1. The 180 students in a group are to be seated in rows so that there is an equal number of students in each row. Each of the following could be the number of rows EXCEPT

   (A) 4
   (B) 20
   (C) 30
   (D) 40
   (E) 90

2. A parking garage rents parking spaces for $10 per week or $30 per month. How much does a person save in a year by renting by the month rather than by the week?

   (A) $140
   (B) $160
   (C) $220
   (D) $240
   (E) $260

3. If $y = 5x^2 - 2x$ and $x = 3$, then $y =$

   (A) 24
   (B) 27
   (C) 39
   (D) 51
   (E) 219

4. Of the following, which is the best approximation to $\sqrt{0.0026}$ ?

   (A) 0.05
   (B) 0.06
   (C) 0.16
   (D) 0.5
   (E) 0.6

5. At a certain diner, a hamburger and coleslaw cost $3.59, and a hamburger and french fries cost $4.40. If french fries cost twice as much as coleslaw, how much do french fries cost?

(A) $0.30
(B) $0.45
(C) $0.60
(D) $0.75
(E) $0.90
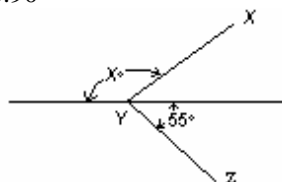


6. If $XYZ$ in the figure above is a right angle, what is the value of $x$?

   (A) 155
   (B) 145
   (C) 135
   (D) 125
   (E) 110

$$\frac{\left(\dfrac{a}{b}\right)}{c}$$

7. In the expression above, $a$, $b$, and $c$ are different numbers and each is one of the numbers 2, 3, or 5. What is the least possible value of the expression?

   (A) $\dfrac{1}{30}$

   (B) $\dfrac{2}{15}$

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

   (D) $\dfrac{3}{10}$

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

8. A certain culture of bacteria quadruples every hour. If a container with these bacteria was half full at 10:00 a.m., at what time was it one-eighth full?

   (A) 9:00 a.m.
   (B) 7:00 a.m.
   (C) 6:00 a.m.

2

(D) 4:00 a.m.
(E) 2:00 a.m.

9. Al, Lew, and Karen pooled their funds to buy a gift for a friend. Al contributed $2 less than $\frac{1}{3}$ of the cost of the gift and Lew contributed $2 more than $\frac{1}{4}$ of the cost. If Karen contributed the remaining $15, what was the cost of the gift?

(A) $24
(B) $33
(C) $36
(D) $43
(E) $45

10. What is the total number of integers between 100 and 200 that are divisible by 3?

(A) 33
(B) 32
(C) 31
(D) 30
(E) 29

11. Which of the following inequalities is equivalent to $10 - 2x > 18$?

(A) x > -14
(B) x > -4
(C) x > 4
(D) x < 4
(E) x < -4

12. In 1979 approximately $\frac{1}{3}$ of the 37.3 million airline passengers traveling to or from the United States used Kennedy Airport. If the number of such passengers that used Miami Airport was $\frac{1}{2}$ the number that used Kennedy Airport and 4 times the number that used Logan Airport, approximately how many millions of these passengers used Logan Airport that year?

(A) 18.6
(B) 9.3
(C) 6.2
(D) 3.1
(E) 1.6

13. A certain basketball team that has played $\frac{2}{3}$ of its games has a record of 17 wins and 3 losses. What is the greatest number of the remaining games that the team can lose and still win at least $\frac{3}{4}$ of all of its games?

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

14. Dan and Karen, who live 10 miles apart meet at a cafe that is directly north of Dan's house and directly east of Karen's house. If the cafe is 2 miles closer to Dan's house than to Karen's house, how many miles is the cafe from Karen's house?

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

15. If $n$ is an integer and $n = \frac{2 \cdot 3 \cdot 5 \cdot 7 \cdot 11 \cdot 13}{77k}$ then which of the following could be the value of $k$?

(A) 22
(B) 26
(C) 35
(D) 54
(E) 60

16. There were 36.000 hardback copies of a certain novel sold before the paperback version was issued. From the time the first paperback copy was sold until the

last copy of the novel was sold. 9 times as many paperback copies as hardback copies were sold. If a total of 441.000 copies of the novel were sold in all, how many paperback copies were sold?

(A) 45.000
(B) 360.000
(C) 364.500
(D) 392.000
(E) 396.900

17. In the formula $w = \dfrac{p}{\sqrt[t]{v}}$ , integers $p$ and $t$ are positive constants. If $w = 2$ when $v = 1$ and if $w = \dfrac{1}{2}$ when $v = 64$, then $t =$

(A) 1
(B) 2
(C) 3
(D) 4
(E) 16

18. Last year Mrs. Long received $160 in dividends on her shares of Company $X$ stock, all of which she had held for the entire year. If she had had 12 more shares of the stock last year, she would have received $15 more in total annual dividends. How many shares of the stock did she have last year?

(A) 128
(B) 140
(C) 172
(D) 175
(E) 200

| Month | Average Price per Dozen |
|-------|-------------------------|
| April | $1.26 |
| May   | $1.20 |
| June  | $1.08 |

19. The table above shows the average (arithmetic mean) price per dozen of the large grade A eggs sold in a certain store during three successive months. If $\dfrac{2}{3}$ as many dozen were sold in April as in May, and twice as many were sold in June as in April, what was the average price per dozen of the eggs sold over the three-month period?

(A) $1.08
(B) $1.10
(C) $1.14
(D) $1.16
(E) $1.18

20. If $y$    3 and $\dfrac{3x}{y}$ is a prime integer greater than 2, which of the following must be true?

  .   $x = y$
  .   $y = 1$
  .   $x$ and $y$ are prime integers.

(A)   None
(B)    only
(C)   only
(D)   only
(E)   and

1. The market value of a certain machine decreased by 30 percent of its purchase price each year. If the machine was purchased in 1982 for its market value of $8,000, what was its market value two years later?

   (A) $8,000
   (B) $5,600
   (C) $3,200
   (D) $2,400
   (E) $800

2. What percent of 50 is 15?

   (A) 30%
   (B) 35%
   (C) 70%
   (D) 300%
   (E) $333\frac{1}{3}\%$

3. In a certain diving competition, 5 judges score each dive on a scale from 1 to 10. The point value of the dive is obtained by dropping the highest score and the lowest score and multiplying the sum of the remaining scores by the degree of difficulty. If a dive with a degree of difficulty of 3.2 received scores of 7.5, 8.0, 9.0, 6.0, and 8.5, what was the point value of the dive?

   (A) 68.8
   (B) 73.6
   (C) 75.2
   (D) 76.8
   (E) 81.6

4. If $2x = 3y = 10$, then $12xy =$

   (A) 1,200
   (B) 200
   (C) 120
   (D) 40
   (E) 20

5. If Jack walked 5 miles in 1 hour and 15 minutes, what was his rate of walking in miles per hour?

   (A) 4
   (B) 4.5
   (C) 6
   (D) 6.25
   (E) 15

6. Of a certain high school graduating class, 75 percent of the students continued their formal education, and 80 percent of those who continued their formal education went to four-year colleges. If 300 students in the class went to four-year colleges, how many students were in the graduating class?

   (A) 500
   (B) 375
   (C) 240
   (D) 225
   (E) 180

7. What is the least integer greater than $-2+0.5$?

   (A) –2
   (B) –1
   (C) 0
   (D) 1
   (E) 2

8. Which of the following is equivalent to $\dfrac{2x+4}{2x^2+8x+8}$ for all values of $x$ for which both expressions are defined?

   (A) $\dfrac{1}{2x^2+6}$

   (B) $\dfrac{1}{9x+2}$

   (C) $\dfrac{2}{x+6}$

   (D) $\dfrac{1}{x+4}$

   (E) $\dfrac{1}{x+2}$

9. A certain business printer can print 40 characters per second, which is 4 times as fast as an average printer. If an average printer can print 5 times as fast as an electric typewriter, how many characters per <u>minute</u> can an electric typewriter print?

(A) 2
(B) 32
(C) 50
(D) 120
(E) 600

10. When ticket sales began, Pat was the $n$th customer in line for a ticket, and customers purchased their tickets at the rate of $x$ customers per minute. Of the following, which best approximates the time, in minutes, that Pat had to wait in line from the moment ticket sales began?

(A) $(n - 1)\, x$
(B) $n + x - 1$
(C) $\dfrac{n - 1}{x}$
(D) $\dfrac{x}{n - 1}$
(E) $\dfrac{n}{x - 1}$

11. If 6 gallons of gasoline are added to a tank that is already filled to $\dfrac{3}{4}$ of its capacity, the tank is then filled to $\dfrac{9}{10}$ of its capacity. How many gallons does the tank hold?

(A) 20
(B) 24
(C) 36
(D) 40
(E) 60

12. A bus trip of 450 miles would have taken 1 hour less if the average speed $S$ for the trip had been greater by 5 miles per hour. What was the average speed $S$, in miles per hour, for the trip?

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

13. $10^3$ is how many times $(0.01)^3$?

(A) $10^6$
(B) $10^8$
(C) $10^9$
(D) $10^{12}$
(E) $10^{18}$

14. Which of the following groups of numbers could be the lengths of the sides of a right triangle?

. $1, 4,\ \sqrt{17}$
. $4, 7,\ \sqrt{11}$
. $4, 9, 6$

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

15. When the stock market opened yesterday, the price of a share of stock $X$ was $10\dfrac{1}{2}$. When the market closed, the price was $11\dfrac{1}{4}$. Of the following, which is closest to the percent increase in the price of stock $X$?

(A) 0.5%
(B) 1.0%
(C) 6.7%
(D) 7.1%
(E) 7.5%

16. If $x$ and $y$ are integers and $xy^2$ is a positive odd integer, which of the following must be true?

. $xy$ is positive.

. $xy$ is odd.

. $x + y$ is even.

(A)      only

(B)      only

(C)      only

(D)      and

(E)      and



8 inches
2 inches
20 inches

17. The figure above shows the dimensions of a rectangular box that is to be completely wrapped with paper. If a single sheet of paper is to be used without patching, then the dimensions of the paper could be

(A) 17 in by 25 in

(B) 21 in by 24 in

(C) 24 in by 12 in

(D) 24 in by 14 in

(E) 26 in by 14 in

18.
$$x - y = 3$$
$$2x = 2y + 6$$

The system of equations above has how many
solutions?

(A) None

(B) Exactly one

(C) Exactly two

(D) Exactly three

(E) Infinitely many

19. If $M$ and $N$ are positive integers that have remainders of 1 and 3, respectively, when divided by 6, which of the following could NOT be a possible value of $M+N$?

(A) 86

(B) 52

(C) 34

(D) 28

(E) 10

20. The $R$ students in a class agree to contribute equally to buy their teacher a birthday present that costs $y$ dollars. If $x$ of the students later fail to contribute their share, which of the following represents the additional number of dollars that each of the remaining students must contribute in order to pay for the present?
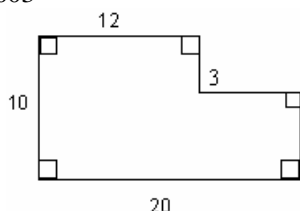
(A) $\dfrac{y}{R}$

(B) $\dfrac{y}{R - x}$

(C) $\dfrac{xy}{R - x}$

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

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

1. $6.09 - 4.693 =$

(A) 1.397
(B) 1.403
(C) 1.407
(D) 1.497
(E) 2.603



2. What is the area of the region enclosed by the figure above?

(A) 116
(B) 144
(C) 176
(D) 179
(E) 284

3. If $p = 0.2$ and n = 100, then

$$\sqrt{\frac{p(1-p)}{n}} =$$

(A) $-\sqrt{0.002}$
(B) $\sqrt{0.02} - 0.02$
(C) 0
(D) 0.04
(E) 0.4

4. If each of 4 subsidiaries of Corporation $R$ has been granted a line of credit of $700,000 and each of the other 3 subsidiaries of Corporation $R$ has been granted a line of credit of $112,000, what is the average (arithmetic mean) line of credit granted to a subsidiary of Corporation $R?$

(A) $1,568,000
(B) $448,000
(C) $406,000
(D) $313,600

(E) $116,000

5. If $x$ is a number such that $x^2 - 3x + 2 = 0$ and $x^2 - x - 2 = 0$, what is the value of $x$

(A) –2
(B) –1
(C) 0
(D) 1
(E) 2

6. In traveling from a dormitory to a certain city, a student went $\dfrac{1}{5}$ of the way by foot, $\dfrac{2}{3}$ of the way by bus, and the remaining 8 kilometers by car. What is the distance, in kilometers, from the dormitory to the city?

(A) 30
(B) 45
(C) 60
(D) 90
(E) 120

7. A certain elevator has a safe weight limit of 2,000 pounds. What is the greatest possible number of people who can safely ride on the elevator at one time with the average (arithmetic mean) weight of half the riders being 180 pounds and the average weight of the others being 215 pounds?

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

8. After paying a 10 percent tax on all income over $3,000, a person had a net income of $12,000. What was the income before taxes?

(A) $13,300
(B) $13,000
(C) $12,900
(D) $10,000
(E) $9,000

8

9. $1-[2-(3-[4-5]+6)+7]=$

(A) –2
(B) 0
(C) 1
(D) 2
(E) 16

10. The price of a model $M$ camera is $209 and the price of a special lens is $69. When the camera and lens are purchased together, the price is $239. The amount saved by purchasing the camera and lens together is approximately what percent of the total price of the camera and lens when purchased separately?

(A) 14%
(B) 16%
(C) 29%
(D) 33%
(E) 86%

11. If 0.497 mark has the value of one dollar, what is the value to the nearest dollar of 350 marks?

(A) $174    (B) $176    (C) $524
(D) $696    (E) $704

12. A right cylindrical container with radius 2 meters and height 1 meter is filled to capacity with oil. How many empty right cylindrical cans, each with radius $\dfrac{1}{2}$ meter and height 4 meters, can be filled to capacity with the oil in this container?

(A) 1        (B) 2        (C) 4

(D) 8        (E) 16

13. If a sequence of 8 consecutive odd integers with increasing values has 9 as its 7th term, what is the sum of the terms of the sequence?

(A) 22       (B) 32       (C) 36
(D) 40       (E) 44

14. A rectangular floor is covered by a rug except for a strip $p$ meters wide along each of the four edges. If the floor is $m$ meters by $n$ meters, what is the area of the rug, in square meters?

(A) $mn – p (m + n)$
(B) $mn – 2p(m +n)$
(C) $mn – p^2$
(D) $(m - p)(n - p)$
(E) $(m –2p)(n – 2p)$

15. Working alone, $R$ can complete a certain kind of job in 9 hours. $R$ and $S$, working together at their respective rates, can complete one of these jobs in 6 hours. In how many hours can $S$, working alone, complete one of these jobs?

(A) 18           (B) 12           (C) 9
(D) 6            (E) 3

16. A family made a down payment of $75 and borrowed the balance on a set of encyclopedias that cost $400. The balance with interest was paid in 23 monthly payments of $16 each and a final payment of $9. The amount of interest paid was what percent of the amount borrowed?

(A) 6%
(B) 12%
(C) 14%
(D) 16%
(E) 20%

17. If $x \geq 0$ and $x = \sqrt{4xy - 4y^2}$ , then, in terms of $y$, $x =$

(A) 2y
(B) y
(C) $\dfrac{y}{2}$

(D) $\dfrac{-4y^2}{1-2y}$

(E) –2y

18. Solution *Y* is 30 percent liquid *X* and 70 percent water. If 2 kilograms of water evaporate from 8 kilograms of solution *Y* and 2 kilograms of solution *Y* are added to the remaining 6 kilograms of liquid, what percent of this new solution is liquid *X?*

(A) 30%

(B) $33\frac{1}{3}\%$

(C) $37\frac{1}{2}\%$

(D) 40%

(E) 50%

19. $\dfrac{1}{\dfrac{1}{0.03}+\dfrac{1}{0.37}}=$

(A) 0.004
(B) 0.02775
(C) 2.775
(D) 3.6036
(E) 36.036
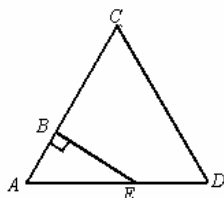


20. If each side of *ACD* above has length 3 and if *AB* has length 1, what is the area of region *BCDE*?

(A) $\dfrac{9}{4}$

(B) $\dfrac{7}{4}\sqrt{3}$

(C) $\dfrac{9}{4}\sqrt{3}$
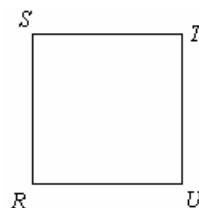
(D) $\dfrac{7}{2}\sqrt{3}$

(E) $6+\sqrt{3}$

1. Which of the following is equal to 85 percent of 160?

(A) 1.88
(B) 13.6
(C) 136
(D) 188
(E) 13,600

2. The regular hourly wage for an employee of a certain factory is $5.60. If the employee worked 8 hours overtime and earned $1\frac{1}{2}$ times this regular hourly wage for overtime, how much overtime money was earned?
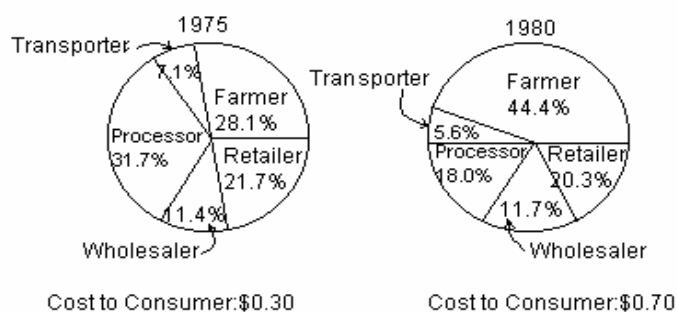
(A) $67.20
(B) $55.40
(C) $50.00
(D) $44.80
(E) $12.00



3. Square *RSTU* shown above is rotated in a plane about its center in a clockwise direction the minimum number of degrees necessary for *T* to be in the position where *S* is now shown. The number of degrees through which *RSTU* is rotated is

(A) $135^{o}$
(B) $180^{o}$
(C) $225^{o}$
(D) $270^{o}$
(E) $315^{o}$

refer to the following graphs.

BREAKDOWN OF COST TO CONSUMER FOR THE PRODUCTION
OF 6 OUNCES OF FROZEN ORANGE JUICE



1975

Transporter
7.1%
Farmer
28.1%
Processor
31.7%
Retailer
21.7%
11.4%
Wholesaler

Cost to Consumer:$0.30

1980

Transporter
5.6%
Farmer
44.4%
Processor
18.0%
Retailer
20.3%
11.7%
Wholesaler

Cost to Consumer:$0.70

4. Of the following, which is closest to the increase from 1975 to 1980 in the amount received by the processor in producing 6 ounces of frozen orange juice?

