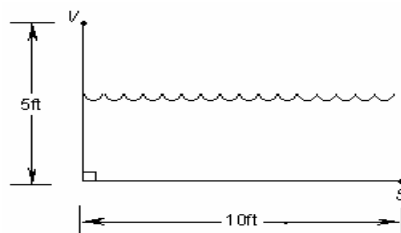
The correct answer is C. Since $(-2)^{2m} = ((-2)^2)^m = 4^m = 2^{2m}$, it follows that $2^{2m} = 2^{9-m}$. The exponents must be equal, so that $2m = 9 - m$, or $m = 3$.

7. If $0 < x < 4$ and $y < 12$, which of the following CANNOT be the value of xy ?

(A) -2
(B) 0
(C) 6
(D) 24
(E) 48

Explanation:

Each of the answer choices of A, B, and C can be a value of xy . For if $x = 1$, then $xy = y$, and each of these choices is less than 12. If $x = 4$, and $y = 6$, then $xy = 24$, so that D also gives a possible value of xy . In the last answer choice, if $xy = 48$, then for all values of x such that $0 < x < 4$, it follows that $y > 12$, which contradicts $y < 12$. Thus, 48 cannot be the value of xy . The last answer choice, therefore, is the correct answer.



8. In the figure above, V represents an observation point at one end of a pool. From V , an object that is actually located on the bottom of the pool at point R appears to be at point S . If $VR = 10$

feet what is the distance RS , in feet, between the actual position and the perceived position of the object?

- (A) $10 - 5\sqrt{3}$
- (B) $10 - 5\sqrt{2}$
- (C) 2
- (D) $2\frac{1}{2}$
- (E) 4

Explanation:

The correct answer is A. Let P be the point 5 feet directly below V . P is the vertex of the right angle of $\triangle VPR$ which is thus a right triangle. Then, by the Pythagorean theorem, $PR = \sqrt{10^2 - 5^2} = \sqrt{75} = 5\sqrt{3}$. Thus, $RS = PS - PR = 10 - 5\sqrt{3}$.

9. If the total payroll expense of a certain business in year Y was \$84,000, which was 20 percent more than in year X , what was the total payroll expense in year X ?

- (A) \$70,000
- (B) \$68,320
- (C) \$64,000
- (D) \$60,000
- (E) \$52,320

Explanation:

A is the correct answer. If P is the total payroll expense in year X , then $1.2P = \$84,000$, so that $P = \frac{\$84,000}{1.2} = \$70,000$.

10. If a , b , and c , are consecutive positive integers and $a < b < c$ which of the following must be true?

- . $c - a = 2$
 - . abc is an even integer.
 - . $\frac{a+b+c}{3}$ is an integer.
- (A) only
 - (B) only
 - (C) and only
 - (D) and only
 - (E) , and

Explanation:

Since a , b , and c are consecutive integers and $a < b < c$, it follows that $b = a + 1$ and $c = a + 2$.

Statement I follows from $c = a + 2$. Concerning statement II, if a is even, then abc is even; if a is odd, then b is even so that abc is even. In either case, abc is even, so statement II must be

true. In statement III, $\frac{a+b+c}{3} = \frac{a+(a+1)+(a+2)}{3} = \frac{3a+3}{3} = a+1 = b$, which is an

integer. Thus, III must be true. Therefore, all three statements are true. The correct answer is E.

answer is E.

11. A straight pipe 1 yard in length was marked off in fourths and also in thirds. If the pipe was then cut into separate pieces at each of these markings, which of the following gives all the different lengths of the pieces, in fractions of a yard?

- (A) $\frac{1}{6}$ and $\frac{1}{4}$ only
(B) $\frac{1}{4}$ and $\frac{1}{3}$ only
(C) $\frac{1}{6}$, $\frac{1}{4}$ and $\frac{1}{3}$
(D) $\frac{1}{12}$, $\frac{1}{6}$ and $\frac{1}{4}$
(E) $\frac{1}{12}$, $\frac{1}{6}$ and $\frac{1}{3}$

Explanation:

Since the pipe is cut at the five markings, six pieces of pipe are produced having lengths, in yards,

$$\frac{1}{4} - 0 = \frac{1}{4}, \quad \frac{1}{3} - \frac{1}{4} = \frac{1}{12}, \quad \frac{1}{2} - \frac{1}{3} = \frac{1}{6}, \quad \frac{2}{3} - \frac{1}{2} = \frac{1}{6}, \quad \frac{3}{4} - \frac{2}{3} = \frac{1}{12}, \quad \text{and} \quad 1 - \frac{3}{4} = \frac{1}{4}.$$

The different lengths of the pieces are therefore $\frac{1}{12}$, $\frac{1}{6}$ and $\frac{1}{4}$ yard. D is the correct answer.

12. What is the least integer that is a sum of three different primes each greater than 20?

- (A) 69
(B) 73
(C) 75
(D) 79
(E) 83

Explanation:

The three smallest primes that are each greater than 20 are 23, 29, and 31, and their sum is 83.

Since any other set of three primes, each greater than 20, would include a prime greater than 31 but no prime less than 23, the corresponding sum would be greater than 83. Thus, 83 is the least such sum. The last answer choice, therefore, is the correct answer.

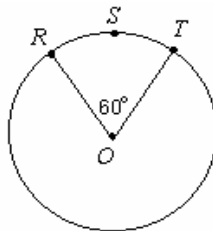
13. A tourist purchased a total of \$1,500 worth of traveler's checks in \$10 and \$50 denominations. During the trip the tourist cashed 7 checks and then lost all of the rest. If the number of \$10 checks cashed was one more or one less than the number of \$50 checks cashed, what is the minimum possible value of the checks that were lost?

- (A) \$1,430
(B) \$1,310
(C) \$1,290
(D) \$1,270
(E) \$1,150

Explanation:

Let t be the number of \$10 traveler's checks that were cashed and let f be the number of \$50 traveler's checks that were cashed. Then $t + f = 7$, and either $t = f + 1$ or $t = f - 1$. Thus, either $t = 4$ and $f = 3$, or $t = 3$ and $f = 4$. In the first case, the value of the lost checks would have been \$1,500

$-t (\$ 10) - f (\$ 50) = \$ 1,500 - \$ 40 - \$ 150 = \$ 1,310$; whereas, in the second case, the value would have been $\$ 1,500 - \$ 30 - \$ 200 = \$ 1,270$. the lesser of these amounts is $\$ 1,270$. the correct answer is D. alternatively, note that the minimum possible value of the lost checks corresponds to the maximum possible value of the checks that were cashed. Thus, $t = 3$ and $f = 4$, and the minimum possible value of the lost checks is $\$ 1,500 - \$ 30 - \$ 200 = \$ 1,270$.



14. If the circle above has center O and circumference 18 , then the perimeter of sector $RSTO$ is

- (A) $3 + 9$
- (B) $3 + 18$
- (C) $6 + 9$
- (D) $6 + 18$
- (E) $6 + 24$

Explanation:

If r is the radius of the circle, then the circumference is $2\pi r = 18\pi$, so that $r = 9$. The ratio of the length of arc RST to the circumference is the same as the ratio of 60° to 360° . Thus, the length of arc RST is $\frac{60}{360}(18\pi) = 3\pi$, and, consequently, the perimeter of sector $RSTO$ is $3\pi + r + r = 3\pi + 18$. The second answer choice, therefore, is the correct answer.

15. If each of the following fractions were written as a repeating decimal, which would have the longest sequence of different digits?

- (A) $\frac{2}{11}$
- (B) $\frac{1}{3}$
- (C) $\frac{41}{99}$
- (D) $\frac{2}{3}$
- (E) $\frac{23}{37}$

Explanation:

As repeating decimals, the choices are

$$\frac{2}{11} = 0.181818\dots, \frac{1}{3} = 0.333\dots, \frac{41}{99} = 0.414141\dots, \frac{2}{3} = 0.666\dots, \text{ and } \frac{23}{37} = 0.621621621\dots$$

. The longest sequence of different digits appears in the last decimal. The last answer choice, therefore, is the correct answer.