   (A) $0.03
   (B) $0.05
   (C) $0.06
   (D) $0.08
   (E) $0.13

5. In 1980, approximately what fraction of the cost to the consumer for the production of 6 ounces of frozen orange juice went to the farmer?

   (A) $\dfrac{3}{11}$   (B) $\dfrac{1}{3}$   (C) $\dfrac{4}{9}$

   (D) $\dfrac{5}{9}$   (E) $\dfrac{3}{5}$

6. $\sqrt[4]{496}$ is between

   (A) 3 and 4
   (B) 4 and 5
   (C) 5 and 6
   (D) 6 and 7
   (E) 7 and 8

7. If $x \neq 0$, $2x = 5y$, and $3z = 7x$, what is the ratio of $z$ to $y$?

   (A) 2 to 21
   (B) 3 to 5
   (C) 14 to 15
   (D) 6 to 5
   (E) 35 to 6

8. A grocer purchased a quantity of bananas at 3 pounds for $0.50 and sold the entire quantity at 4 pounds for $1.00. How many pounds did the grocer purchase if the profit from selling the bananas was $10.00?

   (A) 40
   (B) 60

   (C) 90
   (D) 120
   (E) 240

9. There are between 100 and 110 cards in a collection of cards. If they are counted out 3 at a time, there are 2 left over, but if they are counted out 4 at a time, there is 1 left over. How many cards are in the collection?

   (A) 101
   (B) 103
   (C) 106
   (D) 107
   (E) 109
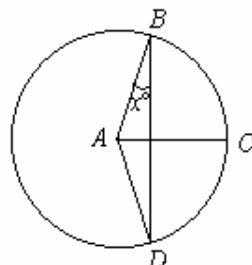


Note: Figure not drawn to scale.

10. If $A$ is the center of the circle shown above and $AB=BC=CD$, what is the value of $x$?

    (A) 15
    (B) 30
    (C) 45
    (D) 60
    (E) 75

11. Out of a total of 1,000 employees at a certain corporation, 52 percent are female and 40 percent of these females work in research. If 60 percent of the total number of employees work in research, how many male employees do NOT work in research?

    (A) 520
    (B) 480
    (C) 392
    (D) 208
    (E) 88

12. An instructor scored a student's test of 50 questions by subtracting 2 times the number of incorrect answers from the number of correct answers. If the student answered all of the questions and received a score of 38, how many questions did that student answer correctly?

(A) 19
(B) 38
(C) 41
(D) 44
(E) 46

13. Which of the following integers does NOT have a divisor greater than 1 that is the square of an integer?

(A) 75
(B) 42
(C) 32
(D) 25
(E) 12
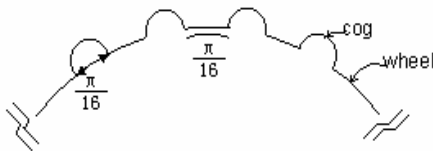


14. There are cogs around the circumference of a wheel and each

cog is $\dfrac{\pi}{16}$ centimeter wide with a

space of $\dfrac{\pi}{16}$ centimeter between

consecutive cogs, as shown above. How many cogs of this size, with the same space between any two consecutive cogs, fit on a wheel with diameter 6 centimeters?

(A) 96
(B) 64
(C) 48
(D) 32

(E) 24

15. If $r \ast s = rs + r + s,$ then for what value of $s$ is $r \ast s$ equal to $r$ for all values of $r$?

(A) –1　　　　(B) 0　　　　(C) 1

(D) $\dfrac{1}{r+1}$　　　　(E) r

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

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

17. If $2x + 5y = 8$ and $3x = 2y,$ what is the value of $2x + y$?

(A) 4

(B) $\dfrac{70}{19}$

(C) $\dfrac{64}{19}$

(D) $\dfrac{56}{19}$

(E) $\dfrac{40}{19}$

18. A ladder 25 feet long is leaning against a wall that is perpendicular to level ground. The bottom of the ladder is 7 feet from the base of the wall. If the top of the ladder slips down 4 feet, how many feet will the bottom of the ladder slip?

(A) 4　　　　(B) 5　　　　(C) 8
(D) 9　　　　(E) 15

19. What is the least possible product of 4 different integers, each of which has a value between –5 and 10, inclusive?

(A) –5040　　　(B) –3600
(C) –720　　　(D) –600

(E) –120

20. If a motorist had driven 1 hour longer on a certain day and at an average rate of 5 miles per hour faster, he would have covered 70 more miles than he actually did. How many more miles would he have covered than he actually did if he had driven 2 hours longer and at an average rate of 10 miles per hour faster on that day?

(A) 100     (B) 120     (C) 140
(D) 150     (E) 160

## SECTION 5
### 30 Minutes (20 Questions)

1. What is the average (arithmetic mean) of the numbers 15, 16, 17, 17, 18, and 19?

(A) 14.2
(B) 16.5
(C) 17
(D) 17.5
(E) 18

2. Kathy bought 4 times as many shares in Company $X$ as Carl, and Carl bought 3 times as many shares in the same company as Tom. Which of the following is the ratio of the number of shares bought by Kathy to the number of shares bought by Tom?

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

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

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

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

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

3. Of the following, which if closest to $\dfrac{0.15 \times 495}{9.97}$?

(A) 7.5
(B) 15
(C) 75
(D) 150
(E) 750

4. A manager has $6,000 budgeted for raises for 4 full-time and 2 part-time employees. Each of the full-time employees receives the same raise, which is twice the raise that each of the part-time employees receives. What is

the amount of the raise that each full-time employee receives?

(A) $750
(B) $1,000
(C) $1,200
(D) $1,500
(E) $3,000

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

   (A) $x^2 - x$

   (B)  $\frac{x^2}{4}$

   (C)  $\frac{x^2}{2}$

   (D)  $\frac{3x^2}{4}$

   (E)  $\frac{3x^2}{2}$

6. A hospital pharmacy charges $0.40 per fluidram of a certain medicine but allows a discount of 15 percent to Medicare patients. How much should the pharmacy charge a Medicare patient for 3 fluidounces of the medicine?(128 fluidrams = 16 fluidounces)

   (A) $9.60
   (B) $8.16
   (C) $3.20
   (D) $2.72
   (E) $1.02

7. $(-1)^2 - (-1)^3 =$

   (A) –2
   (B) –1
   (C) 0
   (D) 1
   (E) 2

8. At a certain bowling alley, it costs $0.50 to rent bowling shoes for the day and $1.25 to bowl 1 game. If a person has $12.80 and must rent shoes, what is

the greatest number of complete games that person can bowl in one day?

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

9.  If $\frac{x}{y} = 2$, then $\frac{x\text{-}y}{x} =$

   (A) –1

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

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

   (D) 1
   (E) 2

10. If each photocopy of a manuscript costs 4 cents per page, what is the cost, in cents, to reproduce $x$ copies of an $x$-page manuscript?

   (A) 4$x$
   (B) 16x
   (C) x2
   (D) 4x2
   (E) 16x2

11. Ken left a job paying $75,000 per year to accept a sales job paying $45,000 per year plus 15 percent commission. If each of his sales is for $750, what is the least number of sales he must make per year if he is not to lose money because of the change?

   (A) 40
   (B) 200
   (C) 266
   (D) 267
   (E) 600

MONTHLY KILOWATT-HOURS

|         | 500     | 1,000   | 1,500   | 2,000   |
|---------|---------|---------|---------|---------|
| Present | $24.00  | $41.00  | $57.00  | $73.00  |
| Proposed | $26.00 | $45.00  | $62.00  | $79.00  |

12. The table above shows present rates and proposed rates for electricity for residential customers. For which of the monthly kilowatt-hours shown would the proposed rate be the greatest percent increase over the present rate?

    (A) 500
    (B) 1,000
    (C) 1,500
    (D) 2,000
    (E) Each of the percent increases is the same.

13. If *a, b,* and *c* are three consecutive odd integers such that $10<a<b<c<20$ and if *b* and *c* are prime numbers, what is the value of $a + b$?

    (A) 24         (B) 28         (C) 30
    (D) 32         (E) 36

14. Of a group of people surveyed in a political poll, 60 percent said that they would vote for candidate *R*. Of those who said they would vote for *R*. 90 percent actually voted for *R*. and of those who did not say that they would vote for R. 5 percent actually voted for *R*. What percent of the group voted for *R*?

    (A) 56%        (B) 59%        (C) 62%
    (D) 65%        (E) 74%

15. If $r = 1 + \dfrac{1}{3} + \dfrac{1}{9} + \dfrac{1}{27}$ and

    $s = 1 + \dfrac{1}{3} r$, then *s* exceeds *r* by

    (A) $\dfrac{1}{3}$      (B) $\dfrac{1}{6}$      (C) $\dfrac{1}{9}$
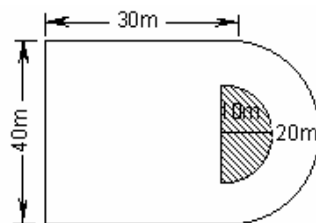
    (D) $\dfrac{1}{27}$        (E) $\dfrac{1}{81}$

16. $\dfrac{0.025 \times \dfrac{15}{2} \times 48}{5 \times 0.0024 \times \dfrac{3}{4}} =$

    (A) 0.1
    (B) 0.2
    (C) 100
    (D) 200
    (E) 1,000

17. A student responded to all of the 22 questions on a test and received a score of 63.5. If the scores were derived by adding 3.5 points for each correct answer and deducting 1 point for each incorrect answer, how many questions did the student answer incorrectly?

    (A) 3
    (B) 4
    (C) 15
    (D) 18
    (E) 20



18. The figure above represents a rectangular parking lot that is 30 meters by 40 meters and an attached semicircular driveway that has an outer radius of 20 meters and an inner radius of 10 meters. If the shaded region is not included, what is the area, in square meters, of the lot and driveway?

    (A) 1,350
    (B) 1,200 + 400
    (C) 1,200 + 300
    (D) 1,200 + 200
    (E) 1,200 + 150

19. One-fifth of the light switches produced by a certain factory are defective. Four-fifths of the defective switches are rejected and $\frac{1}{20}$ of the nondefective switches are rejected by mistake. If all the switches not rejected are sold, what percent of the switches sold by the factory are defective?

(A) 4%
(B) 5%
(C) 6.25%
(D) 11%
(E) 16%
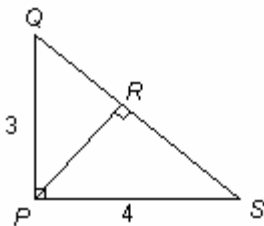


20. In    $PQS$ above, if $PQ = 3$ and $PS = 4$, then   $PR =$

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

(B) $\frac{12}{5}$

(C) $\frac{16}{5}$

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

(E) $\frac{20}{3}$

1. If $x$ is an even integer, which of the following is an odd integer?

(A) $3x + 2$
(B) $7x$
(C) $8x + 5$
(D) $x^2$
(E) $x^3$

2. On a purchase of $120, a store offered a payment plan consisting of a $20 down payment and 12 monthly payments of $10 each. What percent of the purchase price, to the nearest tenth of a percent, did the customer pay in interest by using this plan?

(A) 16.7%
(B) 30%
(C) 75.8%
(D) 106.7%
(E) 107.5%

3. $\frac{5}{4}(42 \div \frac{3}{16}) =$
(A) 6.3
(B) 9.8
(C) 179.2
(D) 224
(E) 280

4. When magnified 1,000 times by an electron microscope, the image of a certain circular piece of tissue has a diameter of 0.5 centimeter. The actual diameter of the tissue, in centimeters, is

(A) 0.005
(B) 0.002
(C) 0.001
(D) 0.0005
(E) 0.0002

5. In 1970 there were 8,902 women stockbrokers in the United States. By 1978 the number had increased to 19,947. Approximately what was the percent increase?

(A) 45%
(B) 125%
(C) 145%
(D) 150%
(E) 225%
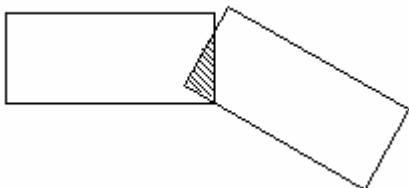


6. In the figure above, two rectangles with the same dimensions overlap to form the shaded region. If each rectangle has perimeter 12 and the shaded region has perimeter 3, what is the total length of the heavy line segments?

(A) 15      (B) 18      (C) 21
(D) 22      (E) 23

7. If one root of the equation $2x^2 + 3x - k = 0$ is 6, what is the value of $k?$

(A) 90
(B) 42
(C) 18
(D) 10
(E) –10

8. Bottle $R$ contains 250 capsules and costs $6.25. Bottle $T$ contains 130 capsules and costs $2.99. What is the difference between the cost per capsule for bottle $R$ and the cost per capsule for bottle $T$?

(A) $0.25
(B) $0.12
(C) $0.05
(D) $0.03
(E) $0.002

9. Trucking transportation rates are $x$ dollars per metric ton per kilometer. How much does it cost, in dollars, to transport one dozen cars, which weigh two metric tons each, $n$ kilometers by truck?

(A) $\dfrac{x}{12n}$

(B) $\dfrac{x}{24n}$

(C) $\dfrac{xn}{24}$

(D) $12xn$
(E) $24xn$

10. For a positive integer $n,$ the number $n!$ is defined to be $n(n - 1)(n - 2)\ldots(1)$. For example, $4!=4(3)(2)(1)$. What is the value of 5!-3!?

(A) 120          (B) 114          (C) 20
(D) 15           (E) 2

11. A man who died left an estate valued at $111,000. His will stipulated that his estate was to be distributed so that each of his three children received from the estate and his previous gifts, combined, the same total amount. If he had previously given his oldest child $15,000, his middle child $10,000, and his youngest $2,000, how much did the youngest child receive from the estate?

(A) $50,000
(B) $48,000
(C) $46,000
(D) $44,000
(E) $39,000

12. If $y > 0$, which of the following is equal to $\sqrt{48y^3}$

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

(B) $3y\sqrt{4y}$

(C) $2\sqrt{12y}$

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

(E) $16y\sqrt{3y}$

13. The volume of a box with a square base is 54 cubic centimeters. If the height of the box is twice the width of the base, what is the height, in centimeters?

   (A) 2
   (B) 3
   (C) 4
   (D) 6
   (E) 9

$$q = 3\sqrt{3}$$
$$r = 1 + 2\sqrt{3}$$
$$s = 3 + \sqrt{3}$$

14. If $q$, $r$ and $s$ are the numbers shown above, which of the following shows their order from greatest to least?

   (A) q, r, s
   (B) q, s, r
   (C) r, q, s
   (D) s, q, r
   (E) s, r, q

15. The sum of the interior angles of any polygon with $n$ sides is $180(n-2)$ degrees. If the sum of the interior angles of polygon $P$ is three times the sum of the interior angles of quadrilateral Q, how many sides does $P$ have?

   (A) 6        (B) 8        (C) 10
   (D) 12       (E) 14

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

   (A) 12%
   (B) 20%
   (C) 22%
   (D) 28%
   (E) 32%

17. If an organization were to sell $n$ tickets for a theater production, the total revenue from ticket sales would be 20 percent greater than the total costs of the production. If the organization actually sold all but 5 percent of the $n$ tickets, the total revenue from ticket sales was what percent greater than the total costs of the production?

   (A) 4%          (B) 10%          (C) 14%
   (D) 15%         (E) 18%

18. When the integer $n$ is divided by 6, the remainder is 3, Which of the following is NOT a multiple of 6?

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

19. How many liters of pure alcohol must be added to a 100-liter solution that is 20 percent alcohol in order to produce a solution that is 25 percent alcohol?

   (A) $\dfrac{7}{2}$
   (B) 5
   (C) $\dfrac{20}{3}$
   (D) 8
   (E) $\dfrac{39}{4}$

20. If 10 persons meet at a reunion and each person shakes hands exactly once with each of the others, what is the total number of handshakes?

   (A) $10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$
   (B) $10 \cdot 10$
   (C) $10 \cdot 9$
   (D) 45
   (E) 36

**SECTION 7**
**30 Minutes (20 Questions)**

1. At the rate of $7.50 per hour, how many hours must a person work to earn $232.50?

   (A) 25
   (B) 27
   (C) 29
   (D) 30
   (E) 31

2. Each month for 6 months the amount of money in a benefit fund is doubled. At the end of the 6 months there is a total of $640 in the fund. How much money was in the fund at the end of 3 months?

   (A) $80
   (B) $100
   (C) $120
   (D) $160
   (E) $320

3. 6[-2(6-9)+11-23]=

   (A) –224
   (B) –108
   (C) –36
   (D) 24
   (E) 79

4. If $\frac{2}{3} \times \frac{3}{5} \times \frac{5}{8} \times \frac{8}{n} = \frac{2}{10}$, then $n =$

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

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

   (C) 5
   (D) 10
   (E) 100

5. If $d = 3.0641$ and $\overline{d}$ is the number obtained by rounding $d$ to the nearest hundredth, then $d - \overline{d} =$

   (A) 0.0001
   (B) 0.0041
   (C) 0.0059

6. Mr. Jones drove from Town $A$ to Town $B$ in $x$ hours. On the return trip over the same route, his average speed was twice as fast. Which of the following expresses the total number of driving hours for the round trip?

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

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

   (C) $\frac{5}{3} x$

   (D) $2x$
   (E) $3x$

7. If 3 is the greatest common divisor of positive integers $r$ and $s$, what is the greatest common divisor of $2r$ and $2s$?

   (A) 2
   (B) 3
   (C) 4
   (D) 6
   (E) 12

8. If $x + y = 5$ and $xy=6$, then $\frac{1}{x} + \frac{1}{y} =$

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

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

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

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

   (E) 5

9. After 5 games, a rugby team had an average of 28 points per game. In order to increase the average by $n$ points, how many points must be scored in a 6th game?

(A) $n$

(B) $6n$

(C) $28n$

(D) $28 + n$

(E) $28 + 6n$

10. On July 1, 1982, Ms. Fox deposited $10,000 in a new account at the annual interest rate of 12 percent compounded monthly. If no additional deposits or withdrawals were made and if interest was credited on the last day of each month, what was the amount of money in the account on September 1, 1982?

(A) $10,200

(B) $10,201

(C) $11,100

(D) $12,100

(E) $12,544

11. How many prime numbers are less than 25 and greater than 10?

(A) Three

(B) Four

(C) Five

(D) Six

(E) Seven

12. Erica has $460 in 5-and 10-dollar bills only. If she has fewer 10-than 5-dollar bills, what is the <u>least</u> possible number of 5-dollar bills she could have?