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

- . Rose is twice as old as Sam.
- . Sam is 3 years younger than Tina.
- . Rose is older than Tina.

- (A) only
 (B) only
 (C) only
 (D) and
 (E) and

Explanation:

When considering the relationships between people's ages, it may be helpful to keep in mind the fact that the difference between two ages remains constant from one year to the next, but their ratio does not. Thus, statement I need not be true, whereas statement II must be true. For statement III, if R, S, and T denote the respective ages of Rose, Sam, and Tina today, then $R = 2S$ and $S = T - 3$, so that $R = 2(T - 3)$. Thus, $R > T$ if and only if $2(T - 3) > T$, or $T > 6$. Therefore, statement III need not be true. Thus, II is the only statement that must be true. The correct answer choice is B.

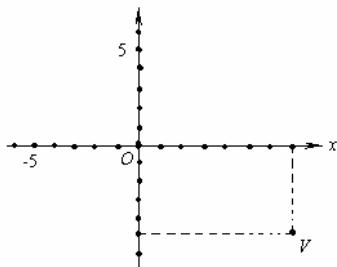
1. The average (arithmetic mean) of 6, 8, and 10 equals the average of 7, 9, and

- (A) 5 (B) 7 (C) 8
 (D) 9 (E) 11

Explanation:

C is the correct answer. The average of 6, 8, and 10 and $\frac{6+8+10}{3} = 8$, which equals the

average of 7, 9, and x. Thus, $\frac{7+9+x}{3} = 8$, $16+x=24$, and $x=8$.



2. In the figure above, the coordinates of point V are

- (A) (-7, 5)
 (B) (-5, 7)
 (C) (5, 7)
 (D) (7, 5)
 (E) (7, -5)

Explanation:

The x-coordinate of V is 7 and the y-coordinate of V is -5. Thus, the coordinates, (x,y), of V are (7,-5). Therefore, the correct answer is E. Alternatively, since point V lies in quadrant IV, the x-coordinate of V is positive, and the y-coordinate of V is negative. Only E meets these condition and is, therefore, the best answer.

3. Tickets for all but 100 seats in a 10,000-seat stadium were sold. Of the tickets sold, 20 percent were sold at half price and the remaining tickets were sold at the full price of \$2. What was the total revenue from ticket sales?
- (A) \$15,840
(B) \$17,820
(C) \$18,000
(D) \$19,800
(E) \$21,780

Explanation:

The number of tickets sold was $10,000 - 100 = 9,900$. If 20 percent of the tickets were sold at half price, then 80 percent were sold at full price. Total revenue was therefore, $0.2(9,900)(\$1.00) + 0.8(9,900)(\$2.00) = \$17,820$. So, the correct answer is B.

4. In a mayoral election, Candidate X received $\frac{1}{3}$ more votes than Candidate Y, and Candidate Y received $\frac{1}{4}$ fewer votes than Candidate Z. If Candidate Z received 24,000 votes, how many votes did Candidate X receive?
- (A) 18,000
(B) 22,000
(C) 24,000
(D) 26,000
(E) 32,000

Explanation:

If x , y , and z are the number of votes received by candidates X, Y, and Z, respectively, then

$x = \frac{4}{3}y$, $y = \frac{3}{4}z$, and $z = 24,000$. By substitution, $y = (\frac{3}{4})(24,000) = 18,000$ and

$x = \frac{4}{3}(18,000) = 24,000$. Candidate X received a total of 24,000 votes. Therefore, C is the correct answer.

5. Rene earns \$8.50 per hour on days other than Sundays and twice that rate on Sundays. Last week she worked a total of 40 hours, including 8 hour on Sunday. What were her earnings for the week?
- (A) \$272
(B) \$340
(C) \$398
(D) \$408
(E) \$476

Explanation:

The correct answer is D. Rene worked a total of 32 hours at \$8.50 per hour during the week, and 8 hours on Sunday at \$17.00 per hour. Her total earnings for the week were $32(\$8.50) + 8(\$17) = \$408$.

6. In a shipment of 120 machine parts, 5 percent were defective. In a shipment of 80 machine parts, 10 percent were defective. For the two shipments combined, what percent of the machine parts were defective?
- (A) 6.5%

- (B) 7.0%
 (C) 7.5%
 (D) 8.0%
 (E) 8.5%

Explanation:

In the combined shipments, there was a total of 200 machine parts, of which $0.05(120) + 0.1(80) = 6 + 8 = 14$ were defective. The percent of machine parts that were defective in the two shipments

combine was $\frac{14}{200} = \frac{7}{100} = 7\%$. Therefore, B is the correct answer.

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

- (A) 16
 (B) 14
 (C) 3
 (D) 1
 (E) -1

Explanation:

$$\frac{2\frac{3}{5} - 1\frac{2}{3}}{\frac{2}{3} - \frac{3}{5}} = \frac{\frac{13}{5} - \frac{5}{3}}{\frac{2}{3} - \frac{3}{5}} = \frac{\frac{39 - 25}{15}}{\frac{10 - 9}{15}} = \frac{\frac{14}{15}}{\frac{1}{15}} = \frac{14}{15} \times \frac{15}{1} = 14. \text{ So B is correct.}$$

8. If $x = -1$, then $\frac{x^4 - x^3 + x^2}{x - 1} =$

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

Explanation:

Substituting the value -1 for x in the expression results in

$$\frac{(-1)^4 - (-1)^3 + (-1)^2}{-1 - 1} = \frac{1 - (-1) + 1}{-2} = -\frac{3}{2}. \text{ Therefore, A is the correct answer.}$$

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

- (A) $25x^2 + 4 = y^2$
 (B) $75x^2 = 3y^2 - 12$
 (C) $25x^2 = (y + 2)(y - 2)$

(D) $5x = y - 2$

(E) $x^2 = \frac{y^2 - 4}{25}$

Explanation:

A is obtained by adding 4 to both sides of the equation $25x^2 = y - 4$. The second choice is obtained by multiplying both sides of the original equation by 3, while the third choice is equivalent because $y^2 - 4 = (y + 2)(y - 2)$. The fifth choice is obtained by dividing both sides of the original equation by 25. By processing of elimination, the answer choice must be D. Squaring both sides of $5x = y - 2$, as indicated by answer D, gives $25x^2 = y^2 - 4y + 4$, which is NOT equivalent to the original equation. D, therefore, is the correct answer.

10. A toy store regularly sells all stock at a discount of 20 percent to 40 percent. If an additional 25 percent were deducted from the discount price during a special sale, what would be the lowest possible price of a toy costing \$16 before any discount ?

- (A) \$5.60
- (B) \$7.20
- (C) \$8.80
- (D) \$9.60
- (E) \$15.20

Explanation:

The lowest possible price is paid when the maximum discount is received, so the lowest possible regular price is $\$16 - 0.40(\$16) = \$9.60$. With an additional 25 percent discount, the lowest possible price is $\$9.60 - 0.25(\$9.60) = \$7.20$. B is the correct answer.

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

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

Explanation:

The ratio of 664,579 to 10 million is approximately 660,000 to 10,000,000 or

$$\frac{66}{1,000} = 0.066 = 6.6\%. \text{ D, therefore, is the correct answer.}$$

12. A bank customer borrowed \$10,000, but received y dollars less than this due to discounting. If there was a separate \$25 service charge, then, in terms of y , the service charge was what fraction of the amount that the customer received?