(A) 32

(B) 30

(C) 29

(D) 28

(E) 27

13. Which of the following is equivalent to the statement that 0.5 is between

$\dfrac{2}{n}$ and $\dfrac{3}{n}$

(A) $1 < n < 6$

(B) $2 < n < 3$

(C) $2 < n < 5$

(D) $4 < n < 6$

(E) $n > 10$

14. A corporation with 5,000,000 shares of publicly listed stock reported total earnings of $7.20 per share for the first 9 months of operation. During the final quarter the number of publicly listed shares was increased to 10,000,000 shares, and fourth quarter earnings were reported as $1.25 per share. What are the average annual earnings per share based on the number of shares at the end of the year?

(A) $1.83

(B) $2.43

(C) $4.85

(D) $8.45

(E) $9.70

15. In 1980 the government spent $12 billion for direct cash payments to single parents with dependent children. If this was 2,000 percent of the amount spent in 1956, what was the amount spent in 1956? (1 billion = 1,000,000,000)

(A) $6 million

(B) $24 million

(C) $60 million

(D) $240 million

(E) $600 million
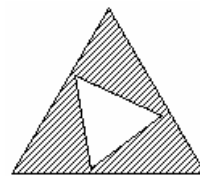


16. The triangles in the figure above are equilateral and the ratio of the length of a side of the larger triangle to the length of a side of the smaller triangle

is $\dfrac{2}{1}$. If the area of the larger triangular region is $K$, what is the area of the shaded region in terms of $K$?

(A) $\dfrac{3}{4} K$

(B) $\dfrac{2}{3}K$

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

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

(E) $\dfrac{1}{4}K$

17. Four cups of milk are to be poured into a 2-cup bottle and a 4-cup bottle. If each bottle is to be filled to the same fraction of its capacity, how many cups of milk should be poured into the 4-cup bottle?
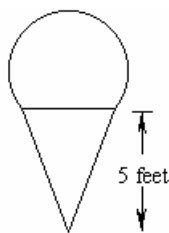
(A) $\dfrac{2}{3}$

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

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

(D) $\dfrac{8}{3}$

(E) 3



18. The outline of a sign for an ice-cream store is made by placing $\dfrac{3}{4}$ of the circumference of a circle with radius 2 feet on top of an isosceles triangle with height 5 feet, as shown above. What is the perimeter, in feet, of the sign?

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

(B) $3\pi + 6\sqrt{3}$

(C) $3\pi + 2\sqrt{33}$

(D) $4\pi + 3\sqrt{3}$

(E) $4\pi + 6\sqrt{3}$

19. The sum of the first 100 positive integers is 5,050. What is the sum of the first 200 positive integers?

(A) 10,100
(B) 10,200
(C) 15,050
(D) 20,050
(E) 20,100

20. A merchant purchased a jacket for $60 and then determined a selling price that equalled the purchase price of the jacket plus a markup that was 25 percent of the selling price. During a sale, the merchant discounted the selling price by 20 percent and sold the jacket. What was the merchant's gross profit on this sale?

(A) $0
(B) $3
(C) $4
(D) $12
(E) $15

## SECTION 8
## 30 Minutes (20 Questions)

1. A certain club has 237 local branches, one national office, and one social service office. If each local branch has 2 officers, and each of the two other offices has 4 officers, how many officers does the club have altogether?

   (A) 482        (B) 476        (C) 474
   (D) 239        (E) 235

2. An employee is paid a salary of $300 per month and earns a 6 percent commission on all her sales. What must her annual sales be in order for her to have a gross annual salary of exactly $21,600?

   (A) $22,896
   (B) $26,712
   (C) $300,000
   (D) $330,000
   (E) $360,000

3. Of the 1,000 students who entered College $X$ as freshmen in September 1979,112 did not graduate in May 1983. If 962 students graduated in May 1983, how many of the graduates did not enter College $X$ as freshmen in September 1979?

   (A) 38         (B) 74         (C) 112
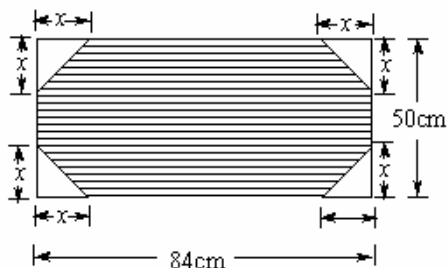   (D) 150        (E) 188
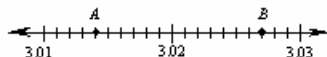
   

4. On the number line above, what is the length of segment $AB$?

   (A) 13
   (B) 1.4
   (C) 1.3
   (D) 0.13
   (E) 0.013

5. Which of the following has a value greater than 1?

   (A) $\dfrac{2}{\sqrt{3}}$

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

   (C) $(\dfrac{3}{4})^2$

   (D) $(\dfrac{7}{8})^3$

   (E) $2(\dfrac{3}{7})$

6. If $\dfrac{m^2 + m - 3}{3} = 1$  then $m$ could equal

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

   

7. The figure above represents a rectangular desk blotter in a holder with dimensions shown. If $x = 8$ centimeters, what is the area, in square centimeters, of the shaded portion of the blotter?

   (A) 4,200
   (B) 4,184
   (C) 4,124
   (D) 4,072
   (E) 3,944

8. The number 25 is 2.5 percent of which of the following?

   (A) 10
   (B) 62.5
   (C) 100
   (D) 625
   (E) 1,000

9. Cottages at a resort are rented for half the summer price in each of the 3 spring months and one-third the summer price in each of the 6 fall and winter months. If each cottage brings in a total of $3,861 when rented for each of the 12 months of the year, what is the monthly rent for each of the 3 summer months?

   (A) $297
   (B) $594
   (C) $702
   (D) $858
   (E) $1,782

10. In 1980 John's salary was $15,000 a year and Don's salary was $20,000 a year. If every year thereafter. John receives a raise of $2,450 and Don receives a raise of $2,000, the first year in which John's salary will be more than Don's salary is

   (A) 1987
   (B) 1988
   (C) 1991
   (D) 1992
   (E) 2000

11. Which of the following is equal to $\dfrac{351}{558}$?

   (A) $\dfrac{7}{11}$

   (B) $\dfrac{39}{62}$

   (C) $\dfrac{19}{31}$

   (D) $\dfrac{117}{196}$

   (E) $\dfrac{107}{186}$

12. On a certain airline, the price of a ticket is directly proportional to the number of miles to be traveled. If the ticket for a 900-mile trip on this airline costs $120, which of the following gives the number of dollars charged for a $k$-mile trip on this airline?

   (A) $\dfrac{2k}{15}$

   (B) $\dfrac{2}{15k}$

   (C) $\dfrac{15}{2k}$

   (D) $\dfrac{15k}{2}$

   (E) $\dfrac{40k}{3}$

13. If $\dfrac{n}{41}$ is 1 more than $\dfrac{m}{41}$, then $n =$

   (A) $m - 41$
   (B) $m + 1$
   (C) $m + 41$
   (D) $m + 42$
   (E) $41m$

14. A discount of 20 percent on an order of goods followed by a discount of 10 percent amounts to

   (A) less than one 15 percent discount
   (B) the same as one 15 percent discount
   (C) the same as one 30 percent discount

(D) less than a discount of 10 percent followed by a discount of 20 percent

(E) the same as a discount of 10 percent followed by a discount of 20 percent

15. If $k$ is an even integer and $p$ and $r$ are odd integers, which of the following CANNOT be an integer?

(A) $\dfrac{r}{k}$

(B) $\dfrac{k}{p}$

(C) $\dfrac{p}{r}$

(D) $\dfrac{kp}{r}$

(E) $\dfrac{kr}{p}$

16. Today Al is 3 times as old as Pat, In 13 years, Al will be one year less than twice as old as Pat will be then. How many years old is Al today?

(A) 12
(B) 33
(C) 36
(D) 42
(E) 49

17. When the integer $n$ is divided by 17, the quotient is $x$ and the remainder is 5. When $n$ is divided by 23, the quotient is $y$ and the remainder is 14. Which of the following is true?

(A) $23x + 17y = 19$
(B) $17x - 23y = 9$
(C) $17x + 23y = 19$
(D) $14x + 5y = 6$
(E) $5x - 14y = -6$
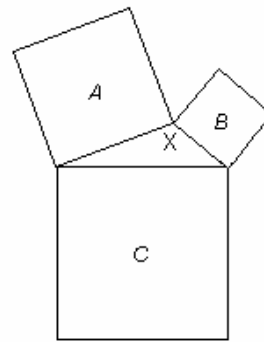


Note: Figure not drawn to scale.

18. In the figure above, three squares and a triangle have areas of $A$, $B$, $C$, and $X$ as shown. If $A = 144$, $B=81$, and $C=225$, then $X =$

(A) 150
(B) 144
(C) 80
(D) 54
(E) 36

19. Three types of pencils, $J, K$, and $L$, cost \$0.05, \$0.10, and \$0.25 each, respectively. If a box of 32 of these pencils costs a total of \$3.40 and if there are twice as many $K$ pencils as $L$ pencils in the box, how many $J$ pencils are in the box?

(A) 6
(B) 12
(C) 14
(D) 18
(E) 20

20. Forty percent of the rats included in an experiment were male rats. If some of the rats died during the experiment and 30 percent of the rats that died were male rats, what was the ratio of the death rate among the male rats to the death rate among the female rats?

(A) $\dfrac{9}{14}$   (B) $\dfrac{3}{4}$   (C) $\dfrac{9}{11}$

(D) $\dfrac{6}{7}$   (E) $\dfrac{7}{8}$

## Section 9
## 30 Minutes   20 Question

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

   (A) *x* – 40
   (B) *x* – 24
   (C) 40 – *x*
   (D) 24 – *x*
   (E) 24 + *x*

2. Running at the same constant rate, 6 identical machines 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

3. NOT SCORED

4. 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
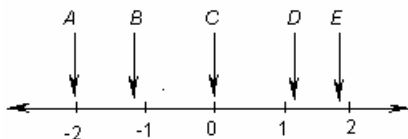


5. Of the five coordinates associated with points *A, B, C, D,* and *E* on the number line above, which has the greatest absolute value?

   (A) *A*
   (B) *B*

   (C) *C*
   (D) *D*
   (E) *E*

6. 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

7. 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

8. 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

9. 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%

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(E) 22.50%

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

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

11. If $(b-3)(4+\dfrac{2}{b})=0$ and $b \ne 3$,

then $b =$

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

12. 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 <u>first</u> lift?

(A) 225
(B) 275
(C) 325
(D) 350
(E) 400

13. 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

14. 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
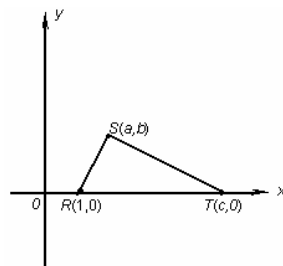


15. In the rectangular coordinate system above, the area of $\triangle RST$ is

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

16. 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) $x^2 - 2x - 3 = 0$

17. 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 $\dfrac{2}{3}$ of the tank?

(A) $\dfrac{8}{15}\,hr$

(B) $\dfrac{15}{4}\,hr$

(C) $\dfrac{5}{4}\,hr$

(D) $\dfrac{15}{8}\,hr$

(E) $\dfrac{8}{3}\,hr$

18. A total of 40 brand *X* television sets and 80 brand *Y* television sets were purchased for a motel chain. If the price of each brand *Y* set was twice the price of each brand *X* set, what percent of the total bill was the price of a brand *Y* set ?

(A) 0.25%
(B) 0.5%
(C) 0.625%
(D) 0.833%
(E) 1.0%

19. Ben and Ann are among 7 contestants from which 4 semifinalists are to be selected. Of the different possible selections, how many contain neither Ben nor Ann?

(A) 5
(B) 6
(C) 7
(D) 14
(E) 21

20. How many positive integers *k* are there such that 100*k* is a factor of $(2^2)(3)(5^3)$?

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

## SECTION 10
**30 minutes    25 questions**

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

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

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

(A) –10
(B) –4
(C) 0
(D) 4
(E) 10

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

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

(A) $-\dfrac{1}{20}$

(B) $-\dfrac{1}{100}$

(C) $\dfrac{1}{100}$

(D) $\dfrac{1}{20}$

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

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

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

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

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

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%

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

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

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 $S = \dfrac{60k}{d^2}$, 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) $\dfrac{3}{10}$ candle

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

(C) $1\dfrac{1}{3}$ candles

(D) 2 candles

(E) 3 candles

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

15. Of the 3,600 employees of Company $X$, $\dfrac{1}{3}$ are clerical. If the clerical staff were to be reduced by $\dfrac{1}{3}$ ,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%

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

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

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

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

(A)      only
(B)      only

(C)      and
(D)      and
(E)      and

17. For a certain performance, $x$ tickets for lower-level seats were sold at $10 each and $y$ tickets for balcony seats were sold at $6 each. If there were no other tickets sold and the number of tickets sold for lower-level seats was 3 times the number of tickets sold for balcony seats, which of the following expresses the total number of dollars from ticket sales in terms of $x$?

(A) 12$x$          (B) 16$x$          (C) 28$x$
(D) 32$x$          (E) 36$x$

18. If the circumference of a circular region is $c$, which of the following represents the area of that circular region?

(A) $\dfrac{c^2}{2}$     (B) $\dfrac{c^2}{4}$   (C) $\dfrac{c^2}{2\pi}$

(D) $\dfrac{c^2}{4\pi}$     (E) $\dfrac{c^2}{4\pi^2}$

19. Each of the integers from 0 to 9, inclusive, is written on a separate slip of blank paper and the ten slips are dropped into a hat. If the slips are then drawn one at a time without replacement, how many must be drawn to ensure that the numbers on two of the slips drawn will have a sum of 10?

(A) Three       (B) Four       (C) Five
(D) Six         (E) Seven

20. In a certain formula, $p$ is directly proportional to $s$ and inversely proportional to $r$. If $p = 1$ when $r = 0.5$ and $s = 2$, what is the value of $p$ in terms of $r$, and $s$?

(A) $\dfrac{s}{r}$                    (B) $\dfrac{r}{4s}$

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(C) $\dfrac{s}{4r}$          (D) $\dfrac{r}{s}$

(E) $\dfrac{4r}{s}$

## SECTION 11
## 30 Minutes   25 Questions

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

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

3. 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) $\dfrac{5x+8y}{x+y}$          (B) $\dfrac{5x+8y}{xy}$

   (C) $\dfrac{5x+8y}{13}$          (D) $\dfrac{40xy}{x+y}$

   (E) $\dfrac{40xy}{13}$

4. If $\dfrac{1}{2}$ of the money in a certain trust fund was invested in stocks, $\dfrac{1}{4}$ in bonds, $\dfrac{1}{5}$ 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

5. 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

6. Machine $A$ produces bolts at a uniform rate of 120 every 40 seconds, and machine $B$ produces bolts at a uniform

Questions 8-10 refer to the following graph.

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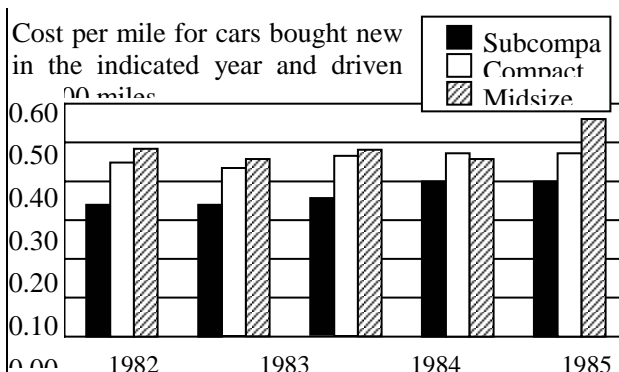


rate of 100 every 20 seconds. If the two
machines run simultaneously, how
many seconds will it take for them to
produce a total of 200 bolts?

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

7. $\dfrac{3.003}{2.002} =$

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

8. 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

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

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

10. 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

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

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

12. 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?
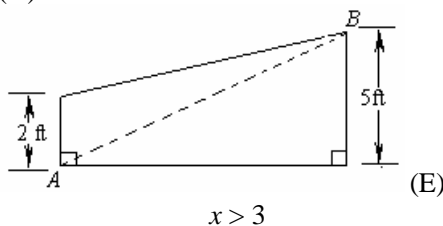
    (A) 140        (B) 220        (C) 260
    (D) 322        (E) 330

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

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

14. 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) $x > 3$

15. 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
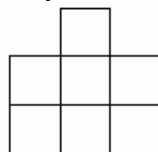    (C) 42
    (D) 45
    (E) 46.5

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

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

17. 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

18. The figure above is composed of 6 squares, each with side $s$ centimeters. If the number of centimeters in the perimeter of the figure is equal to the number of square centimeters in its area, what is the value of $s$?

    (A) 1
    (B) $\dfrac{5}{3}$
    (C) 2
    (D) $\dfrac{5}{2}$
    (E) $\dfrac{7}{3}$

19. If $\dfrac{s}{t} = 2$, then the value of which of the following can be determined?

    . $\dfrac{2t}{s}$

    . $\dfrac{s - t}{t}$

    . $\dfrac{t - 1}{s - 1}$

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

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NET INCOME FOR CORPORATIONS *A* and *B*

| | Corporation *A* | Corporation *B* |
|---|---|---|
| Net Income in 1987 | $2.9 million | $0.87 million |
| Percent Decrease in Net Income from 1986 to 1987 | 8.8% | 13.3% |

20. The net income of Corporation *B* in 1986 was approximately what percent of the net income of Corporation *A* in 1987?

   (A) 35%
   (B) 30%
   (C) 25%
   (D) 20%
   (E) 15%

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

2. If a photocopier makes 2 copies in $\dfrac{1}{3}$ 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

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%

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

   (A) –2
   (B) $-\dfrac{1}{2}$
   (C) $\dfrac{1}{2}$

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(D) 2

(E) 3

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

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

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

(A) –2
(B) 0
(C) 6
(D) 24
(E) 48
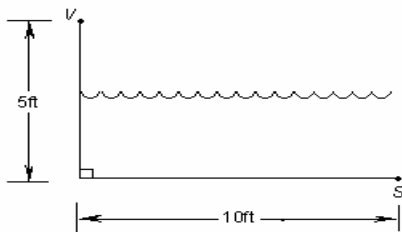


8. In the figure above, $V$ represents an observation point at one end of a pool. From $V$, an object that is actually located on the bottom of the pool at point $R$ appears to be at point $S$. If $VR =$ 10 feet what is the distance $RS$, in feet, between the actual position and the perceived position of the object?

(A) $10 - 5\sqrt{3}$

(B) $10 - 5\sqrt{2}$

(C) 2

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

(E) 4

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

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.

   . $\dfrac{a + b + c}{3}$ is an integer.