- (A) $\frac{25}{10,000 - y}$
- (B) $\frac{25}{10,000 - 25y}$

- (C) $\frac{25y}{10,000 - y}$
 (D) $\frac{y - 25}{10,000 - y}$
 (E) $\frac{25}{10,000 - (y - 25)}$

A is the correct answer. The amount of money the customer received was $(10,000 - y)$ dollars. The \$25 service charge as a fraction of the amount received was, therefore, $\frac{25}{10,000 - y}$.

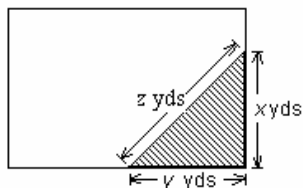
13. An airline passenger is planning a trip that involves three connecting flights that leave from Airports A, B, and C, respectively. The first flight leaves Airport A every hour, beginning at 8:00 a.m., and arrives at Airport B $2\frac{1}{2}$ hours later. The second flight leaves Airport B every 20 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

Explanation:

Regardless of the time of departure from Airport A, arrival at Airport B will be at 30 minutes past the hour. Flights leave Airport B on the hour, and at either 20 or 40 minutes past the hour. Therefore, the earliest a passenger from Airport A could leave Airport B would be at 40 minutes past the hour with a 10-minute wait between flights. The flight from Airport B to Airport C

takes $1\frac{1}{6}$ hours or 1 hour 10 minutes. A flight taken at 40 minutes past the hour would arrive at

Airport C at 50 minutes past the hour, causing the passenger to have missed the flight from Airport C by 5 minutes. The passenger therefore has a 55-minute wait, and the least total amount of time the passenger must spend between flights is $10 + 55 = 65$ minutes, or 1 hour 5 minutes. The second answer choice, therefore, is the correct answer.



14. The shaded portion of the rectangular lot shown above represents a flower bed. If the area of the bed is 24 square yards and $x = y + 2$, then z equals
- (A) $\sqrt{13}$
 (B) $2\sqrt{13}$
 (C) 6
 (D) 8
 (E) 10

Explanation:

The area of the triangular flower bed can be found by the formula $A = \frac{1}{2}(\text{altitude})(\text{base})$ or

$24 = \frac{1}{2}(x)(y) = \frac{1}{2}(y+2)(y)$. thus, $y^2 + 2y = 48$ or $y^2 + 2y - 48 = 0$. Factoring yields $(y + 8)(y - 6) = 0$, and $y = 6$ since the length must be positive. The altitude x of the region is $6 + 2 = 8$, and the flower bed is a 6-8-10 right triangle. The hypotenuse, Z , can be found by using the Pythagorean theorem. The last answer choice, therefore, is the correct answer.

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

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

Explanation:

The most direct way to find the number of multiples of 4 between 12 and 96, inclusive, would be to write every multiple of 4 starting with 12 (i.e., 12, 16, 20, 24, ..., 96), but this very time-consuming and leaves many opportunities for error. Another approach would be to note that in each group of 4 consecutive integers there is one multiple of 4. between 12 and 96, inclusive, there are 85 numbers that, when divided by 4, yield 21 groups of 4 with 1 number remaining that must be considered independently. In the 21 groups of 4, there are 21 multiples of 4 and the remaining number, 96, is also a multiple of 4. the total number of multiples of 4 between 12 and 96, inclusive, is thus $21 + 1 = 22$. The correct answer is B.

16. Jack is now 14 years older than Bill. If in 10 years Jack will be twice as old as Bill, how old will Jack be in 5 years?

- (A) 9
- (B) 19
- (C) 21
- (D) 23
- (E) 33

Explanation:

D is the correct answer. Let j and b be Jack's and Bill's current ages. Then $j = b + 14$ and $j + 10 = 2(b + 10)$. By substitution, $b + 14 + 10 = 2(b + 10)$, and $b + 24 = 2b + 20$. Therefore, $b = 4$ and $j = 18$, and Jack's age in 5 years is $18 + 5 = 23$.

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

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

Explanation:

D is the correct answer. The tourist must pay tax on $\$730 - \$500 = \$230$. The amount of the tax is $0.08(\$230) = \18.40 .

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

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

Explanation:

One way to determine which of the options given is a value greater than $\frac{2}{3}$ is to establish equivalent fractions. In the first answer choice, $\frac{33}{50} < \frac{2}{3}$ because $\frac{99}{150} < \frac{100}{150}$. In the second answer choice, $\frac{8}{11} > \frac{2}{3}$ because $\frac{24}{33} > \frac{22}{33}$. In the third answer choice, $\frac{3}{5} < \frac{2}{3}$ because $\frac{9}{15} < \frac{10}{15}$; in the fourth answer choice, $\frac{13}{27} < \frac{2}{3}$ because $\frac{13}{27} < \frac{18}{27}$; and in the last answer choice, $\frac{5}{8} < \frac{2}{3}$ because $\frac{15}{24} < \frac{16}{24}$. Alternately, convert the fractions to decimal form: $\frac{2}{3} = 0.666666\dots$, $\frac{33}{50} = 0.66$, $\frac{8}{11} = 0.727272\dots$, $\frac{3}{5} = 0.6$, $\frac{13}{27} = 0.481481\dots$, $\frac{5}{8} = 0.625$. Thus, by comparing decimal equivalents, only $\frac{8}{11}$ is greater than $\frac{2}{3}$. The correct answer choice is B.

3. A rope 40 feet long is cut into two pieces. If one piece is 18 feet longer than the other, what is the length, in feet, of the shorter piece?
- (A) 9
 - (B) 11
 - (C) 18
 - (D) 22
 - (E) 29

Explanation:

Let x be the length of the shorter piece of rope, and let $x + 18$ be the length of the longer piece. Then $x + (x + 18) = 40$, which yields $2x + 18 = 40$, and $x = 11$. Therefore, B is the correct answer.

4. If 60 percent of a rectangular floor is covered by a rectangular rug that is 9 feet by 12 feet, what is the area, in square feet, of the floor?
- (A) 65
 - (B) 108
 - (C) 180
 - (D) 270
 - (E) 300

Explanation:

The area of the rug is $(9)(12) = 108$ square feet, which is 60 percent of x , the total area of the floor.

Thus, $108 = 0.6x$, or $x = \frac{108}{0.6} = 180$. So, C is the correct answer.

5. The Earth travels around the Sun at a speed of approximately 18.5 miles per second. This approximate speed is how many miles per hour?

(A) 1,080
(B) 1,160
(C) 64,800
(D) 66,600
(E) 3,996,000

Explanation:

D is the correct answer. There are 60 seconds in one minute, and 60 minutes in one hour. In one hour the Earth travels $18.5 \times 60 \times 60 = 66,600$ miles.

6. 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

Explanation:

Since $\frac{2}{3}$ of the books in the collection were sold, $\frac{1}{3}$ were not sold. The 36 unsold books represent $\frac{1}{3}$ of the total number of books in the collection, and $\frac{2}{3}$ of the total number of books equals $2(36)$ or 72. The total proceeds of the sale was $72(\$2.50)$ or \$180. Therefore, A is the correct answer.

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

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

Explanation:

There is a difference of 20 percent between 82.5 percent and 62.5 percent. If 1 percent equals 100 basis points, then 20 percent equals $20(100)$ or 2,000 basis points. Therefore, E is the correct answer.

8. The amounts of time that three secretaries worked on a special project are in the ratio of 1 to 2 to 5. If they worked a combined total of 112 hours, how many hours did the secretary who worked the longest spend on the project?

- (A) 80
- (B) 70
- (C) 56
- (D) 16
- (E) 14

Explanation:

B is the correct answer. Since the ratio of hours worked by the secretaries on the project is 1 to 2 to 5, the third secretary spent the longest time on the project, that is, $\frac{5}{8}(112)$ or 70 hours.

9. If the quotient $\frac{a}{b}$ is positive, which of the following must be true?

- (A) $a > 0$
- (B) $b > 0$
- (C) $ab > 0$
- (D) $a - b > 0$
- (E) $a + b > 0$

Explanation:

C is the correct answer. The product of two positive or two negative numbers is positive.