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

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) $\dfrac{1}{6}$ and $\dfrac{1}{4}$ only

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

(C) $\dfrac{1}{6}, \dfrac{1}{4}$ and $\dfrac{1}{3}$

(D) $\dfrac{1}{12}, \dfrac{1}{6}$ and $\dfrac{1}{4}$

(E) $\dfrac{1}{12}, \dfrac{1}{6}$ and $\dfrac{1}{3}$

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

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
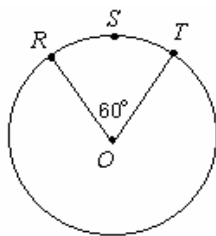


14. If the circle above has center $O$ and circumference 18 , then the perimeter of sector RSTO *is*

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

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

   (A) $\dfrac{2}{11}$

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

   (C) $\dfrac{41}{99}$

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

   (E) $\dfrac{23}{37}$

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

17. If $k$ and $w$ are the dimensions of a rectangle that has area 42, and if $k$ and $w$ are integers such that $k > w$, what is the total number of possible values of $k$?

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

18. $R$ campers fished for 3 hours. If $m$ of the campers caught 2 fish apiece and the rest caught a combined total of $n$ fish, how many fish did the $R$ campers catch per hour?

(A) $2m + n(R - m)$

(B) $\dfrac{2m + n(R - m)}{3}$

(C) $\dfrac{2m + n(m - R)}{3}$

(D) $\dfrac{2m + n}{3}$

(E) $\dfrac{2m + n}{R}$

19. Last year the annual premium on a certain hospitalization insurance policy was $408, and the policy paid 80 percent of any hospital expenses incurred. If the amount paid by the insurance policy last year was equal to the annual premium plus the amount of hospital expenses not paid by the policy, what was the total amount of hospital expenses last year?

    (A) $850.00
    (B) $680.00
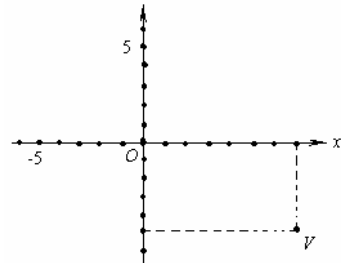    (C) $640.00
    (D) $510.00
    (E) $326.40

20. The average (arithmetic mean) of three numbers is $3x + 2$. If one of the numbers is $x$, what is the average of the other two numbers?

    (A) $x + 1$
    (B) $2x + 2$
    (C) $4x + 1$
    (D) $4x + 3$
    (E) $8x + 6$

## SECTION 13
## 30 Minutes    20 Questions

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



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)

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

4. In a mayoral election, Candidate $X$ received $\dfrac{1}{3}$ more votes than Candidate $Y$, and Candidate $Y$ received $\dfrac{1}{4}$ 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

49

(C) 24,000
(D) 26,000
(E) 32,000

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

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%

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

(A) 16
(B) 14
(C) 3
(D) 1
(E) –1

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

(A) $-\dfrac{3}{2}$

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

(C) 0

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

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

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) $x^2 = \dfrac{y^2 - 4}{25}$

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

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%

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) $\dfrac{25}{10,000-y}$

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

(C) $\dfrac{25y}{10,000-y}$

(D) $\dfrac{y-25}{10,000-y}$

(E) $\dfrac{25}{10,000-(y-25)}$

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* $2\dfrac{1}{2}$ hours later. The second flight leaves Airport *B* every 20 minutes, beginning at 8:00 a.m., and arrives at Airport *C* $1\dfrac{1}{6}$ 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
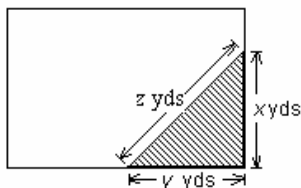


14. The shaded portion of the rectangular lot shown above represents a flower bed. If the area of the bed is 24 square yards and $x = y + 2$, then $z$ equals

(A) $\sqrt{13}$
(B) $2\sqrt{13}$
(C) 6
(D) 8
(E) 10

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

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

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

17. In Township *K,* $\dfrac{1}{5}$ of the housing units are equipped with cable television. If $\dfrac{1}{10}$ of the housing units, including $\dfrac{1}{3}$ of those that are equipped with cable television, are equipped with videocassette recorders, what fraction of the housing units have neither cable television nor videocassette recorders?

(A) $\dfrac{23}{30}$

(B) $\dfrac{11}{15}$

(C) $\dfrac{7}{10}$

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

(E) $\dfrac{2}{15}$

18. Set *S* consists of *n* distinct positive integers, none of which is greater than 12. What is the greatest possible value of *n* if no two integers in *S* have a common factor greater than 1?

    (A) 4
    (B) 5
    (C) 6
    (D) 7
    (E) 11

19. In a certain contest, Fred must select any 3 of 5 different gifts offered by the sponsor. From how many different combinations of 3 gifts can Fred make his selection?

    (A) 10
    (B) 15
    (C) 20
    (D) 30
    (E) 60

20. If the number of square units in the area of circle *C* is twice the number of linear units in the circumference of *C*, what is the number of square units in the area?

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

## SECTION 14
## 30 Minutes    20 Questions

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

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) $\frac{5}{8}$

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

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

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

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

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

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

(D) 3 hr 12 min
(E) 2 hr 40 min

9. If the quotient $\dfrac{a}{b}$ 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

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

(A) –3
(B) –1
(C) 0
(D) 1
(E) 3

11. Of the following, the closest

approximation to $\sqrt{\dfrac{5.98(601.5)}{15.79}}$ is

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

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) $x + y$

13. An empty pool being filled with water
at a constant rate takes 8 hours to fill

to $\dfrac{3}{5}$ 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

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) $\dfrac{9}{4}$

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

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

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

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

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%

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) $(x – y)(s – p)$

17. NOT SCORED
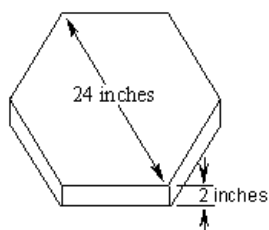


24 inches

2 inches

Note: figure not drawn to scale.

18. The hexagonal face of the block shown in the figure above has sides of equal length and angles of equal measure. If each lateral face is rectangular, what is the area, in square inches, of one lateral face?

(A) $2\sqrt{10}$
(B) 12
(C) 20
(D) $12\sqrt{3}$
(E) 24

19. If $w, x, y,$ and $z$ are on-negative integers, each less than 3, and $w(3^3) + x(3^2) + y(3) + z = 34$, then $w+z=$

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

20. Cars $X$ and $Y$ were traveling together on a straight road at a constant speed of 55 miles per hour when car $X$ stopped for 5 minutes. If car $Y$ continued to travel at 55 miles per hour, how many minutes from the time that car $X$ resumed traveling did it take car $X$ traveling at 60 miles per hour to catch up with car $Y$?(Assume that the time for car $X$ to slow down and speed up was negligible.)

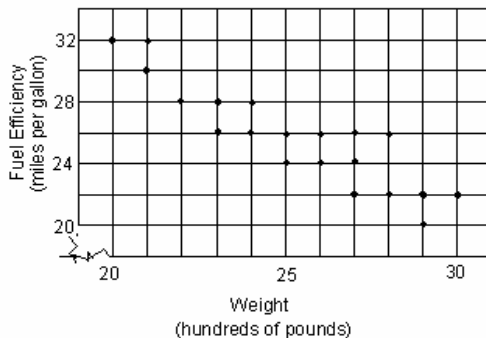(A) 5
(B) 30
(C) 45

(D) 55
(E) 60

### SECTION 15
### 30 Minutes    20 Questions

1. If $x + 5y = 16$ and $x = -3y$, then $y =$

(A) –24
(B) –8
(C) –2
(D) 2
(E) 8

2. An empty swimming pool with a capacity of 5,760 gallons is filled at the rate of 12 gallons per minute, How many hours does it take to fill the pool to capacity?

(A) 8
(B) 20
(C) 96
(D) 480
(E) 720



3. The dots on the graph above indicate the weights and fuel efficiency ratings for 20 cars. How many of the cars weigh more than 2,500 pounds and also get more than 22 miles per gallon?

(A) Three
(B) Five
(C) Eight
(D) Ten
(E) Eleven

4. $\dfrac{90 - 8(20 \div 4)}{\dfrac{1}{2}} =$

(A) 25
(B) 50
(C) 100
(D) 116
(E) 170

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

(A) $\dfrac{a - b}{c}$

(B) $\dfrac{a - c}{b}$

(C) $\dfrac{b - c}{a}$

(D) $\dfrac{b - a}{c}$

(E) $\dfrac{c - b}{a}$

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

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

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

(A) $\dfrac{11}{30}$

(B) $\dfrac{9}{20}$

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

(D) $\dfrac{11}{15}$

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

8. In 1985, 45 percent of a document storage facility's 60 customers were banks, and in 1987. 25 percent of its 144 customers were banks. What was the percent increase from 1985 to 1987 in the number of bank customers the facility had?

(A) 10.7%
(B) 20%
(C) 25%
(D) $33\dfrac{1}{3}\%$
(E) $58\dfrac{1}{3}\%$
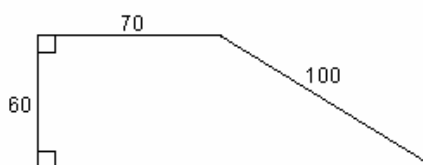


9. what is the perimeter of the figure above?

(A) 380
(B) 360
(C) 330
(D) 300
(E) 230

10. A committee is composed of *w* women and *m* men. If 3 women and 2 men are

added to the committee, and if one person is selected at random from the enlarged committee, then the probability that a woman is selected can be represented by

(A) $\dfrac{w}{m}$

(B) $\dfrac{w}{w+m}$

(C) $\dfrac{w+3}{m+2}$

(D) $\dfrac{w+3}{w+m+3}$

(E) $\dfrac{w+3}{w+m+5}$

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

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

12. Jan lives $x$ floors above the ground floor of a high-rise building. It takes her 30 seconds per floor to walk down the steps and 2 seconds per floor to ride the elevator. If it takes Jan the same amount of time to walk down the steps to the ground floor as to wait for the elevator for 7 minutes and ride down, then $x$ equals

(A) 4
(B) 7
(C) 14
(D) 15
(E) 16

13. A corporation that had $115.19 billion in profits for the year paid out $230.10 million in employee benefits.

Approximately what percent of the profits were the employee benefits?(1 billion $= 10^9$)

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

Questions 14-15 refer to the following definition.

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

14. Which of the following integers has length 3?

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

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

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

16. A dealer originally bought 100 identical batteries at a total cost of $q$ dollars. If each battery was sold at 50 percent above the original cost per battery, then, in terms of q, for how many dollars was each battery sold?

(A) $\dfrac{3q}{200}$

(B) $\dfrac{3q}{2}$

(C) $150q$

(D) $\dfrac{q}{100} + 50$

(E) $\dfrac{150}{q}$

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

(A) $1
(B) $2
(C) $3
(D) $4
(E) $8

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

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

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

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

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

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

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

(A) $2z + 1$
(B) $3z$
(C) $5z$

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

(E) $\dfrac{3z}{2}$

20. If the product of the integers *w, x, y,* and *z* is 770, and if $1 < w < x < y < z,$ what is the value of *w+z*

(A) 10
(B) 13
(C) 16
(D) 18
(E) 21

## SECTION 16

### 30 Minutes    20 Questions

1. If the population of a certain country increases at the rate of one person every 15 seconds, by how many persons does the population increase in 20 minutes?

(A) 80
(B) 100
(C) 150
(D) 240
(E) 300

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

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

3. For an agricultural experiment, 300 seeds were planted in one plot and 200 were planted in a second plot. If exactly 25 percent of the seeds in the first plot germinated and exactly 35 percent of the seeds in the second plot germinated, what percent of the total number of seeds germinated?

(A) 12%
(B) 26%
(C) 29%
(D) 30%
(E) 60%

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

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

(B) $\dfrac{b}{b - a} = 3$

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

(D) $\dfrac{2a}{3b} = \dfrac{4}{3b}$
(E) $\dfrac{3\dfrac{2a}{3b} - 3\dfrac{4}{9}}{a} = \dfrac{11}{2}$

5. On the number line, if $r < s$, if $p$ is halfway between $r$ and $s$, and if $t$ is halfway between $p$ and $r$, then

$$\dfrac{s - t}{t - r} =$$

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

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

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

(D) 3
(E) 4

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

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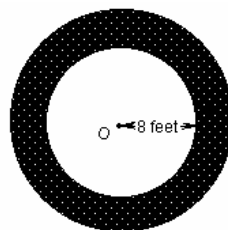


7. The figure above shows a circular flower bed, with its center at $O$, surrounded by a circular path that is 3

feet wide. What is the area of the path, in square feet?

(A) 25
(B) 38
(C) 55
(D) 57
(E) 64

|              | Brand X | Brand Y |
|--------------|---------|---------|
| Miles per Gallon | 40 | 36 |
| Cost per Gallon | $0.80 | $0.75 |

8. The table above gives the gasoline costs and consumption rates for a certain car driven at 50 miles per hour, using each of two brands of gasoline. How many miles further can the car be driven at this speed on $12 worth of brand $X$ gasoline than on $12 worth of brand $Y$ gasoline?

(A) 20
(B) 24
(C) 84
(D) 100
(E) 104

9. If $1 were invested at 8 percent interest compounded annually, the total value of the investment, in dollars, at the end of 6 years would be

(A) $(1.8)^6$
(B) $(1.08)^6$
(C) $6(1.08)$
(D) $1+(0.08)^6$
(E) $1 + 6(0.08)$

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

(A) $114,000
(B) $186,000
(C) $294.000
(D) 4380,000
(E) $660,000

11. How many minutes does it take John to type $y$ words if he types at the rate of $x$ words per minute?

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

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

(C) $xy$

(D) $\dfrac{60x}{y}$

(E) $\dfrac{y}{60x}$

12. The weights of four packages are 1,3,5, and 7 pounds, respectively. Which of the following CANNOT be the total weight, in pounds, of any combination of the packages?

(A) 9
(B)10
(C) 12
(D) 13
(E) 14

13. $\sqrt{(16)(20) + (8)(32)} =$

(A) $4\sqrt{20}$
(B) 24
(C) 25
(D) $4\sqrt{20} + 8\sqrt{2}$
(E) 32

14. The positive integer $n$ is divisible by 25. If $\sqrt{n}$ is greater than 25, which of the following could be the value of
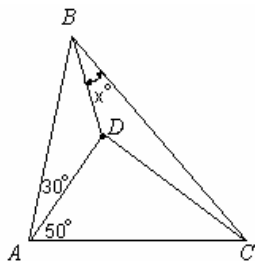
$\dfrac{n}{25}$ ?

(A) 22
(B) 23
(C) 24
(D) 25
(E) 26

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

    . $x = 0$
    . $y = 0$
    . $x = -y$

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



Note: Figure not drawn to scale.

16. In the figure above, $DA = DB = DC$, What is the value of $x$?

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

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

(A) 6

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

18. During the four years that Mrs. Lopez owned her car, she found that her total car expenses were $18,000. Fuel and maintenance costs accounted for $\dfrac{1}{3}$ of the total and depreciation accounted for $\dfrac{3}{5}$ of the remainder. The cost of insurance was 3 times the cost of financing, and together these two costs accounted for $\dfrac{1}{5}$ of the total. If the only other expenses were taxes and license fees, then the cost of financing was how much more or less than the cost of taxes and license fees?

(A) $1,500 more
(B) $1,200 more
(C) $100 less
(D) $300 less
(E) $1,500 less

19. A car travels from Mayville to Rome at an average speed of 30 miles per hour and returns immediately along the same route at an average speed of 40 miles per hour. Of the following, which is closest to the average speed, in miles per hour, for the round-trip?

(A) 32.0
(B) 33.0
(C) 34.3
(D) 35.5
(E) 36.5

20. If $\dfrac{0.0015 \times 10^m}{0.03 \times 10^k} = 5 \times 10^7$, then $m - k =$

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

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

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

2. For telephone calls between two particular cities, a telephone company charges $0.40 per minute if the calls are placed between 5:00 a.m. and 9:00 p.m. and $0.25 per minute if the calls are placed between 9:00 p.m. and 5:00 a.m. If the charge for a call between the two cities placed at 1:00 p.m. was $10.00, how much would a call of the same duration have cost if it had been placed at 11:00 p.m.?

   (A) $3.75
   (B) $6.25
   (C) $9.85
   (D) $10.00
   (E) $16.00
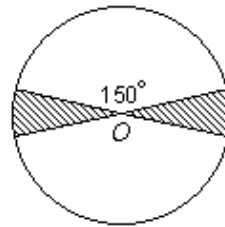


3. If *O* is the center of the circle above, what fraction of the circular region is shaded?

   (A) $\dfrac{1}{12}$

   (B) $\dfrac{1}{9}$

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

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

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

4. If a compact disc that usually sells for $12,95 is on sale for $9.95, then the percent decrease in price is closest to

   (A) 38%
   (B) 31%
   (C) 30%
   (D) 29%
   (E) 23%

5. $\dfrac{1}{1+\dfrac{1}{2+\dfrac{1}{3}}}=$

   (A) $\dfrac{3}{10}$

   (B) $\dfrac{7}{10}$

   (C) $\dfrac{6}{7}$

(D) $\dfrac{10}{7}$

(E) $\dfrac{10}{3}$

6. A fruit-salad mixture consists of apples, peaches, and grapes in the ratio 6:5:2, respectively, by weight. If 39 pounds of the mixture is prepared, the mixture includes how many more pounds of apples than grapes?

(A) 15
(B) 12
(C) 9
(D) 6
(E) 4

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

(A) $\dfrac{10}{9}$

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

(C) $\dfrac{20}{11}$

(D) $\dfrac{30}{11}$

(E) 5

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

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

9. Starting from point $O$ on a flat school playground, a child walks 10 yards due north, then 6 yards due east, and then 2 yards due south, arriving at point $P$. How far apart, in yards, are

points $O$ and $P$?

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

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

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

11. Lois has $x$ dollars more than Jim has, and together they have a total of $y$ dollars. Which of the following represents the number of dollars that Jim has?

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

(B) $y - \dfrac{x}{2}$

(C) $\dfrac{y}{2} - x$

(D) $2y - x$
(E) $y - 2x$
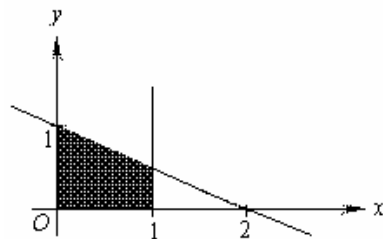


12. In the rectangular coordinate system above, the shaded region is bounded

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by straight lines. Which of the following is NOT an equation of one of the boundary lines?

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

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

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

14. During a certain season, a team won 80 percent of its first 100 games and 50 percent of its remaining games. If the team won 70 percent of its games for the entire season, what was the total number of games that the team played?