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

- (A) -3
- (B) -1
- (C) 0
- (D) 1
- (E) 3

Explanation:

B is the correct answer. Since $8^{2x+3} = (2^3)^{2x+3} = 2^{6x+9}$, it follows, by equating exponents, that $6x + 9 = 3x + 6$, or $x = -1$.

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

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

Explanation:

The value of the expression under the square root sign is approximately $\frac{6(600)}{16} = 225$. Since $225 = 15^2$, $\sqrt{225} = 15$, B is the correct answer.

12. Which of the following CANNOT be the greatest common divisor of two positive integers x and y ?
- (A) 1
 - (B) x
 - (C) y
 - (D) $x - y$
 - (E) $x + y$

Explanation:

Except for E, each choice can be the greatest common divisor (g.c.d) of two positive integers. However, the greatest common divisor of two positive integers cannot be greater than either one of the integers individually.

13. An empty pool being filled with water at a constant rate takes 8 hours to fill to $\frac{3}{5}$ of its capacity. How much more time will it take to finish filling the pool?
- (A) 5 hr 30 min
 - (B) 5 hr 20 min
 - (C) 4 hr 48 min
 - (D) 3 hr 12 min
 - (E) 2 hr 40 min

Explanation:

If t is the total time required to fill the entire pool, then $\frac{3}{5}t = 8$. Thus, $t + \frac{40}{3} = 13\frac{1}{3}$ hours, or 13 hours 20 minutes. It will therefore take 13 hours 20 minutes $-$ 8 hours = 5 hours 20 minutes to finish filling the pool. Therefore, B is the correct answer.

14. A positive number x is multiplied by 2, and this product is then divided by 3. If the positive square root of the result of these two operations equals x , what is the value of x ?
- (A) $\frac{9}{4}$
 - (B) $\frac{3}{2}$
 - (C) $\frac{4}{3}$
 - (D) $\frac{2}{3}$
 - (E) $\frac{1}{2}$

Explanation:

The value of x must satisfy the equation $\sqrt{\frac{2x}{3}}$. Squaring both sides of the equation and multiplying by 3 yields $2x = 3x^2$, and, since $x > 0$, it follows that $x = \frac{2}{3}$. Therefore, D is the correct answer.

15. A tank contains 10,000 gallons of a solution that is 5 percent sodium chloride by volume. If 2,500 gallons of water evaporate from the tank, the remaining solution will be approximately what percent sodium chloride?
- (A) 1.25%
(B) 3.75%
(C) 6.25%
(D) 6.67%
(E) 11.7%

Explanation:

The amount of sodium chloride in the tank is $0.05 \times 10,000$ or 500 gallons. After the evaporation of the water, the total amount of solution is $10,000 - 2,500 = 7,500$ gallons, and 500 gallons of sodium chloride remain. The percent of sodium chloride is thus $\frac{500}{7,500} = 6.67$ percent.

Alternatively, this problem can be approached as an inverse proportion. The original solution contains 5 percent sodium chloride by volume in 10,000 gallons. As water evaporates from the tank, the concentration of sodium chloride in the solution will increase. If x is the fraction of

sodium chloride in the remaining solution, then $\frac{10,000}{7,500} = \frac{x}{0.05}$. Solving for x gives

$$\frac{(0.05)(10,000)}{7,500} = 0.0667, \text{ which equals 6.67 percent. Therefore, D is the correct answer.}$$

16. 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) $(x - y)(s - p)$

Explanation:

The grocery paid xp dollars for the produce. The grocery sold $(x - y)$ pounds of the produce for s dollars per pound, and so the total income was $(x - y)s$ dollars. The gross profit, or income minus cost, was therefore, $(x - y)s - xp$. Therefore, A is the correct answer.

Directions

This data sufficiency problem consists of a question and two statements, labeled (1) and (2), in which certain data are given. You have to decide whether the data given in the statements are sufficient for answering the question. Using the data given in the statements plus your knowledge of mathematics and everyday facts (such as the number of days in July or the meaning of counterclockwise), you must indicate whether

- 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;
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.

1. At a certain picnic, each of the guests was served either a single scoop or a double scoop of ice cream. How many of the guests were served a double scoop of ice cream?

(1) At the picnic, 60 percent of the guests were served a double scoop of ice cream.

(2) A total of 120 scoops of ice cream were served to all the guests at the picnic.

Explanation:

Statement (1) alone is not sufficient because the total number of guests is unknown. Statement (2) alone is not sufficient since there is no information indicating how the 120 scoops were divided into single-scoop and double-scoop servings. From (1) the ratio of the number of guests who were served a single scoop to the number of guests who were served a double scoop can be determined and can be used with (2) to determine the number of guests who were served a double scoop. Thus, **BOTH statements TOGETHER are sufficient to answer the question.** (It may be helpful to set up equations to determine whether there is sufficient information given in (1) and (2) for answering the question, but it is not actually necessary to solve the equations.)

2. 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.

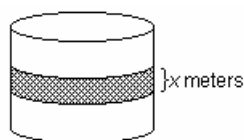
Explanation:

In (1), only the increase in price is given, and both the original and final prices are unknown. Thus, the percent increase cannot be determined from statement (1) alone. In (2), only the final price is given, so the percent increase cannot be determined from statement (2) alone. From (1) and (2) together, the amount of the increase is known and the price before the increase can be computed. Therefore, the percent increase can be determined, so **BOTH statements TOGETHER are sufficient** to answer the question.

3. A circular tub has a band painted around its circumference, as shown above. What is the surface area of this painted band?

(1) $x = 0.5$

(2) The height of the tub is 1 meter.



Explanation:

The surface area of the band is the product of the circumference of the band and the width of the band. In (1), the width of the band is given, but the circumference is unknown, so the surface area cannot be determined. Therefore, statement (1) alone is not sufficient. In (2), the height of the tub is given, which has no relation to the circumference or the width of the band. Thus, (2) is not sufficient, with or without (1). Therefore, **statements (1) and (2) TOGETHER are NOT sufficient** to answer the question.

4. Is it true that $a > b$?

(1) $2a > 2b$

(2) $a + c > b + c$

Explanation:

In (1), when both sides of $2a > 2b$ are divided by 2, the result is $a > b$. Thus, statement (1) alone is sufficient. In (2), when c is subtracted from both sides of $a + c > b + c$, the result is $\frac{a}{b}$. Thus, (2) alone is also sufficient, and **EACH statement ALONE is sufficient** to answer the question.

5. A thoroughly blended biscuit mix includes only flour and baking powder. What is the ratio of the number of grams of baking powder to the number of grams of flour in the mix?

(1) Exactly 9.9 grams of flour is contained in 10 grams of the mix.

(2) Exactly 0.3 gram of baking powder is contained in 30 grams of the mix.

Explanation:

In any amount of the mix, once both ingredient amounts are known, their ratio can be determined. (This ratio must be the same in any amount of the mix since the mix is thoroughly blended.) Each of statements (1) and (2) alone gives the amount of one ingredient in some amount of the mix, so the amount of the other ingredient can be determined. Thus, **EACH statement ALONE is sufficient** to answer the question.

6. If a real estate agent received a commission of 6 percent of the selling price of a certain house, what was the selling price of the house?

(1) The selling price minus the real estate agent's commission was \$ 84,600.

(2) The selling price was 250 percent of the original purchase price of \$ 36,000.

Explanation:

From (1) it follows that \$ 84,600 is 94% (100%-6%) of the selling price, and thus the selling price, $\$ 84,600 / 0.94$, can be determined. Therefore, statement (1) alone is sufficient. From (2) it follows that the selling price is 2.5 (\$ 36,000). Thus, (2) alone is also sufficient. Therefore, **EACH statement ALONE is sufficient** to answer the question.

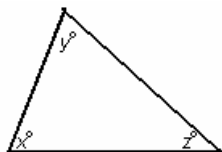
7. What is the value of $|x|$?

(1) $x = -|x|$

(2) $x^2 = 4$

Explanation:

From (1) all that can be determined is that x is negative (or 0) since $|x|$, the absolute value of x , is always positive (or 0). Thus, (1) alone is not sufficient. From (2) it can be determined that $x = \pm 2$; in either case $|x| = 2$. Thus, **statement (2) ALONE is sufficient, but statement (1) alone is not sufficient** to determine the value of $|x|$.



8. What is the value of z in the triangle above?

- (1) $x + y = 139$
- (2) $y + z = 108$

Explanation:

Note that, as in any triangle, $x + y + z = 180$. Using (1), the value 139 can be substituted for $x + y$ in $x + y + z = 180$ to obtain the value of z . Thus, statement (1) alone is sufficient. When the equation in (2) is combined with $x + y + z = 180$, all that can be deduced is the value of x . Thus, **statement (1) ALONE is sufficient, but statement (2) alone is not sufficient** to answer the question.

9. 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 in this bakery?
- (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.

Explanation:

Lets s and t be the prices of a 16-ounce loaf and a 24-ounce loaf, respectively. According to (1), $s + t = \$ 2.40$. Since t cannot be determined without knowing s , statement (1) alone is not sufficient. Similarly, according to (2), $2s + t = \$ 3.40$, so t cannot be determined. Therefore, statement (2) alone is not sufficient. Using both equations from (1) and (2), $t = \$ 2.40 - s = \$ 3.40 - 2s$, from which s , and thus t , can be determined. Therefore, **BOTH statements TOGETHER are sufficient** to answer the question.

3.2 6

10. If and each represent single digits in the decimal above, what digit does represent?
- (1) When the decimal is rounded to the nearest tenth, 3.2 is the result.
 - (2) When the decimal is rounded to the nearest hundredth, 3.24 is the result.

Explanation:

From (1) the decimal must have been rounded down since the tenths digit is 2 in both 3.2 6 and 3.2. Hence, represents 0, 1, 2, 3, or 4. It cannot be determined from statement (1) alone what digit represents. From (2), can represent 3 or 4, depending upon the value of . For example, both 3.2376 and 3.2416, when rounded to the nearest hundredth, are 3.24. Therefore, statement (2) alone is not sufficient. Since the numbers 3.2376 and 3.2416 also satisfy (1) and (2) together, **statements (1) and (2) TOGETHER are NOT sufficient** to answer the question.

11. If m and n are consecutive positive integers, is m greater than n ?
- (1) $m - 1$ and $n + 1$ are consecutive positive integers.
 - (2) m is an even integer.

Explanation:

Note that for two consecutive integers the larger must be 1 more than the smaller. That statement (1) alone is sufficient can probably be seen most easily by considering particular values for m and n . For example, if $m = 4$, then $n = 3$ or 5 since m and n are consecutive. Then $m - 1 = 3$ and $n + 1$

$= 4$ or 6 . Since $m - 1$ and $n + 1$ are consecutive, $n = 3$ and $m > n$.

12. Paula and Sandy were among those people who sold raffle tickets to raise money for Club x . If Paula and Sandy sold a total of 100 of the tickets, how many of the tickets did Paula sell?

- (1) Sandy sold $\frac{2}{3}$ as many of the raffle tickets as Paula did.
(2) Sandy sold 8 percent of all the raffle tickets sold for Club x .

Explanation:

If Paula sold p tickets and Sandy sold s tickets, then $p + s = 100$. According to (1), $s = \frac{2}{3}p$, the value of p can be determined by solving both equations simultaneously. Thus, statement (1) alone is sufficient. From (2) the number of raffle tickets that Sandy (and thus Paula) sold cannot be determined since the total number of raffle tickets sold is unknown. Thus, **statement (1) ALONE is sufficient, but statement (2) alone is not sufficient**.

13. Is the integer n odd?

- (1) n is divisible by 3.
(2) n is divisible by 5.

Explanation:

In statement (1), n is divisible by 3, but n may be even or odd as the examples $n = 6$ and $n = 9$ show. Similarly, in statement (2), n is divisible by 5, but it may be even or odd as the examples $n = 10$ and $n = 15$ show. Therefore, neither statement alone is sufficient. From (1) and (2) together, n must be divisible by 15, and the examples $n = 3$ and $n = 45$ show that n may be even or odd. Thus, **statements (1) and (2) TOGETHER are NOT sufficient** to answer the question.

14.

15. A certain company currently has how many employees?

- (1) If 3 additional employees are hired by the company and all of the present employees remain, there will be at least 20 employees in the company.
(2) If no additional employees are hired by the company and 3 of the present employees resign, there will be fewer than 15 employees in the company.

Explanation:

Let n be the current number of employees. According to (1), $n + 3 \geq 20$, or $n \geq 17$, which gives a range of possible values of n . Thus, statement (1) alone is not sufficient. According to (2), $n - 3 < 15$, or $n < 18$, which also gives a range for n . Thus, statement (2) alone is not sufficient. From (1) and (2) together, the value of n can be determined to be 17. Therefore, **BOTH statements TOGETHER are sufficient** to answer the question.

16. If x is equal to one of the number $\frac{1}{4}$, $\frac{3}{8}$, or $\frac{2}{5}$, what is the value of x ?

- (1) $\frac{1}{4} < x < \frac{1}{2}$

$$(2) \frac{1}{3} < x < \frac{3}{5}$$

Explanation:

In decimal form, $\frac{1}{4} = 0.25$, $\frac{3}{8} = 0.375$, and $\frac{2}{5} = 0.4$, and statement (1) can be written as $0.25 < x < 0.5$, so that both $\frac{3}{8}$ and $\frac{2}{5}$ are possible values of x . Thus, statement (1) alone is not sufficient. Statement (2) can be written as $0.333... < x < 0.6$, so that both $\frac{3}{8}$ and $\frac{2}{5}$ are possible values of x . Thus, statement (2) alone is not sufficient. When both (1) and (2) are considered, it follows that $0.333... < x < 0.5$, so that, again, $\frac{3}{8}$ and $\frac{2}{5}$ are both possible values of x . Therefore, **statements (1) and (2) TOGETHER are NOT sufficient** to answer the question.

17. If a , b , and c are integers, is $a - b + c$ greater than $a + b - c$?

- (1) b is negative.
- (2) c is positive.

Explanation:

The inequality, $a - b + c > a + b - c$, is equivalent to $-b + c > b - c$, which is equivalent to $2c > 2b$, or $c > b$. Thus, the simpler inequality, $c > b$, may be considered. In (1), $b < 0$ is not sufficient to determine whether $c > b$ since no information is given about c . Similarly, in (2), $c > 0$ is not sufficient since no information is given about b . Using (1) and (2) together, $b < 0 < c$, so that $c > b$, or equivalently, $a - b + c > a + b - c$. Thus, **BOTH statements TOGETHER are sufficient** to answer the question.

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

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

Explanation:

The equation $x + 2y + 1 = y - x$ is equivalent to $2x = -y - 1$, or $x = -\frac{1}{2}(y + 1)$. Thus, the value of x can be determined if and only if the value of y is known. From (1) it follows that $y = 3$ or $y = -3$, so that x has two possible values as well. Thus, statement (1) alone is not sufficient. In (2) the value of y is given; therefore, the value of x can be determined. Thus, **statement (2) ALONE is sufficient, but statement (1) alone is not sufficient** to answer the question.

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

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

Explanation:

According to (1), $n = pq$, where both p and q are prime numbers and $p \neq q$. Thus, n is divisible by the positive integers 1, p , q , pq , and no others. Statement (1) alone is therefore sufficient to determine the number of positive divisors of n . Since $2^3 = 8$ and the number of positive divisors of 8 can be determined, statement (2) alone is also sufficient. Therefore, **EACH statement ALONE**

is sufficient to answer the question.