(A) 180
(B) 170
(C) 156
(D) 150
(E) 105

15. If Juan takes 11 seconds to run $y$ yards, how many seconds will it take him to run $x$ yards at the same rate?

(A) $\dfrac{11x}{y}$

(B) $\dfrac{11y}{x}$

(C) $\dfrac{x}{11y}$

(D) $\dfrac{11}{xy}$

(E) $\dfrac{xy}{11}$

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

(A) $\dfrac{6}{(2^2)(5^2)}$

(B) $\dfrac{1}{(2^3)(5^2)}$

(C) $\dfrac{28}{(2^2)(5^3)}$

(D) $\dfrac{62}{(2^3)(5^3)}$

(E) $\dfrac{122}{(2^4)(5^3)}$

17. Of 30 applicants for a job, 14 had at least 4 years experience, 18 had degrees, and 3 had less than 4 years experience and did not have a degree. How many of the applicants had at least 4 years experience and a degree?

(A) 14          (B) 13          (C) 9
(D) 7           (E) 5

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

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

19. A certain clock marks every hour by striking a number of times equal to the hour and the time required for a stroke is exactly equal to the time interval between strokes. At 6:00 the time lapse between the beginning of the first stroke and the end of the last

stroke is 22 seconds. At 12:00, how many seconds elapse between the beginning of the first stroke and the end of the last stroke?

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

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

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

**SECTION 18**

**30 Minutes    20 Questions**

1.  $\dfrac{\dfrac{1}{2} + \dfrac{1}{3}}{\dfrac{1}{4}} =$

(A) $\dfrac{1}{12}$

(B) $\dfrac{5}{24}$

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

(D) $\dfrac{9}{4}$

(E) $\dfrac{10}{3}$

2. John has 10 pairs of matched socks. If he loses 7 individual socks, what is the greatest number of pairs of matched socks he can have left?

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

3. Last year's receipts from the sale of candy on Valentine's Day totaled 385 million dollars, which represented 7 percent of total candy sales for the year. Candy sales for the year totaled how many million dollars?

(A) 55
(B) 550
(C) 2,695
(D) 5,500
(E) 26,950

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

(A) 3

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

(C) $8\frac{2}{3}$

(D) 12

(E) 18

5. If $1 + \frac{1}{x} = 2 - \frac{2}{x}$, then $x =$

(A) –1

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

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

(D) 2

(E) 3

6. Last year, for every 100 million vehicles that traveled on a certain highway, 96 vehicles were involved in accidents. If 3 billion vehicles traveled on the highway last year, how many of those vehicles were involved in accidents?
(1 billion 1,000,000,000)

(A) 288

(B) 320

(C) 2,880

(D) 3,200

(E) 28,800

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

(A) 5ft

(B) 6ft

(C) 10ft

(D) 12ft

(E) 15ft

8. What is the least positive integer that is divisible by each of the integers 1 through 7, inclusive?

(A) 420

(B) 840

(C) 1,260

(D) 2,520

(E) 5,040

9. Thirty percent of the members of a swim club have passed the lifesaving test. Among the members who have <u>not</u> passed the test, 12 have taken the preparatory course and 30 have not taken the course. How many members are there in the swim club?

(A) 60

(B) 80

(C) 100

(D) 120

(E) 140

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

(A) 2

(B) 3

(C) 5

(D)6

(E) 11

11. In an increasing sequence of 10 consecutive integers, the sum of the first 5 integers is 560. What is the sum of the last 5 integers in the sequence?

(A) 585

(B) 580

(C) 575

(D) 570

(E) 565

12. A certain manufacturer produces items

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

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

13. How many two-element subsets of {1, 2, 3, 4} are there that do <u>not</u> contain the pair of elements 2 and 4?

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

14. In a certain company, the ratio of the number of managers to the number of production-line workers is 5 to 72. If 8 additional production-line workers were to be hired, the ratio of the number of managers to the number of production-line workers would be 5 to 74. How many managers does the company have?

(A) 5
(B) 10
(C) 15
(D) 20
(E) 25

15. If $(x - 1)^2 = 400$, which of the following could be the value of $x - 5$?

(A) 15
(B) 14

(C) –24
(D) –25
(E) –26

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

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

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

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

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

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

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

(A) $y - 6$

(B) $2y - 6$

(C) $\dfrac{y}{2} - 6$

(D) $\dfrac{3y}{2} - 6$

(E) $\dfrac{5y}{2} - 6$

$$\begin{array}{r} 1,234 \\ 1,243 \\ 1,324 \\ \cdots\cdots \\ \cdots\cdots \\ +4,321 \\ \hline \end{array}$$

20. The addition problem above shows four of the 24 different integers that can be formed by using each of the digits 1, 2, 3, and 4 exactly once in each integer. What is the sum of these 24 integers?
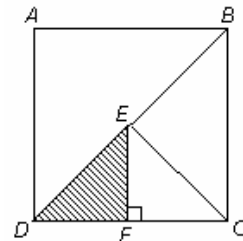
(A) 24,000

(B) 26,664

(C) 40,440

(D) 60,000

(E) 66,660

**SECTION 19**
**30 Minutes    20 Questions**

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

(A) $80

(B) $66

(C) $55

(D) $50

(E) $45



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

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

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

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

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

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

3. Craig sells major appliances. For each appliance he sells, Craig receives a commission of $50 plus 10 percent of the selling price. During one particular week Craig sold 6 appliances for

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selling prices totaling $3,620. What was the total of Craig's commissions for that week?

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

4. The average (arithmetic mean) of 10,30, and 50 is 5 more than the average of 20,40, and

(A) 15
(B) 25
(C) 35
(D) 45
(E) 55

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

(A) $\dfrac{2}{7}$

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

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

(D) $\dfrac{24}{7}$

(E) $\dfrac{7}{2}$

6. If $y = 4 + (x - 3)^2$, then $y$ is least when $x$ =

(A) –4
(B) –3
(C) 0
(D) 3
(E) 4

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

(A) $\dfrac{3x + 2y}{5}$

(B) $\dfrac{3x + 2y}{x + y}$

(C) $\dfrac{3x + 2y}{xy}$

(D) $5(3x + 2y)$
(E) $3x + 2y$

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

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

9. Which of the following is NOT equal to the square of an integer?

(A) $\sqrt{\sqrt{1}}$

(B) $\sqrt{4}$

(C) $\dfrac{18}{2}$

(D) $41 - 25$
(E) 36

10. An artist wishes to paint a circular region on a square poster that is 2 feet on a side. If the area of the circular

region is to be $\dfrac{1}{2}$ the area of the poster, what must be the radius of the circular region in feet?

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

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

(C)  1

(D)  $\dfrac{2}{\sqrt{\pi}}$

(E)  $\dfrac{\pi}{2}$

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

.  $-\dfrac{1}{x}$

.$x + (-x)$

.$x^0$

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

12. At the rate of $m$ meters per $s$ seconds, how many meters does a cyclist travel in $x$ minutes?

(A)  $\dfrac{m}{sx}$

(B)  $\dfrac{mx}{s}$

(C)  $\dfrac{60m}{sx}$

(D)  $\dfrac{60ms}{x}$

(E)  $\dfrac{60mx}{s}$

|        | City A | City B | City C | City D | City E | City F |
|--------|--------|--------|--------|--------|--------|--------|
| City A |        |        |        |        |        |        |
| City B |        |        |        |        |        |        |
| City C |        |        |        |        |        |        |
| City D |        |        |        |        |        |        |
| City E |        |        |        |        |        |        |
| City F |        |        |        |        |        |        |

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

(A) 15
(B) 21
(C) 25
(D) 30
(E) 36

14. A certain tax rate is $0.82 per $100.00. What is this rate, expressed as a percent?

(A) 82%
(B) 8.2%
(C) 0.82%
(D) 0.082%
(E) 0.0082%

15. Fermat primes are prime numbers that can be written in the from $2^k + 1$, where $k$ is an integer and a power of 2. Which of the following is NOT a Fermat prime?

(A) 3
(B) 5
(C) 17
(D) 31
(E) 257

16. A shipment of 1,500 heads of cabbage, each of which was approximately the same size, was purchased for $600.

The day the shipment arrived, $\dfrac{2}{3}$ of the heads were sold, each at 25 percent above the cost per head. The following day the rest were sold at a price per head equal to 10 percent less than the price each head sold for on the day before. What was the gross profit on this shipment?

(A) $100
(B) $115
(C) $125
(D) $130
(E) $135

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

(A) –6
(B) –2
(C) 2
(D) 6
(E) 14

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

(A) 1
(B) 3
(C) 5
(D) 7
(E) 9

19. The ratio, by volume, of soap to alcohol to water in a certain solution is 2:50:100. The solution will be altered so that the ratio of soap to alcohol is doubled while the ratio of soap to water is halved. If the altered solution will contain 100 cubic centimeters of alcohol, how many cubic centimeters of water will it contain?

(A) 50
(B) 200
(C) 400
(D) 625
(E) 800

20. If 75 percent of a class answered the first question on a certain test correctly, 55 percent answered the second question on the test correctly, and 20 percent answered neither of the questions correctly, what percent answered both correctly?

(A) 10%
(B) 20%
(C) 30%
(D) 50%
(E) 65%

## SECTION 20

### 30 Minutes    20 Questions

1. $\dfrac{31}{125} =$

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

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

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

3. If $x^2 = 2y^3$ and $2y = 4$, what is the value of $x^2 + y$?

(A) –14
(B) –2
(C) 3
(D) 6
(E) 18

4. If the cost of 12 eggs varies between $0.90 and $1.20. then the cost per egg varies between

(A) $0.06 and $0.08
(B) $0.065 and $0.085
(C) $0.07 and $0.09
(D) $0.075 and $0.10
(E) $0.08 and $0.105

5.
$(\sqrt{3} + 2)(\sqrt{3} - 2) =$

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

6. A glucose solution contains 15 grams of glucose per 100 cubic centimeters of solution. If 45 cubic centimeters of the solution were poured into an empty container, how many grams of glucose would be in the container?

(A) 3.00
(B) 5.00
(C) 5.50
(D) 6.50
(E) 6.75

7. If Sam were twice as old as he is, he would be 40 years older than Jim. If Jim is 10 years younger than Sam, how old is Sam?
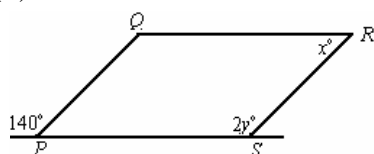
(A) 20
(B) 30
(C) 40
(D) 50
(E) 60

8. If $\dfrac{1}{2} + \dfrac{1}{3} + \dfrac{1}{4} = \dfrac{13}{x}$, which of the following must be an integer?

 $\cdot\ \dfrac{x}{8}$

 $\cdot\ \dfrac{x}{12}$

 $\cdot\ \dfrac{x}{24}$

(A)    only
(B)    only
(C)    and    only

(D)      and      only

(E)      .  .and



9. In the figure above, if *PQRS* is a parallelogram, then $y - x =$
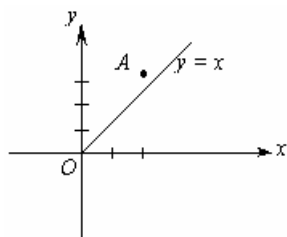
   (A) 30
   (B) 35
   (C) 40
   (D) 70
   (E) 100

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

   (A) $20^\circ$
   (B) $\left(\dfrac{32}{5}\right)^\circ$
   (C) $0^\circ$
   (D) $-20^\circ$
   (E) $-40^\circ$



11. In the rectangular coordinate system above, the line $y = x$ is the perpendicular bisector of segment *AB*(not shown), and the *x*-axis is the perpendicular bisector of segment *BC* (not shown). If the coordinates of point *A* are (2,3), what are the coordinates of point *C*?

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

12. If 1 kilometer is approximately 0.6 mile, which of the following best approximates the number of kilometers in 2 miles?

   (A) $\dfrac{10}{3}$
   (B) 3
   (C) $\dfrac{6}{5}$
   (D) $\dfrac{1}{3}$
   (E) $\dfrac{3}{10}$

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

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

14. A store currently charges the same price for each towel that it sells. If the current price of each towel were to be increased by $1, 10 fewer of the towels could be bought for $120, excluding sales tax. What is the current price of each towel?

   (A) $1
   (B) $2

(C) $3
(D) $4
(E) $12

15. If the sum of *n* consecutive integers is 0, which of the following must be true?

    . *n* is an even number.
    . *n* is an odd number.
    . The average (arithmetic mean) of the
      *n* integers is 0.

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

16. In the formula $V = \dfrac{1}{(2r)^3}$, if *r* is halved, then *V* is multiplied by

(A) 64
(B) 8
(C) 1
(D) $\dfrac{1}{8}$
(E) $\dfrac{1}{64}$

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

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

18. In how many arrangements can a teacher seat 3 girls and 3 boys in a row of 6 seats if the boys are to have the first, third, and fifth seats?

(A) 6
(B) 9
(C) 12
(D) 36
(E) 720

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

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

20. The cost *C* of manufacturing a certain product can be estimated by the formula $C = 0.03rst^2$, where *r* and *s* are the amounts, in pounds, of the two major ingredients and *t* is the production time in hours. If *r* is increased by 50 percent, *s* is increased by 20 percent, and *t* is decreased by 30 percent, by approximately what percent will the estimated cost of manufacturing the product change?

(A) 40% increase
(B) 12% increase
(C) 4% increase
(D) 12% decrease
(E) 24% decrease

### Section 21
### 30 Minutes    20 Questions

1. In Township *K* each property is taxed at 8 percent of its assessed value. If the assessed value of a property in Township *K* is increased from $20,000

to      $24,000, by how much will the property tax increase?

(A) $32
(B) $50
(C) $320
(D) $400
(E) $500

2. One night 18 percent of the female officers on a police force were on duty. If 180 officers were on duty that night and half of these were female officers, how many female officers were on the police force?

(A) 90
(B) 180
(C) 270
(D) 500
(E) 1,000

3. If an integer $n$ is divisible by both 6 and 8, then it must also be divisible by which of the following?

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

4. On the number line, if $x$ is halfway between -5 and 3, and if $y$ is halfway between -2 and 6, what number is halfway between $x$ and $y$ ?

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

5. In a certain company, the total monthly payroll for the 12 production workers

is $18,000 and the total    monthly payroll for the 36 office workers is $63,000.    By how much does the average (arithmetic mean) monthly salary of an office worker exceed that of a    production worker in this company?

(A) $62.50
(B) $187.50
(C) $250.00
(D) $375.00
(E) $500.00
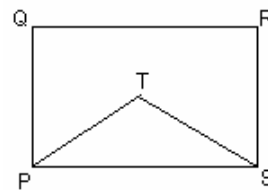


Note: Not drawn to scale.

6. In the figure above, if the area of the rectangular region *PQRS* is 40, and if *PT = TS*, what is the area of the pentagonal region *PQRST*?

(A) 15
(B) 20
(C) 25
(D) 30
(E) It cannot be determined from the information given.

7. $\dfrac{\dfrac{1}{100} - \dfrac{2}{1,000}}{\dfrac{1}{1,000} - \dfrac{2}{10,000}} =$

(A) $\dfrac{1}{10}$
(B) $\dfrac{1}{8}$
(C) 1
(D) 8
(E) 10

8. Which of the following is the prime factorization of 2,520?

(A) $2^2 \times 3^2 \times 5^2$
(B) $2^2 \times 3 \times 5^2 \times 7$
(C) $2^3 \times 3 \times 5 \times 7^2$
(D) $2^3 \times 3^2 \times 5 \times 7$
(E) $2^3 \times 3^2 \times 5^2 \times 7$

9. If $\dfrac{2x}{3} = x - 1, then \dfrac{x}{6} =$

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

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

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

(D) $\dfrac{1}{10}$

(E) $\dfrac{1}{18}$

10. Out of their annual net income, a couple spent 25 percent for food, 13.5 percent for entertainment, 20 percent for housing, 8 percent for car expenses, 15 percent for clothing, and saved the rest. What was the ratio of the amount saved to the amount spent for entertainment?

(A) $\dfrac{19}{27}$

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

(C) $\dfrac{37}{27}$

(D) $\dfrac{19}{9}$

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

11. If $\dfrac{z+3}{z-1} + \dfrac{z+1}{z-3} = 2$, then $z =$

(A) 2
(B) 1

(C) -1
(D) -2
(E) -3

12. The population of city $X$ increased from 325,000 in 1980 to 350,000 in 1990, and it is projected that the population will increase by the same number from 1990 to 2000. Approximately what is the projected percent increase in population from 1990 to 2000 ?

(A) 7.1%
(B) 7.7%
(C) 8.3%
(D) 14.3%
(E) 15.3%

13. A jar contains only $x$ black balls and $y$ white balls. One ball is drawn randomly from the jar and is not replaced. A second ball is then drawn randomly from the jar. What is the probability that the first ball drawn is black and the second ball drawn is white?

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

(B) $\left( \dfrac{x}{x+y} \right)\left( \dfrac{x-1}{x+y-1} \right)$

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

(D) $\left( \dfrac{x-1}{x+y} \right)\left( \dfrac{y-1}{x+y} \right)$

(E) $\left( \dfrac{x}{x+y} \right)\left( \dfrac{y}{x+y-1} \right)$

14. If $y + /y/ = 0$, which of the following must be true?

(A) $y > 0$
(B) $y \quad 0$
(C) $y < 0$
(D) $y \quad 0$
(E) $y = 0$

15. Of the $z$ students at a certain college, $x$ are studying French and $y$ are studying German. If $w$ are studying both French and German, which of the following expresses the number of students at the college <u>not</u> studying either French or German ?

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

16. Of the science books in a certain supply room, 50 are on botany, 65 are on zoology, 90 are on physics. 50 are on geology, and 110 are on chemistry. If science books are removed randomly from the supply room, how many must be removed to ensure that 80 of the books removed are on the same science?

    (A) 81
    (B) 159
    (C) 166
    (D) 285
    (E) 324

17. What is the greatest possible straight-line distance, in centimeters, between two vertices of the rectangular box shown above?

    (A) $10\sqrt{2}$
    (B) $10\sqrt{5}$
    (C) $10\sqrt{6}$
    (D) 30
    (E) 40

18. A certain shade of gray paint is obtained by mixing 3 parts of white paint with 5 parts of black paint. If 2 gallons of the mixture is needed and the individual colors can be purchased only in one-gallon or half- gallon cans, what is the least amount of paint, in gallons, that must be purchased in order to measure out the portions needed for the mixture?

    (A) 2
    (B) $2\dfrac{1}{2}$
    (C) 3
    (D) $3\dfrac{1}{2}$
    (E) 4

19. A merchant paid $300 for a shipment of $x$ identical    calculators. The merchant used 2 of the calculators as demonstrators and sold each of the others for $5 more than the average (arithmetic mean) cost of the     $x$ calculators. If the total revenue from the sale of the calculators was $120 more than the cost of the shipment, how many calculators were in the shipment?