20. How many miles long is the route from Houghton to Callahan?

- (1) It will take 1 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.

Explanation:

Using the standard formula $\text{rate} \times \text{time} = \text{distance}$, or $rt = d$, it can be determined from (1) that $d = 50t$ and $d = 55(t - 1)$, where t is the time it takes to travel the entire route at an average rate of 50 miles per hour. These equations can be solved simultaneously for t , and then d can be determined. Therefore, statement (1) alone is sufficient. Statement (2) can be expressed as $\frac{d}{2} = 25(11)$, which can be solved for d . Thus, statement (2) alone is also sufficient. Therefore, **EACH statement ALONE is sufficient** to answer the question.

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

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

Explanation:

Statement (1) indicates that the value of x is 3.927 times the value of y , and statement (2) gives the value of y . Therefore, (1) and (2) together are sufficient to determine the value of x , but neither statement alone is sufficient. Thus, the best answer is **BOTH statements TOGETHER are sufficient**.

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

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

Explanation:

In (1) there is no information about David's salary and in (2) there is no information about John's salary; thus, neither statement alone is sufficient. Since (1) and (2) together give only the percentage increases in salary, it cannot be determined which person received the greater dollar increase. For example, if John's salary was the large salary, then his salary increase would evidently be the greater amount; however, if David's salary was more than $\frac{8}{5}$ times John's salary, then David's salary increase would be the greater amount. Therefore, **statements (1) and (2) TOGETHER are NOT sufficient** to answer the question.

4. Carlotta can drive from her home to her office by one of two possible routes. If she must also return by one of these routes, what is the distance of the shorter route?

- (1) When she drives from her home to her office by the shorter route and returns by the longer route, she drives a total of 42 kilometers.
- (2) When she drives both ways, from her home to her office and back, by the longer route, she drives a total of 46 kilometers.

Explanation:

Statement (1) alone is not sufficient because only the sum of the distances of the two routes is given and there are infinitely many pairs of numbers with a given sum. From (2) the distance of the longer route can be found, but there is no information about the distance of the shorter route. Statement (2) alone is therefore not sufficient. From (1) and (2) together, the distance of the shorter route can be determined $(42 - \frac{46}{2})$, and the best answer is **BOTH statements TOGETHER are sufficient**.

5. If r and s are positive integers, r is what percent of s ?

$$(1) r = \frac{3}{4}s$$

$$(2) r \div s = \frac{75}{100}$$

Explanation:

To determine r as a percent of s it suffices to know the ratio of r to s , since any ratio can be converted to an equivalent ratio with denominator 100. Since (1) and (2) both give the ratio of r to s , **EACH statement ALONE is sufficient** to answer the question.

6. 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.

Explanation:

From (1) it can be determined that the total cost of the shirt and gloves is three times the cost of the gloves alone; in other words, the gloves cost one third as much as the shirt and gloves together. Thus, statement (1) alone is sufficient. Since the cost of the gloves is the difference between the total cost, \$ 41.70, and the cost of the shirt, statement (2) alone is also sufficient. Therefore, **EACH statement ALONE is sufficient** to answer the question.

7. 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 minutes.

Explanation:

For each 360-degree rotation, the wheel has traveled a distance equal to its circumference. Thus, the number of 360-degree rotations is equal to the number of times the circumference of the wheel can be laid out along the straight-line path that is 100 meters long; so it suffices to know the size of the wheel. From (1) the circumference of the wheel can be determined. Thus, statement (1) alone is sufficient. Statement (2) gives the speed at which the wheel is traveling; however, the size of the wheel cannot be determined, and statement (2) alone is not sufficient. Therefore, **statement (1) ALONE is sufficient, but statement (2) alone is not sufficient**.

8. If a certain animated cartoon consists of a total of 17,280 frames on film, how many minutes will it take to run the cartoon?

- (1) The cartoon runs without interruption at the rate of 24 frames per second.
- (2) It takes 6 times as long to run the cartoon as it takes to rewind the film, and it takes total of 14 minutes to do both.

Explanation:

From (1) it can be determined that it takes $\frac{17,280}{24 \times 60}$ minutes to run the cartoon. Thus, statement

(1) alone is sufficient. From (2) it can be determined that the time it takes to run the cartoon is $\frac{6}{7}$ of the 14 minutes it takes both to run the cartoon and to rewind the film, and so statement (2) alone is also sufficient. Therefore, **EACH statement ALONE is sufficient** to answer the question.

9. What was the average number of miles per gallon of gasoline for a car during a certain trip?

- (1) The total cost of the gasoline used by the car for the 180-mile trip was \$ 12.00.
- (2) The cost of the gasoline used by the car for the trip was \$ 1.20 per gallon.

Explanation:

Statement (1) gives the number of miles the car traveled; however, the number of gallons of gasoline used cannot be determined, since only the total cost of the gasoline used is given. Thus, statement (1) alone is not sufficient. Statement (2) alone is obviously not sufficient, but it gives the additional information needed in (1) to determine the number of gallons of gasoline used. Once the number of miles traveled and the number of gallons used are known, the average number of miles per gallon can be determined. Therefore, **BOTH statements TOGETHER are sufficient** to answer the question.

10. If x and y are positive, is $\frac{x}{y}$ greater than 1?

- (1) $xy > 1$
- (2) $x - y > 0$

Explanation:

Since $y > 0$, it follows that $\frac{x}{y} > 1$ if and only if $x > y$. Thus, to answer the question it suffices to

determine whether $x > y$. In (1) there are innumerable pairs of different numbers x and y whose product xy is greater than 1, and the larger number in each such pair can be either x or y . Thus, statement (1) alone is not sufficient. In (2), $x - y > 0$ is equivalent to $x > y$, so (2) alone is sufficient. **Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient** to answer the question.

11. In $\triangle PQR$, if $PQ = x + 2$, and $PR = y$, which of the three angles of $\triangle PQR$ has the greatest degree measure?

- (1) $y = x + 3$
- (2) $x = 2$

Explanation:

In any triangle, the largest angle is opposite the longest side. To determine the longest side it

suffices to determine whether $y > x + 2$. Since $x + 3 > x + 2$, it follows from (1) that $y > x + 2$. Statement (1) alone is therefore sufficient. From (2) it follows that $PQ = 2$ and $QR = 4$. Thus, y can be any value between 2 and 6; it follows that $y > x$, but it cannot be concluded that $y > x + 2$. Statement (2) alone is therefore not sufficient. Therefore, **statement (1) ALONE is sufficient, but statement (2) alone is not sufficient** to answer the question.

12. Is the prime number p equal to 37?

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

(2) p^2 is greater than 200.

Explanation:

In (1) the expression $n^2 + 1$ can represent a prime number less than 37, equal to 37, or greater than 37, depending on the value of n . For example, if $n = 4$, then $4^2 + 1 = 17$; if $n = 6$, then $6^2 + 1 = 37$; if $n = 10$, then $10^2 + 1 = 101$; and 17, 37 and 101 are all prime numbers. Thus, statement (1) alone is not sufficient. Since $14^2 = 196$ and $15^2 = 225$, it follows from (2) that $p > 14$, so that p might or might not equal 37. Thus, statement (2) alone is not sufficient. The value of p for $n = 4$ and for $n = 6$ given above show that **statements (1) and (2) TOGETHER are NOT sufficient**.

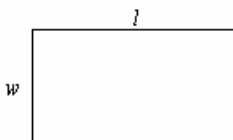
13. The only contents a parcel are 25 photographs and 30 negatives. What is the total weight, in ounces, of the parcel's contents?

(1) The weight of each photograph is 3 times the weight of each negative.