    (A) 24
    (B) 25
    (C) 26
    (D) 28
    (E) 30

20.  $5^{12} + 5^{13} =$

    (A) $5^{25}$
    (B) $10^{25}$
    (C) $6(5^{12})$
    (D) $10^{12} + 5$
    (E) $2(5^{12}) + 5$

## Section 22
## 30 Minutes    20 Questions

1. Tamara saves $35 each week. If she now has $100 saved, in how many weeks can she first have enough saved to buy a lawn mower that costs $250 ?

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

2. $-2(-4-(-3+5)) =$

   (A) – 16
   (B) – 10
   (C) 6
   (D) 12
   (E) 16

3. On a certain test, 3 students each had a score of 90, 9 students each had a score of 80, 4 students each had a score of 70, and 4 students each had a score of 60. What was the average (arithmetic mean) score for the 20 students ?

   (A) 70.5
   (B) 75.0
   (C) 75.5
   (D) 80.0
   (E) 80.5

4. If a hiker walks at a constant speed of $2\frac{1}{2}$ miles per hour, how many miles can the hiker walk in 4 hours and 12 minutes ?

   (A) 10.0
   (B) 10.3
   (C) 10.4
   (D) 10.5
   (E) 10.8

5. In the manufacture of a certain product, 5 percent of the units produced are defective and 4 percent of the defective units are shipped for sale. What percent of the units produced are defective units that are shipped for sale?

   (A) 0.125%
   (B) 0.2%
   (C) 0.8%
   (D) 1.25%
   (E) 2.0%

6. $x(x+1)(x+2)+x(x+3) =$

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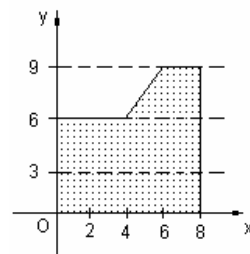


7. What is the area of the shaded region in the figure above ?

   (A) 72
   (B) 57
   (C) 55
   (D) $54\frac{1}{2}$
   (E) $49\frac{1}{2}$

8. Which of the following equals the ratio of $3\frac{1}{3}$ to $1\frac{1}{3}$ ?

   (A) 1 : 3
   (B) 2 : 5
   (C) 5 : 2
   (D) 3 : 1
   (E) 40 : 9

| | Company X | Company Y |
|---|---|---|
| Prince | $75 | $530 |
| Surcharge as a Percent of Price | 4% | 3% |
| Installation Charge | $82.50 | $93.00 |

9. The table above shows the various charges made by two companies for the same air conditioner. What is the total amount that can be saved on the purchase and installation of the air conditioner by dealing with the company that offers the lower total charge?

(A) $41.60
(B) $45.00
(C) $50.75
(D) $55.75
(E) $61.25

10. The numbers in which of the following pairs do NOT have a pair of distinct prime divisors in common ?

(A) 10 and 20
(B) 12 and 18
(C) 24 and 32
(D) 21 and 63
(E) 22 and 88

11. If the sum of two integers is 6, then it must be true that

(A) both integers are even
(B) both integers are odd
(C) both integers are positive
(D) if one integer is negative, the other is positive
(E) if one integer is positive, the other is negative

12. A square picture frame has an outer perimeter of 36 inches and is 1 inch wide on all sides. What is the inner perimeter of the frame, in inches?

(A) 27

(B) $27\dfrac{1}{2}$

(C) 28

(D) $31\dfrac{1}{2}$

(E) 32

13. If $2 - x(\dfrac{1}{x} + 2) = 19 - 4x$, then $x =$

(A) -3
(B) 3
(C) 4
(D) 5
(E) 9

14. For a group of $n$ people, $k$ of whom are of the same sex, the expression $\dfrac{n-k}{n}$ yields an index for a certain phenomenon in group dynamics for members of that sex. For a group that consists of 20 people, 4 of whom are females, by how much does the index for the females exceed the index for the males in the group?

(A) 0.05
(B) 0.0625
(C) 0.2
(D) 0.25
(E) 0.6

15. A certain used-book dealer sells paperback books at 3 times dealer's cost and hardback books at 4 times dealer's cost. Last week the dealer sold a total of 120 books, each of which had cost the dealer $1. If the gross profit (sales revenue minus dealer's cost) on the sale of all of these books was $300, how many of the books sold were paperbacks?

(A) 40
(B) 60
(C) 75
(D) 90

(E) 100

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$d = \dfrac{3v^2}{20}$ and $t = \dfrac{2d}{v}$, where

d   is the distance traveled, in meters, after the brakes are applied

v   is the velocity, in meters per second, before the brakes are applied

t   is the time, in seconds, it takes to stop after the brakes are applied

---

16. The formulas above are used to compute the distance a car travels after the brakes are applied. If the driver of a car applied the brakes just as a traffic light turned yellow and stopped exactly 6 seconds later, what is the value of *v*

(A) 20

(B) $\dfrac{80}{3}$

(C) 30

(D) 40

(E) 60

17. A certain fraction is equivalent to $\dfrac{2}{5}$.

If the numerator of the fraction is increased by 4 and the denominator is doubled, the new fraction is equivalent to $\dfrac{1}{3}$. What is the sum of the numerator and denominator of the original fraction?

(A) 49      (B) 35   (C) 28

(D) 26      (E) 21

18. If all of the telephone extensions in a certain company must be even numbers, and if each of the extensions uses all four of the digits 1, 2, 3, and 6, what is the greatest number of four-digit extensions that the company can have?

(A) 4       (B) 6    (C) 12

(D) 16      (E) 24

19. The product of the first twelve

positive integers is divisible by all of the following EXCEPT

(A) 210

(B) 88

(C) 75

(D) 60

(E) 34

20. A car traveled 462 miles per tankful of gasoline on the highway and 336 miles per tankful of gasoline in the city. If the car traveled 6 fewer miles per gallon in the city than on the highway, how many miles per gallon did the car travel in the city?

(A) 14

(B) 16

(C) 21

(D) 22

(E) 27

**Section 23**
**30 Minutes    20 Questions**

1. The value of which of the following expressions is equal to 2 ?

   I.  $\dfrac{2^2 + 2}{2}$

   II.  $\dfrac{2^2 + 2^2}{2}$

   III.  $\dfrac{2^4 + 2^4}{2^4}$

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

2. If a survey shows that 28 citizens out of a sample of 200 support a particular Senate bill, what percent of the sample does <u>not</u> support the bill?

   (A) 56%
   (B) 64%
   (C) 72%
   (D) 82%
   (E) 86%

3. Joe went on a diet 6 months ago when he weighed 222 pounds. If he now weighs 198 pounds and continues to lose at the same average monthly rate, in approximately how many months will he weigh 180 pounds?

   (A) 3
   (B) 3.5
   (C) 4
   (D) 4.5
   (E) 5

4. $\dfrac{\left(\dfrac{1}{2}\right)^3}{\left(\dfrac{1}{2}\right)^4} =$

   (A) 2
   (B) $\dfrac{4}{3}$
   (C) 1
   (D) $\dfrac{3}{4}$
   (E) $\dfrac{1}{2}$

5. $3x^2 + 2x - 8 =$

   (A) $(3x + 4)(x - 2)$
   (B) $(3x - 4)(x + 2)$
   (C) $(3x + 2)(x - 4)$
   (D) $(3x - 2)(x + 4)$
   (E) none of the above

6. NOT SCORED

7. If the sum of 7 consecutive integers is 434, then the greatest of the 7 integers is

   (A) 71
   (B) 69
   (C) 67
   (D) 65
   (E) 62

8. At a certain college, 50 percent of the total number of students are freshmen. If 20 percent of the fresh-men are enrolled in the school of liberal arts and, of these, 30 percent are psychology majors, what percent of the students at the college are freshmen psychology majors enrolled in the school of liberal arts?

   (A) 3%
   (B) 6%
   (C) 12%

(D) 15%
(E) 20%

9. A plane was originally flying at an altitude of $x$ feet when it ascended 2,000 feet and then descended 5,000 feet. If the plane's altitude after these two changes was $\frac{1}{3}$ its original altitude, then the solution of which of the following equations gives the plane's original altitude, in feet ?

(A) $x + 2,000 = \frac{1}{3}(x - 3,000)$

(B) $\frac{1}{3}(x - 3,000) = x$

(C) $x + 3,000 = \frac{1}{3}x$

(D) $x - 7,000 = \frac{1}{3}x$

(E) $x - 3,000 = \frac{1}{3}x$
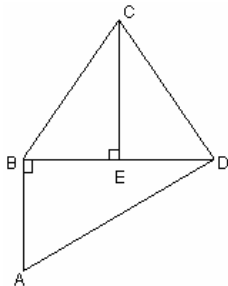


10. In the figure above, $CE = 5$, $BD = 8$, and the area of quadrilateral $ABCD$ is 36. What is the area of $ABD$ ?

(A) 4
(B) 9
(C) 16
(D) 20
(E) 56

11. If the remainder is 7 when positive integer $n$ is divided by 18, what is the remainder when $n$ is divided by 6 ?

(A) 0

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

12. There are how many hours between $x$ minutes past 12 noon and 8:10 p.m. of the same day, where $x < 60$?

(A) $\dfrac{490 - x}{60}$

(B) $\dfrac{480 - x}{60}$

(C) $\dfrac{470 - x}{60}$

(D) 60 (60 − $x$ + 7)
(E) 60 (60 − $x$ + 17)

13. If $x = 4$ and $y = 16$, then $\sqrt{\dfrac{x + y}{xy}}$ is closest to which of the following ?

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

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

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

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

(E) 1

14. A total of $20,000 was invested in two certificates of deposit at simple annual interest rates of 6 percent and 8 percent, respectively. If the total interest on the two certificates was $1,440 at the end of one year, what fractional part of the $20.000 was invested at the higher rate?

(A) $\dfrac{3}{8}$

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

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

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

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

15. If the tens digit $x$ and the units digit $y$ of a positive integer $n$ are reversed, the resulting integer is 9 more than $n$. What is $y$ in terms of $x$ ?

(A) 10 - $x$

(B) 9 - $x$

(C) $x + 9$

(D) $x$ - 1

(E) $x + 1$

16. Beth received $\dfrac{3}{10}$ of the votes cast in a certain election. What fraction of the other votes cast would she have needed in order to have received $\dfrac{1}{2}$ of the votes cast?

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

(B) $\dfrac{2}{7}$

(C) $\dfrac{3}{10}$

(D) $\dfrac{7}{20}$

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

17. Kim bought a total of $2.65 worth of postage stamps in four denominations. If she bought an equal number of 5-cent and 25-cent stamps and twice as many 10-cent stamps as 5-cent stamps, what is the least number of 1-cent stamps she could have bought ?

(A) 5

(B) 10

(C) 15

(D) 20

(E) 25

18. If $x$ is an even integer and $y$ is an odd integer, which of the following CANNOT be true?

(A) $x^y$ is an even integer.

(B) $y^x$ is an odd integer.

(C) $x$ is a multiple of $y$.

(D) $y$ is a multiple of $x$.

(E) $xy$ is an even integer.
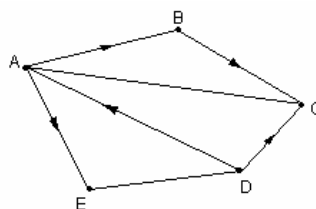


19. In the diagram above, points $A$, $B$, $C$, $D$, and $E$ represent the five teams in a certain league in which each team must play each of the other teams exactly once. The segments connecting pairs of points indicate that the two corresponding teams have already played their game. The arrows on the segments point to the teams that lost; the lack of an arrow on a segment indicates that the game ended in a tie. After all games have been played, which of the following could NOT be the percent of games played that ended in a tie?

(A) 10%

(B) 20%

(C) 30%

(D) 40%

(E) 50%
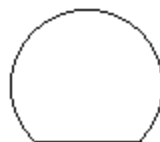


20. The figure above shows the shape of a tunnel entrance. If the curved portion

is $\dfrac{3}{4}$ of a circle and the base of the entrance is 12 feet across, what is the perimeter, in feet, of the curved portion of the entrance'?

(A) 9
(B) 12
(C) $9\pi\sqrt{2}$
(D) 18
(E) $\dfrac{9\pi}{\sqrt{2}}$

## Section 24
### 30 Minutes    20 Questions

1. Of the 10 employees at a certain company, 5 had annual salaries of $20,000, 4 had annual salaries of $25,000, and 1 had an annual salary of $30,000. If a bonus equal to 10 percent of annual salary was given to each employee, what was the total amount of he bonuses?

(A) $230,000
(B) $75,000
(C) $30,000
(D) $23,000
(E) $7,500
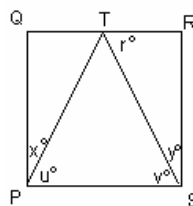


2. In the figure above, if *PQRS* is a square and *QT = TR,* which of the following statements is NOT true?

(A) *PT = TS*
(B) *x = y*
(C) *u = v*
(D) *r = y*
(E) The area of     *PQT* is equal to the area of     *SRT.*

3. If *ab*      0, which of the following is equal to $\dfrac{1}{\dfrac{a}{b}}$ ?

(A) $\dfrac{a}{b}$
(B) 1
(C) *a*

(D) $b$

(E) $\dfrac{b}{a}$

4. What is the greatest integer $k$ such that
   $2^{k} \leq 100$ ?

   (A) 5     (B) 6   (C) 7     (D) 49     (E) 50

5. A certain electric-company plan offers customers reduced rates for electricity used between 8 p.m. and 8 a.m. weekdays and 24 hours a day Saturdays and Sundays. Under this plan, the reduced rates apply to what fraction of a week?

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

   (B) $\dfrac{5}{8}$

   (C) $\dfrac{9}{14}$

   (D) $\dfrac{16}{21}$

   (E) $\dfrac{9}{10}$

6. A certain mixture of nuts consists of 5 parts almonds to 2 parts walnuts, by weight. What is the number of pounds of almonds in 140 pounds of the mixture ?

   (A) 100
   (B) 84
   (C) 40
   (D) 28
   (E) 20

7. $(0.01)^{2}(0.014)+(0.01)(0.0026) =$

   (A) 0.0000166
   (B) 0.0000274
   (C) 0.00004

(D) 0.000166
(E) 0.0004

8. The pages of a report are numbered consecutively from 1 to 10. If the sum of the page numbers up to and including page number $x$ of the report is equal to one more than the sum of the page numbers following page number $x$, then $x =$

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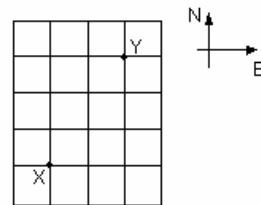


Note: Figure not drawn to scale.

9. In City $R$, streets run either east-west or north-south, as shown on the map above. Blocks along east-west streets are 400 feet long and blocks along north-south streets are 200 feet long. If the width of the streets is ignored, what is the straight-line distance, in feet, from $X$ to $Y$ ?

   (A) $200\sqrt{5}$
   (B) 1,000
   (C) 1,200
   (D) $400\sqrt{10}$
   (E) 1,600

10. If $x(1-\dfrac{1}{x}) = 1- y$, then $y =$

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

   (B) $x$

(C) $x - 2$

(D) $1 - \dfrac{1}{x^2}$

(E) $2 - x$

11. A side of beef lost 35 percent of its weight in processing. If the side of beef weighed 546 pounds after processing, how many pounds did it weigh before processing?

(A) 191
(B) 355
(C) 737
(D) 840
(E) 1,560

12. The total price of $n$ ($n > 1$) equally priced copies of a certain book is $50. In terms of $n$, which of the following gives the total price of $n$ - 1 of these copies?

(A) $50\,(n - 1)$

(B) $\dfrac{50}{n - 1}$

(C) $\dfrac{50(n - 1)}{n}$

(D) $\dfrac{50n}{n - 1}$

(E) $\dfrac{50}{n(n - 1)}$

13. Of the following sums, which is greatest ?

(A) $\dfrac{1}{\sqrt{2}} + \dfrac{1}{\sqrt{3}} + \dfrac{1}{\sqrt{4}} + \dfrac{1}{\sqrt{5}}$

(B) $\dfrac{1}{2^2} + \dfrac{1}{3^2} + \dfrac{1}{4^2} + \dfrac{1}{5^2}$

(C) $\dfrac{1}{2^2} + \dfrac{1}{2^3} + \dfrac{1}{2^4} + \dfrac{1}{2^5}$

(D) $1 - \dfrac{1}{2} + \dfrac{1}{3} - \dfrac{1}{4}$

(E) $\dfrac{1}{2} + \dfrac{1}{3} + \dfrac{1}{4} + \dfrac{1}{5}$

14. One millisecond is 0.001 of a second. The costs for a single run of a computer program are $1.07 for operating-system overhead, $0.023 per millisecond of computer time, and $4.35 for the mounting of a data tape. What is the total of these three costs for 1 run of a program that requires 1.5 seconds of computer time ?

(A) $7.15
(B) $8.87
(C) $28.96
(D) $35.57
(E) $39.92

15. A certain theater has 100 balcony seats. For every $2 increase in the price of a balcony seat above $10, 5 fewer seats will be sold. If all the balcony seats are sold when the price of each seat is $10, which of the following could be the price of a balcony seat if the revenue from the sale of balcony seats is $1,360 ?

(A) $12
(B) $14
(C) $16
(D) $17
(E) $18

16. If $n = (2^2)(3^4)(5^6)$, the value of which of the following products is greater than $\sqrt{n}$ ?

  I.  $(2)(3^3)(5^2)$
  II.  $(2)(3)(5^4)$
  III.  $(2^2)(3^2)(5^3)$

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

17. If $b$ and $c$ are positive numbers and $\dfrac{1}{b} = \dfrac{b}{c} = \dfrac{c}{8}$, then $b + c =$

(A) 4
(B) 6
(C) 7
(D) 8
(E) 9

18. In a certain performance of a 3-act play, the first act was 18 minutes shorter than the third act and half as long as the second act. If the average (arithmetic mean) length of the 3 acts was 46 minutes, how many minutes long was the third act?

(A) 30
(B) 39
(C) 46
(D) 48
(E) 66

19. In an office, 40 percent of the workers have at least 5 years of service, and a total of 16 workers have at least 10 years of service. If 90 percent of the workers have fewer than 10 years of service, how many of the workers have at least 5 but fewer than 10 years of service?

(A) 48
(B) 64
(C) 50
(D) 144
(E) 160

20. If $n$ and $p$ are different positive prime numbers, which of the integers $n^4$, $p^3$, and $np$ has (have) exactly 4 positive divisors?