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

Explanation:

Let p and n denote the weight, in ounces, of a photograph and a negative, respectively. Then the total weight of the parcel's contents can be written as $25p + 30n$. The information in (1) can be written as $p = 3n$. By substituting $3n$ for p in the expression $25p + 30n$, it can be seen that the resulting expression depends on n . Thus, statement (1) alone is not sufficient. The information in (2) can be written as $p + 2n = \frac{1}{3}$ and is, similarly, not sufficient. The two linear equations summarizing the information in (1) and (2) can be solved simultaneously for p and n , so that **BOTH statements TOGETHER are sufficient**.



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

(1) $2l + w = 40$

(2) $l + w = 25$

Explanation:

The formula for the perimeter of a rectangle is $p = 2l + 2w = 2(l + w)$, where l and w represent the length and width, respectively. The perimeter can therefore be determined once $l + w$ is known. The value of $l + w$ cannot be determined from (1), since $2l + w = 40$ is equivalent to $l + w = 40 - l$,

which depends on l . Thus, statement (1) alone is not sufficient. However, statement (2) alone is sufficient because $l + w$ is known. The best answer is **statement (2) ALONE is sufficient, but statement (1) alone is not sufficient**.

15. What is the ratio of x to y ?

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

Explanation:

Statement (1) can be expressed as $x = 2y + 4$, which is not sufficient since $\frac{x}{y} = 2 + \frac{4}{y}$ showing

that $\frac{x}{y}$ depends on y . Statement (2) can be expressed as $\frac{0.5x}{2y} = \frac{3}{5}$; so $\frac{x}{y} = \frac{3}{5} \div \frac{0.5}{2}$.

Therefore, **statement (2) ALONE is sufficient, but statement (1) alone is not sufficient** to answer the question.

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

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

Explanation:

From (1) it follows that there is exactly one integer between x and z , but there is no information about y . Thus, statement (1) is not sufficient. Statement (2) alone is not sufficient because there could be other integers between x and z besides y . From (1) and (2) together, it follows that y is the unique integer between x and z ; that is, $y = x + 1$ and $z = y + 1$, and the integers are consecutive. Thus, **BOTH statements TOGETHER are sufficient** to answer the question.

17. What is the value of x ?

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

Explanation:

In (1) the equation $-(x + y) = x - y$ can be written as $-x - y = x - y$, which reduces to $-x = x$. The expression $-x$ denotes the additive inverse of x . Because 0 is the only number that is equal to its additive inverse, it follows that $x = 0$, and statement (1) alone is sufficient. Alternatively, $-x = x$ can be written as $2x = 0$ so that $x = 0$. In (2) the value of x depends on the value of y , so statement (2) alone is not sufficient. Therefore, **statement (1) ALONE is sufficient, but statement (2) alone is not sufficient**.

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

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

and \$ 62, 500 less than the spouse.

Explanation:

From (1) the combined amount of the estate that the two younger children received can be determined, but not the individual amount received by either of them. Thus, statement (1) alone is not sufficient. In (2) the amount of the estate received by the oldest child and by the spouse can each be expressed in terms of the amount, x , received by each of the two younger children. An equation expressing the sum of \$ 200, 000 in terms of x can then be set up and solved for x . It follows that statement (2) alone is sufficient. Therefore, **statement (2) ALONE is sufficient, but statement (1) alone is not sufficient** to answer the question.

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

- (1) The expenditure for newspapers was 40 percent greater than the expenditure for periodicals.
- (2) The total of the expenditure for periodicals and newspapers was 25 percent less than the expenditure for books.

Explanation:

Let b , p , and n denote the expenditure, in dollars, for books, periodicals, and newspapers, respectively. Then $b + p + n = 35,000$. In (1) it follows that $n = 1.4p$, so $b + 2.4p = 35,000$. Since the value of b cannot be determined, statement (1) alone is not sufficient. In (2) it follows that $p + n = 0.75b$. Then $0.75b$ can be substituted for $p + n$ in the equation $b + p + n = 35,000$, resulting in an equation involving b alone. Since the value of b can be determined by solving this equation, statement (2) alone is sufficient. Therefore, **statement (2) ALONE is sufficient, but statement (1) alone is not sufficient** to answer the question.

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

- (1) $0 \oplus 1 = 1$
- (2) $1 \oplus 0 = 1$

Explanation:

Since $0 + 1 = 1$, $0 - 1 = -1$, and $0 \div 1 = 0$, it follows from (1) that \oplus represents addition, so the value of $3 \oplus 2$ can be determined. Thus, statement (1) alone is sufficient. Since $1 + 0 = 1$, $1 - 0 = 1$, $1 \times 0 = 0$, and $1 \div 0$ is undefined, it follows from (2) that \oplus could represent either addition or subtraction, so $3 \oplus 2$ could equal 5 or 1. Thus, (2) alone is not sufficient. Therefore, **statement (1) ALONE is sufficient, but statement (2) alone is not sufficient** to answer question.

1. The regular price for canned soup was reduced during a sale. How much money could one have saved by purchasing a dozen 7-ounce cans of soup at the reduced price rather than at the regular price?

- (1) The regular price for the 7-ounce cans was 3 for a dollar.
- (2) The reduced price for the 7-ounce cans was 4 for a dollar.

Explanation:

The saving is the difference between the regular price of a dozen cans and their reduced price.

Since (1) gives no information about the reduced price, (1) alone is not sufficient to determine the saving. Statement (2) alone gives no information about the regular price. Therefore, statement (2) alone is not sufficient. From (1) and (2) together, both prices can be computed, and the saving can be determined. Therefore, **BOTH statements TOGETHER are sufficient** to answer the question.

2. If on a fishing trip Jim and Tom each caught some fish, which one caught more fish?

(1) Jim caught $\frac{2}{3}$ as many fish as Tom.

(2) After Tom stopped fishing, Jim continued fishing until he had caught 12 fish.

Explanation:

Statement (1) indicates that Jim caught fewer fish than Tom. Therefore, statement (1) alone is sufficient to answer the question. Statement (2) gives no information about the number of fish Tom caught. Therefore, **statement (1) ALONE is sufficient, but statement (2) alone is not sufficient**.

3. If $5x + 3y = 17$, what is the value of x ?

(1) x is a positive integer.

(2) $y = 4x$

Explanation:

Statement (1) alone is not sufficient because it gives no information about the value of y . From (2) it follows that $5x = 3(4x) = 17$, which can be solved for x . Therefore, **statement (2) ALONE is sufficient, but statement (1) alone is not sufficient** to answer the question.

4. Yesterday Nan parked her car at a certain parking garage that charges more for the first hour than for each additional hour. If Nan's total parking charge at the garage yesterday was \$3.75, for how many hours of parking was she charged?

(1) Parking charges at the garage are \$0.75 for the first hour and \$0.50 for each additional hour or fraction of an hour.

(2) If the charge for the first hour had been \$1.00, Nan's total parking charge would have been \$4.00.

Explanation:

Statement (1) gives the charge for the first hour and for subsequent hours. From this information, together with the total charge that is given, the number of hours after the first hour can be computed. From statement (2) the charge for the first hour can be determined; however, there is no information about charges after the first hour. Therefore, **statement (1) ALONE is sufficient, but statement (2) alone is not sufficient**.

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

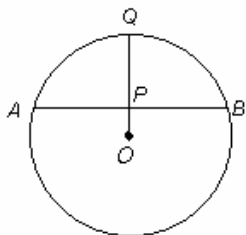
(1) s is divisible by 3.

(2) r is divisible by 3.

Explanation:

One approach to answering this question is to choose values for r and s . In statement (1), for example, let $s = 6$, which is divisible by 3. Then, $r + s$ is divisible by 3 if $r = 9$ but not if $r = 10$, and similarly for statement (2). In more general terms, $r + s$ is divisible by 3 if both r and s are divisible by 3. If either r or s is not divisible by 3, then $r + s$ might or might not be divisible by 3. Since neither (1) alone nor (2) alone gives information about both r and s , neither statement alone

is sufficient. Statements (1) and (2) together state that both r and s are divisible by 3, however, so **BOTH statements TOGETHER are sufficient** to answer the question.