(A) $n^4$ only
(B) $p^3$ only
(C) $np$ only
(D) $n^4$ and $np$
(E) $p^3$ and $np$

## Section 25
### 30 Minutes    20 Questions

1. For each color copy, Print Shop $X$ charges $1.25 and Print Shop $Y$ charges $2.75. How much greater is the charge for 84 color copies at Print Shop $Y$ than at Print Shop $X$ ?

(A) $84.00
(B) $105.00
(C) $126.00
(D) $231.00
(E) $336.00

2. The sum of 25 percent of 36 and 75 percent of 56 equals

(A) 23
(B) 37
(C) 41
(D) 51
(E) 69

3. If $x^2 < x$. then $x$ must be

(A) less than 0
(B) equal to 0
(C) between 0 and 1
(D) equal to 1
(E) greater than 1

4. If 15 people contributed a total of $20.00 toward a gift and each of them contributed at least $1.00, then the maximum possible amount any one person could have contributed is

(A) $1.00
(B) $1.25
(C) $5.00
(D) $6.00
(E) $20.00

5. If the cost of a yearly membership in a certain club increased from $199 to

$299, what was the approximate percent increase in cost?

(A) $33\frac{1}{3}\%$

(B) 50%

(C) $66\frac{2}{3}\%$

(D) 100%

(E) 150%

6. On the number line, the number $p$ is twice as many units from -2 as -2 is from 6. If $p$ is less than –2, what is the value of $p$ ?

(A) –18
(B) –10
(C) –6
(D) 10
(E) 14

7. A telephone call costs $1.25 for the first minute and $0.32 for each additional minute. What is the cost, in dollars, of a telephone call that lasts for $x$ minutes, where $x$ is an integer?

(A) 0.32+ 1.25$x$
(B) 1.25+ 0.32$x$
(C) 0.32+ 1.25($x$ - 1)
(D) 1.25+ 0.32($x$ + 1)
(E) 1.25 + 0.32($x$ - 1)

8. If $x$ and $y$ are integers, then $\dfrac{1}{x+y}$

CANNOT be equal to

(A) –1

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

(C) 0

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

(E) 1

9. The markup on a television set is 20 percent of the cost. The markup is what percent of the selling price?

(markup = selling price - cost)

(A) 8%
(B) 10%

(C) $12\frac{1}{2}\%$

(D) 15%

(E) $16\frac{2}{3}\%$

10. If $x$ and $y$ are two-digit integers such that $x > 40$ and $y<70$, which of the following is closest to the maximum possible value of $xy$ ?

(A) 700
(B) 2,800
(C) 4,000
(D) 7,000
(E) 28,000

11. What is the diameter of a circular region that has area 10    ?

(A) 5
(B) 10
(C) 20
(D) $\sqrt{10}$
(E) $2\sqrt{10}$

12. If $3x + 2y = 7$ and $2x – y = 7$, what is the value of $x$ ?

(A) 0
(B) 1

(C) $\dfrac{7}{5}$

(D) $\dfrac{21}{11}$

(E) 3

13. Worldwide production of motor vehicles was 3.9 million vehicles in 1946 and 45.7 million in 1987. Of the following, which is closest to the average (arithmetic mean) annual

increase, in millions, in worldwide production of motor vehicles during this period?

(A) 0.08
(B) 1.0
(C) 1.1
(D) 10.5
(E) 41.8

14. Raymond took several days to mow a certain lawn. He mowed $\frac{1}{3}$ of the lawn the first day, $\frac{1}{2}$ of the remaining unmowed portion the second day, and $\frac{3}{4}$ of the remaining unmowed portion the third day. What fraction of the lawn remained unmowed at the end of the third day?

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

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

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

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

(E) $\frac{1}{24}$

15. Of the votes cast on a certain proposal, 80 more were in favor of the proposal than were against it. If the number of votes against the proposal was 40 percent of the total vote, what was the total number of votes cast?

(Each vote cast was either in favor of the proposal or against it.)

(A) 480
(B) 400
(C) 300
(D) 240
(E) 160

16. If $xy \quad 0$ and $\frac{1}{x} - \frac{1}{y} = cx$. Which of the following is equal to $c$ ?

(A) $\dfrac{x}{y(1-x^2)}$

(B) $\dfrac{1}{-x^2 y}$

(C) $\dfrac{y-x}{x^2 y}$

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

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

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

(A) 5
(B) 8
(C) 10
(D) 15
(E) 24
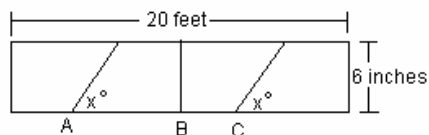


Note: Figure not drawn to scale.

18. The figure above shows the dimensions of a rectangular board that is to be cut into four identical pieces by making cuts at points *A, B*, and *C*, as indicated. If $x = 45$, what is the length *AB* ?

(1 foot = 12 inches)

(A) 5 ft 6 in
(B) 5 ft  $3\sqrt{2}$  in
(C) 5 ft 3 in

(D) 5 ft
(E) 4 ft 9 in

19. If $x < y < z$ and $y - x > 5$, where $x$ is an even integer and $y$ and $z$ are odd integers, what is the least possible value of $z - x$ ?

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

20. On the day of the performance of a certain play, each ticket that regularly sells for less than $10.00 is sold   for half price plus $0.50, and each ticket that regularly sells for $10.00 or more is sold for half price plus $1.00. On the day of the performance, a person purchases a total of $y$ tickets, of which $x$ regularly sell for $9.00 each and the rest regularly sell for $12.00 each. What is the amount paid, in dollars, for the $y$ tickets ?

(A) $7y - 2x$
(B) $12x - 7y$
(C) $\dfrac{9x + 12y}{2}$
(D) $7y + 4x$
(E) $7y + 5x$

## Section 26
## 30 Minutes    20 Questions

1. A car with a 12-gallon gas tank used $\frac{1}{2}$ of a full tank of gas to make a 150-mile trip. How many miles per gallon did the car average on the trip?

(A) 30
(B) 25
(C) $12\frac{1}{2}$
(D) $8\frac{1}{3}$
(E) 6

2. If $5n + 4 = 11$, what is the value of $10n - 2$ ?

(A) 68
(B) 14
(C) 12
(D) 7
(E) -1

3. At the beginning of each year, the price of item $X$ is 10 percent higher than its price at the beginning of the previous year. During three consecutive years, if the price of item $X$ is $8 at the beginning of the first year, what is its price at the beginning of the third year?

(A) $8.80
(B) $9.60
(C) $9.68
(D) $10.00
(E) $16.00

4. $\dfrac{\left(\frac{1}{2}\right)\left(\frac{1}{3}\right)}{\frac{1}{2} \div \frac{1}{3}} =$

(A) $\frac{1}{9}$
(B) $\frac{1}{4}$
(C) 1
(D) $\frac{3}{2}$
(E) 6
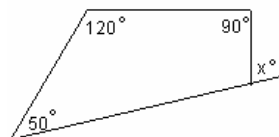


5. An association of mathematics teachers has 1,260 members. Only 525 of these members cast votes in the election for president of the association. What percent of the total membership voted for the winning candidate if the winning candidate received 60 percent of the votes cast?

(A) 75%
(B) 58%
(C) 42%
(D) 34%
(E) 25%

6. In the figure above, what is the value of $x$ ?

(A) 50
(B) 70
(C) 80
(D) 90
(E) 100

7. Which of the following fractions, if written as a decimal, would have a 2 in the thousandths place ?

(A) $\frac{3}{11}$
(B) $\frac{7}{9}$

(C) $\dfrac{1}{8}$

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

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

8. If $P$ dollars is invested at an annual interest rate of 5 percent, which of the following gives the amount of simple interest, in dollars, earned after $n$ months ?

(A) $0.05P + n$

(B) $0.05P + \dfrac{n}{12}$

(C) $0.05P \times n$

(D) $0.05P \times \dfrac{1}{12n}$

(E) $0.05P \times \dfrac{n}{12}$

9. If a person purchases 15 of the 3,000 tickets sold in a raffle that awards one prize, what is the probability that this person will <u>not</u> win?

(A) 0

(B) $\dfrac{1}{200}$

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

(D) $\dfrac{199}{200}$

(E) 1

10. Virginia, Adrienne, and Dennis have taught history for a combined total of 96 years. If Virginia has taught for 9 more years than Adrienne and for 9 fewer years than Dennis, for how many years has Dennis taught?

(A) 23
(B) 32
(C) 35
(D) 41

(E) 44

11. Approximately 90 percent of the volume of a certain cube that is floating in a tank of water is beneath the surface. If 6.4 cubic centimeters of the cube is above the surface of the water, what is the approximate length, in centimeters, of an edge of the cube?

(A) 10
(B) 8
(C) 6
(D) 4
(E) 2

12. If $x = 2u,$ then the average (arithmetic mean) of $x$ and $u$, in terms of $u$, is

(A) $\dfrac{u}{3}$

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

(C) $\dfrac{2u}{3}$

(D) $\dfrac{3u}{4}$

(E) $\dfrac{3u}{2}$

13. If the sum of a set of ten different positive prime numbers is an even number, which of the following prime numbers CANNOT be in the set ?

(A) 2
(B) 3
(C) 5
(D) 7
(E) 11

14. A book dealer buys used books for prices ranging from $0.75 to $1.50 and then sells them for prices ranging from $3.00 to $5.50. If the dealer were to sell 20 of these books, the minimum gross profit from this sale would be

(A) $15

(B) $30
(C) $45
(D) $50
(E) $80

15. If $x(a+b) = y$, where $y \quad 0$ and $2a$

= $3b = 1$, then $\dfrac{y}{x} =$

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

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

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

(D) $\dfrac{5}{6}$

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

16. A certain Social Security recipient will receive an annual benefit of $12,000 provided he has annual earnings of $9,360 or less, but the benefit will be reduced by $1 for every $3 of annual earnings over $9,360. What amount of total annual earnings would result in a 50 percent reduction in the recipient's annual Social Security benefit? (Assume Social Security benefits are not counted as part of annual earnings.)

(A) $15,360
(B) $17,360
(C) $18,000
(D) $21,360
(E) $27,360

17. $\dfrac{1}{2^{10}} + \dfrac{1}{2^{11}} + \dfrac{1}{2^{12}} + \dfrac{1}{2^{12}} =$

(A) $\dfrac{1}{2^{7}}$

(B) $\dfrac{1}{2^{8}}$

(C) $\dfrac{1}{2^{9}}$

(D) $\dfrac{1}{2^{13}}$

(E) $\dfrac{1}{2^{45}}$

18. If it would take one machine 10 minutes to fill a large production order and another machine 12 minutes to fill the same order, how many minutes would it take both machines working together, at their respective rates, to fill the order?

(A) $4\dfrac{1}{60}$

(B) 5

(C) $5\dfrac{5}{11}$

(D) $5\dfrac{1}{2}$

(E) 11

19. If $\dfrac{m}{7}$ is an integer, then each of the following must be an integer EXCEPT

(A) $\dfrac{m-28}{7}$

(B) $\dfrac{m+21}{7}$

(C) $\dfrac{14m}{98}$

(D) $\dfrac{m^{2}-49}{49}$

(E) $\dfrac{m+14}{14}$

20. Not Scored

## Section 27
## 25 mintues    16 Questions

1. A project scheduled to be carried out over a single fiscal year has a budget of $12,600, divided into 12 equal monthly allocations. At the end of the 4th month of that fiscal year, the total amount actually spent on the project was $4,580. By how much was the project over its budget ?

(A) $380
(B) $540
(C) $1,050
(D) $1,380
(E) $1,430

2. For which of the following values of $n$ is $\dfrac{100+n}{n}$ NOT an integer ?

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

3. Rectangular floors $X$ and $Y$ have equal area. If floor $X$ is 12 feet by 18 feet and floor $Y$ is 9 feet wide, what is the length of floor $Y$, in feet ?

(A) $13\dfrac{1}{2}$
(B) 18
(C) $18\dfrac{3}{4}$
(D) 21
(E) 24

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

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

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

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

6. if $\left(\dfrac{3x-5}{2}\right)y = y$ and $y \neq 0$, then $x =$

(A) $\dfrac{2}{3}$
(B) $\dfrac{5}{3}$
(C) $\dfrac{7}{3}$
(D) 1
(E) 4

7. If $x + 5 > 2$ and, $x - 3 < 7$, the value of $x$ must be between which of he following pairs of numbers ?

(A) -3 and 10
(B) -3 and 4
(C) 2 and 7
(D) 3 and 4

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(E) 3 and 10

8. A certain company retirement plan has a "rule of 70" provision that allows an employee to retire when the employee's age plus years of employment with the company total at least 70. In what year could a female employee hired in 1986 on her 32nd birthday first be eligible to retire under this provision ?

(A) 2003
(B) 2004
(C) 2005
(D) 2006
(E) 2007

9. $\dfrac{1}{2}+\left[\left(\dfrac{2}{3}\times\dfrac{3}{8}\right)\div 4\right]-\dfrac{9}{16}=$

(A) $\dfrac{29}{16}$

(B) $\dfrac{19}{16}$

(C) $\dfrac{15}{16}$

(D) $\dfrac{9}{13}$

(E) 0

10. The sum of the prime numbers that are greater than 60 and less than 70 is

(A) 67
(B) 128
(C) 191
(D) 197
(E) 260

11. Water consists of hydrogen and oxygen, and the approximate ratio, by mass, of hydrogen to oxygen is 2 : 16. Approximately how many grams of oxygen are there in 144 grams of water ?

(A) 16

(B) 72
(C) 112
(D) 128
(E) 142

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

(A) –3

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

(C) 0

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

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

13. A rainstorm increased the amount of water stored in State J reservoirs from 124 billion gallons to 138 billion gallons. If the storm increased the amount of water in the reservoirs to 82 percent of total capacity, approximately how many billion gallons of water were the reservoirs short of total capacity prior to the storm?

(A) 9     (B) 14     (C) 25
(D) 30    (E) 44

14. If $s_1, s_2, s_3, \ldots$ is the sequence such that $s_n = \dfrac{n}{n+1}$ for all positive integers $n$, then the product of the first 10 terms of this sequence is

(A) $\dfrac{1}{(10)(11)}$     (B) $\dfrac{1}{11}$

(C) $\dfrac{1}{10}$     (D) $\dfrac{9}{10}$

(E) $\dfrac{10}{11}$

15. On a scale that measures the intensity of a certain phenomenon, a reading of $n+1$ corresponds to an intensity that

is 10 times the intensity corresponding to a reading of *n*. On that scale, the intensity    corresponding to a reading of 8 is how many times as great as the intensity corresponding to a reading of 3 ?

(A) 5     (B) 50     (C) $10^5$
(D) $5^{10}$     (E) $8^{10} - 3^{10}$

16. John and Mary were each paid *x* dollars in advance to do a certain job together, John worked on the job for 10 hours and Mary worked 2 hours less than John. If Mary gave John *y* dollars of her payment so that they would have received the same hourly wage, what was the dollar amount, in terms of *y,* that John was paid in advance ?

(A) 4*y*     (B) 5*y*     (C) 6*y*
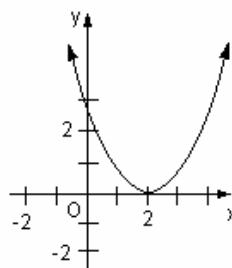(D) 8*y*     (E) 9*y*

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## Section 28
## 25 Minutes    16 Questions

SOURCES OF FUNDS FOR HIGHWAY
MAINTENANCE IN STATE X IN 1983
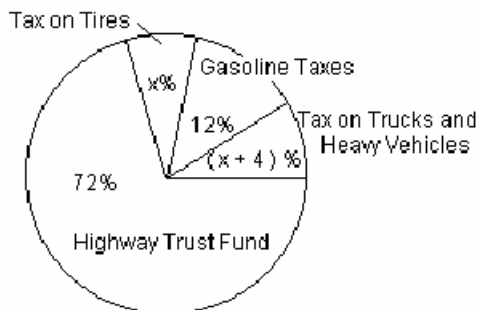


1. According to the graph above, what percent of the funds for highway maintenance came from the tax on tires?

(A) 3 %
(B) 6 %
(C) 8 %
(D) 10%
(E) 16%



2. According to the graph above, when *x* = 3, *y* most nearly ?

(A) –1
(B)  $-\dfrac{1}{2}$
(C) 0
(D)  $\dfrac{1}{2}$

(E) 1

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

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

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

(A) 19
(B) 17
(C) 16
(D) 14
(E) 13

5. When $\frac{1}{10}$ percent of 5,000 is subtracted from $\frac{1}{10}$ of 5,000 the difference is

(A) 0
(B) 50
(C) 450
(D) 495
(E) 500

6. A poll reveals that the average (arithmetic mean) income of 10 households is $25,000. If 6 of the households have incomes of $30,000 each, what is the average income of the other 4 households?

(A) $21,500
(B) $20,000
(C) $17,500
(D) $7,500
(E) $7,000

7. $1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{3}}} =$

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

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

(C) $\dfrac{11}{8}$

(D) $\dfrac{11}{7}$

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

8. If $T = \dfrac{5}{9}(k - 32)$, and if $T = 290$, then $K =$

(A) $\dfrac{1,738}{9}$

(B) 322
(C) 490
(D) 554

(E) $\dfrac{2,898}{5}$

9. The water from one outlet, flowing at a constant rate, can fill a swimming pool in 9 hours. The water from a second outlet, flowing at a constant rate, can fill the same pool in 5 hours. If both outlets are used at the same time, approximately what is the number of hours required to fill the pool ?

(A) 0.22
(B) 0.31

(C) 2.50
(D) 3.21
(E) 4.56

10. Diana bought a stereo for $530, which was the retail price plus a 6 percent sales tax. How much money could she have saved if she had bought the stereo at the same retail price in a neighboring state where she would have paid a sales tax of 5 percent?

(A) $1.00
(B) $2.65
(C) $4.30
(D) $5.00
(E) $5.30

11. If a square mirror has a 20-inch diagonal, what is the approximate perimeter of the mirror, in inches?

(A) 40
(B) 60
(C) 80
(D) 100
(E) l20

12. Which of the following is the value of $\sqrt{\sqrt[3]{0.000064}}$ ?

(A) 0.004
(B) 0.008
(C) 0.02
(D) 0.04
(E) 0.2

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

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

(E) 15

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

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

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

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

(B) $\dfrac{2}{7}$

(C) $\dfrac{33}{83}$

(D) $\dfrac{99}{250}$

(E) $\dfrac{100}{249}$

16. If $x$ and $y$ are different prime numbers, each greater
    than 2, which of the following must be true ?
    I. $x + y$    91
    II. $x - y$ is an even integer.