6. 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 .

Explanation:

From statement (1) it can be concluded only that the radius is 3 times the length of OP . Since there are many possible lengths of OP and PQ that would have a ratio of 1 to 2, statement (1) alone is not sufficient. Similarly, knowing that P is the midpoint of chord AB is of no help in determining the radius, so statement (2) alone is not sufficient. Statements (1) and (2) together do not give the length of any line segment shown in the circle, so they are not sufficient to determine the radius. Thus, **statements (1) and (2) TOGETHER are NOT sufficient** to answer the question.

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

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

Explanation:

Statement (1) can be solved for x , so (1) alone is sufficient. Statement (2) can be solved for y . Since $x + y = 4$, substituting the value of y in the equation will give the value of x . Thus, statement (2) alone is also sufficient. Therefore, **EACH statement ALONE is sufficient** to answer question.

8. Is $x < 0$?

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

Explanation:

A negative number times a positive number is negative, whereas a negative number times a negative number is positive. Thus, from statement (1) it can be determined that x must be negative, since -2 times x is positive. Therefore, statement (1) alone is sufficient. Statement (2) alone is also sufficient, since the cube of a positive number is positive and the cube of a negative number is negative. Therefore, **EACH statement ALONE is sufficient** to answer the question.

9. 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.

Explanation:

Statement (1) does not give the percentage of homes built last year that were occupied. Any number of the 230 homes could be included in the 90 percent of the total. Similarly, any number of the 230 homes could be included in the total, and statement (2) alone is not sufficient. From (1) and (2) together, only the total number of single-family homes can be determined. Thus, **statements (1) and (2) TOGETHER are NOT sufficient** to answer the question.

10. Does the product $jkmn$ equal 1?

$$(1) \frac{jk}{mn} = 1$$

$$(2) j = \frac{1}{k} \text{ and } m = \frac{1}{n}$$

Explanation:

From statement (1) it can be determined only that $jk = mn$. This information is not sufficient. From (2) alone, it can be determined that $jk = 1$ and $mn = 1$, so $jkmn = 1$. Thus, **statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.**

11. 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.

Explanation:

From statement (1), only the total number of children who have brown hair can be determined, so statement (1) alone is not sufficient. Clearly statement (2) alone is not sufficient because nothing is said about brown hair. From statements (1) and (2) together, only the total number of children who have brown hair and the number of boys in the group are known. Thus, **statements (1) and (2) TOGETHER are NOT sufficient** to answer the question.

12. 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.

Explanation:

In considering (1), let the length of each side of S be $4x$ and the length of each side of T be $5x$, which is consistent with the ratio given. Thus, the perimeter of S is $4(4x)$ and the perimeter of T is $3(5x)$, and statement (1) alone is sufficient. Statement (2) alone is not sufficient because there are many pairs of numbers whose sum is 18, and for some of these pairs the perimeter of S is less than that of T , while for other pairs it is greater. Thus, **statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.**

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

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

$$(2) \frac{p}{2} \text{ is an integer.}$$

Explanation:

There are four pairs of positive integers whose product is 24: 1 and 24, 2 and 12, 3 and 8, and 4 and 6. From statement (1) the possible values of q are 24, 12, and 6, and there is a value of p corresponding to each of these three values. Thus, statement (1) alone is not sufficient. From (2), the possible values of p are 2, 4, 6, 8, 12, and 24. Thus, statement (2) alone is not sufficient. From (1) and (2) together, it can be determined only that q can be either 12 or 6, so p can be either 2 or 4. Thus, **statements (1) and (2) TOGETHER are NOT sufficient** to answer the question.

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

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

Explanation:

From statement (1) it follows, by substitution, that $\frac{x^p}{x^q} = 1$, and thus statement (1) alone is sufficient to determine the value of $\left(\frac{x^p}{x^q}\right)^4$. Statement (2) alone is not sufficient because it gives no information about the values of p and q . Thus, **statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.**

15. From May 1, 1960 to May 1, 1975, the closing price of a share of stock X doubled. What was the closing price of a share of stock X on May 1, 1960?

- (1) From May 1, 1975, to May 1, 1984, the closing price of a share of stock X doubled.
- (2) From May 1, 1975, to May 1, 1984, the closing price of a share of stock X increased by \$4.50.

Explanation:

Neither statement (1) alone nor statement (2) alone gives any information about the price from 1960 to 1975. From statements (1) and (2) together, the closing price of a share of the stock on May 1, 1975, can be determined (\$4.50) and the closing price on May 1, 1960, can be determined (half of \$4.50). Therefore, **BOTH statements TOGETHER are sufficient.**

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

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

Explanation:

Statement (1) can be expressed as $d = x^2$, where x is a nonzero integer. Then $\sqrt{d} = \sqrt{x^2}$ equals x or $-x$, depending on whether x is positive or negative, respectively. In either case, \sqrt{d} is an integer. For example, $\sqrt{10^2} = 10$ and $\sqrt{(-4)^2} = \sqrt{16} = 4 = -(-4)$. Therefore, statement (1) alone is sufficient. In (2) the square of an integer must also be an integer. Thus, statement (2) alone is also sufficient. Therefore, **EACH statement ALONE is sufficient** to answer the question.

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

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

Explanation:

If x and y are the digits of Q , statement (1) can be expressed as $x = y + 3$ and $x + y = 9$, which can be solved for x and y . It is also possible to see that only the numbers 36 and 63 satisfy (1) without actually setting up equations, but the order of the digits is not known regardless of the method used. Thus, statement (1) alone is not sufficient. Clearly, statement (2) alone is not sufficient because it only narrows the range of possible values of Q . When the two possible values of Q are considered and it is noted that only one of the values is less than 50, it can be seen that **BOTH statement TOGETHER are sufficient** to determine the value of Q .

18. If 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) $h < 5$

Explanation:

The value of d , rounded to the nearest tenth, is 0.3 for $h \geq 5$ and 0.2 for $h < 5$. Statement (1) can be written $d < 0.250$, so $h < 5$. Thus, statement (1) alone is sufficient. Statement (2) gives the information that $h < 5$ directly, so (2) alone is also sufficient. Therefore, **EACH statement ALONE is sufficient** to answer the question.

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

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

Explanation:

From statement (1) it can be determined only that $x = 2y + 2$ and that $x^2 - y^2 = (2y + 2)^2 - y^2$, which depends on the value of y . Thus, statement (1) alone is not sufficient to determine the value of $x^2 - y^2$. Statement (2) can be rewritten $(x - y)(x + y) = 1$, or $x^2 - y^2 = 1$. Therefore, **statement (2) ALONE is sufficient, but statement (1) alone is not sufficient** to answer the question.

20. If \bullet represents one of the operations $+$, $-$, and \times , is $k \bullet (\ell + m) = (k \bullet \ell) + (k \bullet m)$ for all numbers k , ℓ and m ?

- (1) $k \bullet \ell$ is not equal to $\ell \bullet k$ for some numbers k .
- (2) \bullet represents subtraction.

Explanation:

Since $k \bullet 1 = 1 \bullet k$ for both $+$ and \times (i.e., $k + 1 = 1 + k$ and $k \times 1 = 1 \times k$ for all values of k), according to statement (1), \bullet must represent subtraction. Thus, it can be determined whether $k - (\ell + m) = (k - \ell) + (k - m)$ holds for all k , ℓ , and m . Note, however, that it is not actually necessary to answer this question, only to see that the answer can be determined. Thus, statement (1) alone is sufficient. Because statement (2) gives the information directly that \bullet represents subtraction, statement (2) alone is also sufficient. Therefore, **EACH statement**

ALONE is sufficient to answer the question.