    III. $\dfrac{x}{y}$ is not an integer.

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

## Section 29
## 25 Minutes    16 Questions

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

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

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

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

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

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

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

(C) $\dfrac{10}{21}$

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

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

4. Machine $A$ produces 100 parts twice as fast as machine $B$ does. Machine $B$ produces 100 parts in 40 minutes. If each machine produces parts at a constant rate, how many parts does machine $A$ produce in 6 minutes ?

(A) 30
(B) 25
(C) 20
(D) 15
(E) 7.5

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

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

6. A necklace is made by stringing $N$ individual beads together in the repeating pattern red bead, green bead, white bead, blue bead, and yellow bead. If the necklace design begins with a red bead and ends with a white bead, then $N$ could equal.

(A) 16
(B) 32
(C) 41
(D) 54
(E) 68

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

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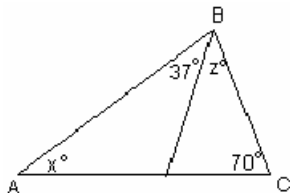


8. In   $ABC$ above, what is $x$ in terms of $z$ ?

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

9. In 1990 a total of $x$ earthquakes occurred worldwide, some but not all of which occurred in Asia. If $m$ of these earthquakes occurred in Asia, which of the following represents the ratio of the umber of earth quakes that occurred in Asia to the number that did not occur in Asia ?

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

(B) $\dfrac{m}{x}$

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

(D) $\dfrac{x}{x - m}$

(E) $1 - \dfrac{m}{x}$

10. If $\dfrac{x + y}{xy} = 1$, then $y =$

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

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

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

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

(E) $x$

11. If $\dfrac{1}{2}$ of the air in a tank is removed with each stroke of a vacuum pump, what fraction of the original amount of air has been removed after 4 strokes ?

(A) $\dfrac{15}{16}$

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

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

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

(E) $\dfrac{1}{16}$

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

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

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

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

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

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

13. How many integers *n* are there such that $1 < 5n + 5 < 25$ ?

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

14. If the two-digit integers *M* and *N* are positive and have the same digits, but in reverse order, which of the following CANNOT be the sum of *M* and *N* ?

(A) 181
(B) 163
(C) 121
(D) 99
(E) 44

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

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

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

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

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

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

16. In 1985 a company sold a brand of shoes to retailers for a fixed price per pair. In 1986 the number of pairs of the shoes that the company sold to retailers decreased by 20 percent, while the price per pair increased by 20 percent. If the company's revenue from the sale of the shoes in 1986 was $3.0 million, what was the approximate revenue from the sale of the shoes in 1985 ?

(A) $2.4 million
(B) $2.9 million
(C) $3.0 million
(D) $3.1 million
(E) $3.6 million

**Section 30**
**25 Minutes    16 Questions**

1. $\dfrac{(3)(0.072)}{0.54} =$

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

2. A car dealer sold $x$ used cars and $y$ new cars during May. If the number of used cars sold was 10 greater than the number of new cars sold. Which of the following expresses this relationship ?

(A) $x > 10y$
(B) $x > y + 10$
(C) $x > y - 10$
(D) $x = y + 10$
(E) $x = y - 10$

3. What is the maximum number of

$1\dfrac{1}{4}$-foot pieces of wire that can be cut

from a wire that is 24 feet long?

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

4. If each of the two lines $\ell_1$ and $\ell_2$ is

parallel to line $\ell_3$, which of the

following must be true?

(A) Lines $\ell_1$, $\ell_2$, and $\ell_3$ lie in the
     same plane.
(B) Lines $\ell_1$, $\ell_2$, and $\ell_3$ lie in
     different planes.
(C) Line $\ell_1$ is parallel to line $\ell_2$.
(D) Line $\ell_1$ is the same line as line
     $\ell_2$.

(E) Line $\ell_1$ is the same line as line
     $\ell_3$.

5.          $\dfrac{61.24 \times (0.998)^2}{\sqrt{403}}$   The

expression above is approximately equal to

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

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

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

(B) 1

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

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

(E) 3

7. If the numbers $\dfrac{17}{24}$, $\dfrac{1}{2}$, $\dfrac{3}{8}$, $\dfrac{3}{4}$, and

$\dfrac{9}{16}$ were ordered from greatest to least,

the middle number of the resulting sequence would be

(A) $\dfrac{17}{24}$

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

(C) $\dfrac{3}{8}$

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

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

(E) $25\dfrac{3}{10}$

8. If a 10 percent deposit that has been paid toward the purchase of a certain product is $110, how much more remains to he paid?

(A) $880
(B) $900
(C) $1,000
(D) $1,100
(E) $1,210

9. Kim purchased $n$ items from a catalog for $8 each. Postage and handling charges consisted of $3 for the first item and $1 for each additional item. Which of the following gives the total dollar amount of Kim's purchase, including postage and handling, in terms of $n$ ?

(A) $8n + 2$
(B) $8n + 4$
(C) $9n + 2$
(D) $9n + 3$
(E) $9n + 4$

10. $\left(\sqrt{7} + \sqrt{7}\right)^2 =$

(A) 98
(B) 49
(C) 28
(D) 21
(E) 14

11. If the average (arithmetic mean) of the four numbers $K$, $2K + 3$, $3K - 5$, and $5K + 1$ is 63, what is the value of $K$ ?

(A) 11
(B) $15\dfrac{3}{4}$
(C) 22
(D) 23

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

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

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

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

14. If x + y = a and x – y = b, then 2xy =

(A) $\dfrac{a^2 - b^2}{2}$

(B) $\dfrac{b^2 - a^2}{2}$

(C) $\dfrac{a - b}{2}$

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

(E) $\dfrac{a^2 + b^2}{2}$

15. A rectangular circuit board is designed to have width $w$ inches, perimeter $p$

inches, and area $k$ square inches. Which of the following equations must be true?

(A) $w^2 + pw + k = 0$

(B) $w^2 - pw + 2k = 0$

(C) $2w^2 + pw + 2k = 0$

(D) $2w^2 - pw - 2k = 0$

(E) $2w^2 - pw + 2k = 0$

16. On a certain road, 10 percent of the motorists exceed the posted speed limit and receive speeding tickets, but 20 percent of the motorists who exceed the posted speed limit do not receive speeding tickets. What percent of the motorists on that road exceed the posted speed limit ?

(A) $10\frac{1}{2}\%$    (B) $12\frac{1}{2}\%$

(C) 15%          (D) 22%

(E) 30%

**Section 31**
**25 Minutes    16 Questions**

1. If $x$ is 11 percent greater than 80, then $x$ =

(A) 70.9
(B) 71.2
(C) 88.0
(D) 88.8
(E) 91.0

2. A certain car uses 12 gallons of gasoline in traveling 240 miles. In order for the car to travel the same distance using 10 gallons of gasoline, by how many miles per gallon must the car's gas mileage be increased?

(A) 2    (B) 4    (C) 6    (D) 8    (E) 10
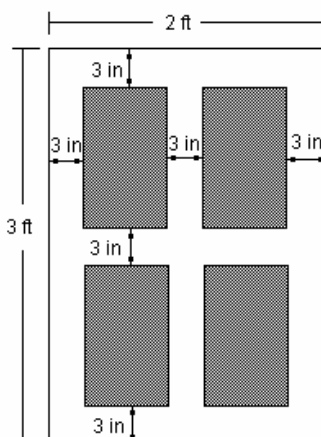


3. The figure above represents a window, with the shaded regions representing the openings for the glass. If all line segments in the figure are either horizontal or vertical and the openings are all the same size, what are the dimensions, in inches, of each opening (1 foot = 12 inches)?

(A) 12.0 by 18.0
(B) 10.5 by 16.5
(C) 9.0 by 15.0
(D) 8.0 by 10.0
(E) 7.5 by 13.5

4. A farmer used 1,034 acres of land for beans, wheat, and corn in the ratio of 5 : 2 : 4, respectively. How many acres were used for corn?

(A) 188
(B) 258
(C) 376
(D) 470
(E) 517

5. If $2x^2 + 4x - 5 = x^2 + 2x + x^2 + 5$, then $x^2 =$

(A) 0
(B) 4

(C) 10
(D) 25
(E) 100

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

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

7. A circle graph shows how the budget of a certain company was spent: 63 percent for salaries, 12 percent for research and development, 6 percent for utilities, 5 percent for equipment, 4 percent for supplies, and the remainder for transportation. If the area of each sector of the graph is proportional to the percent of the budget it represents, how many degrees of the circle are used to represent

transportation?

(A) 10°
(B) 18°
(C) 36°
(D) 90°
(E) 324°

8. What is the area of a square with perimeter $P$ ?

(A) $16P^2$
(B) $4P$
(C) $\dfrac{P^2}{4}$
(D) $\dfrac{P}{16}$
(E) $\dfrac{P^2}{16}$

9. A certain ball was dropped from a window 8 meters above a sidewalk. On each bounce it rose straight up exactly one-half the distance of the previous fall. After the third bounce the ball was caught when it reached a height of exactly 1 meter above the sidewalk. How many meters did the ball travel in all?

(A) 21
(B) 19
(C) 17
(D) 15
(E) 13

10. A certain store sells all maps at one price and all books at another price. On Monday the store sold 12 maps and 10 books for a total of $38.00, and on Tuesday the store sold 20 maps and 15 books for a total of $60.00. At this store, how much less does a map sell for than a book?

(A) $0.25
(B) $0.50
(C) $0.75
(D) $1.00
(E) $l.25

11. Which of the following procedures is always equivalent to adding 5 given numbers and then dividing the sum by 5 ?

I. Multiplying the 5 numbers and then finding the 5th root of the product.
II. Adding the 5 numbers, doubling the sum, and then moving the decimal point one place to the left.
III. Ordering the 5 numbers numerically and then selecting the middle number.
(A) None
(B) I only
(C) II only
(D) III only
(E) I and III

12. A certain company has records stored with a record-storage firm in 15-inch by 12-inch by 10-inch boxes. The boxes occupy 1.08 million cubic inches of space. If the company pays $0.25 per box per month for record storage, what is the total amount that the company pays each month for record storage?

(A) $150
(B) $300
(C) $600
(D) $1,200
(E) $2,400

13. If a 3-digit integer is selected at random from the integers 100 through 199, inclusive, what is the probability that the first digit and the last digit of the integer are each equal to one more than the middle digit?

(A) $\dfrac{2}{225}$

(B) $\dfrac{1}{111}$

(C) $\dfrac{1}{110}$

(D) $\dfrac{1}{100}$

(E) $\dfrac{1}{50}$

14. Mr. Kramer, the losing candidate in a two-candidate election, received 942,568 votes, which was exactly 40 percent of all the votes cast. Approximately what percent of the remaining votes would he need to have received in order to have won at least 50 percent of all the votes cast?

(A) 10%
(B) 12%
(C) 15%
(D) 17%
(E) 20%

15. Which of the following inequalities is

equivalent to $-2 < x < 4$ ?

(A) $|x - 2| < 4$
(B) $|x - 1| < 3$
(C) $|x + 1| < 3$
(D) $|x + 2| < 4$
(E) None of the above

16. If the average (arithmetic mean) of 5 positive temperatures is $x$ degrees Fahrenheit, then the sum of the 3 greatest of these temperatures, in degrees Fahrenheit, could be

(A) $6x$

(B) $4x$

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

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

(E) $\dfrac{3x}{5}$

**Section 32**
**25 Minutes   16 Questions**

1. A certain taxi fare consists of an initial charge of $1.25 and an additional charge of $0.25 for each $\frac{1}{5}$ mile traveled. What is the total fare for a trip of 2.4 miles?

   (A) $4.25
   (B) $3.00
   (C) $2.25
   (D) $1.85
   (E) $1.75

2. If $\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$ for all numbers $a, b, c,$ and $d$, then $\begin{vmatrix} 3 & 5 \\ -2 & 4 \end{vmatrix} =$

   (A) –22
   (B) –2
   (C) 2
   (D) 7
   (E) 22

3. If the area of a square region having sides of length 6 centimeters is equal to the area of a rectangular region having width 2.5 centimeters, then the length of the rectangle, in centimeters, is

   (A) 8.5
   (B) 9.5
   (C) 9.6
   (D) 10.5
   (E) 14.4

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

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

5. Of the following, which is most nearly equal to $\sqrt{10}$ ?

   (A) 3.1
   (B) 3.2
   (C) 3.3
   (D) 3.4
   (E) 3.5

6. Exactly $\frac{1}{3}$ of the children in a certain class are girls. If there are 18 boys in the class, how many girls are in the class?

   (A) 6
   (B) 9
   (C) 12
   (D) 24
   (E) 27
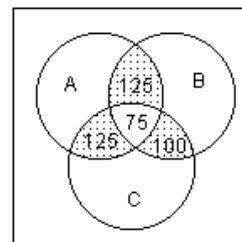


Questions 7-8: refer to the following information

   In a marketing survey for products *A, B*, and *C*, 1,000 people were asked which of the products, if any, they use. The three circular regions in the diagram above represent the numbers of people who use products *A, B,*

and *C*, according to the survey results. Of the people surveyed, a total of 400 use *A*, a total of 400 use *B*, and a total of 450 use *C*.

7. How many of the people surveyed use exactly one of the products?

(A) 75
(B) 100
(C) 150
(D) 250
(E) 325

8. What percent of the people surveyed use product *A* or product *B* or both, but not product *C*?

(A) 12.5%
(B) 17.5%
(C) 30%
(D) 40%
(E) 60%

9. If $x = \dfrac{a}{2} + \dfrac{b}{2^3} + \dfrac{c}{2^4}$ , where *a, b,* and *c* are each equal to 0 or 1, then *x* could be each of the following EXCEPT

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

(B) $\dfrac{3}{16}$

(C) $\dfrac{5}{16}$

(D) $\dfrac{10}{16}$

(E) $\dfrac{11}{16}$

10. The equation $\dfrac{M+6}{36} = \dfrac{P-7}{21}$ relates two temperature scales, where *M* is the number of degrees on one scale and *P* is the number of degrees on the other scale. Which of the following equations can be used to convert temperatures from the *P* scale to the *M* scale?

(A) $M = \dfrac{7}{12}P + 13$

(B) $M = \dfrac{7}{12}P + 21$

(C) $M = \dfrac{7}{12}P - 12$

(D) $M = \dfrac{7}{12}P - 13$

(E) $M = \dfrac{7}{12}P - 18$

11. If *x* is a positive number and $\dfrac{1}{2}$ the square root of *x* is equal to 2*x*, then *x* =

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

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

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

(D) 2
(E) 8

| Score | Number of Students |
|-------|--------------------|
| 83 | 5 |
| 70 | 6 |
| 92 | 3 |
|  | 5 |
| 64 | 1 |

12. The incomplete table above shows a distribution of scores for a class of 20 students. If the average (arithmetic mean) score for the class is 78, what score is missing from the table ?

(A) 73
(B) 75
(C) 77
(D) 79
(E) 81

13. Carl drove from his home to the beach at an average speed of 80 kilometers
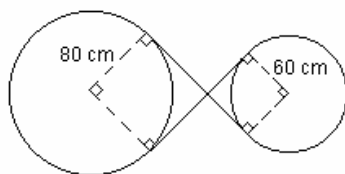
per hour and returned home by the same route at an average speed of 70 kilometers per hour. If the trip home took $\frac{1}{2}$ hour longer than the trip to the beach, how many kilometers did Carl drive each way?

(A) 350
(B) 345
(C) 320
(D) 280
(E) 240

14. If $5x = 6y$ and $xy \neq 0$, what is the ratio of

$\frac{1}{5}x$ to $\frac{1}{6}y$ ?

(A) $\dfrac{25}{6}$

(B) $\dfrac{36}{25}$

(C) $\dfrac{6}{5}$

(D) $\dfrac{5}{6}$

(E) $\dfrac{25}{36}$



15. The figure above shows a cord around two circular disks. If the radii of the two disks are 80 centimeters and 60 centimeters, respectively, what is the total length, in centimeters, of the cord?

(A) 210
(B) 210 + 280
(C) 280
(D) 280 + 80

(E) 280 + 280

16. If $x$, $y$, and $z$ are positive integers and $3x = 4y = 7z$, then the least possible value of $x + y + z$ is

(A) 33
(B) 40
(C) 49
(D) 61
(E) 84

## Section 33
## 25 Minutes    16 Questions

1. If *p* is an even integer and *q* is an odd integer, which of the following must be an odd integer?

(A) $\dfrac{p}{q}$

(B) $pq$

(C) $2p + q$

(D) $2\,(p + q)$

(E) $\dfrac{3p}{q}$

2. A certain college has a student-to-teacher ratio of 11 to 1. The average (arithmetic mean) annual salary for teachers is $26,000. If the college pays a total of $3,380,000 in annual salaries to its teachers, how many students does the college have ?

(A) 130
(B) 169
(C) 1,300
(D) 1,430
(E) 1,560

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

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

4. Drum *X* is $\dfrac{1}{2}$ full of oil and drum *Y*, which has twice the capacity of drum *X*,

is $\dfrac{2}{J}$ full of oil. If all of the oil in drum *X* is poured into drum *Y*. then drum *Y* will be filled to what fraction of its capacity ?

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

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

(C) $\dfrac{11}{12}$

(D) $\dfrac{7}{6}$

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

5. In a certain population, there are 3 times as many people aged twenty-one or under as there are people over twenty-one. The ratio of those twenty-one or under to the total population is

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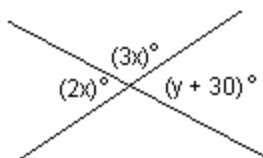(B) 1 to 3
(C) 1 to 4
(D) 2 to 3
(E) 3 to 4

6. $\dfrac{2 + 2\sqrt{6}}{2} =$

(A) $\sqrt{6}$

(B) $2\sqrt{6}$

(C) $1 + \sqrt{6}$

(D) $1 + 2\sqrt{6}$

(E) $2 + \sqrt{6}$

7. A certain telescope increases the visual range at a particular location from 90 kilometers to 150 kilometers. By what

percent is the visual range increased by using the telescope ?

(A) 30%

(B) $33\frac{1}{2}$%

(C) 40%

(D) 60%

(E) $66\frac{2}{3}$%



Note: Figure not drawn to scale.

8. In the figure above, the value of $y$ is

(A) 6
(B) 12
(C) 24
(D) 36
(E) 42

9. A part-time employee whose hourly wage was increased by 25 percent decided to reduce the number of hours worked per week so that the employee's total weekly income would remain unchanged. By what percent should the number of hours worked be reduced?

(A) 12.5%
(B) 20%
(C) 25%
(D) 50%
(E) 75%

10. if $x > 0$, $\dfrac{x}{50} + \dfrac{x}{25}$ is what percent of $x$ ?

(A) 6%
(B) 25%

(C) $37\frac{1}{2}$ %

(D) 60%

(E) 75%

11. If the operation $\otimes$ is defined for all $a$ and $b$ by the equation $a \otimes b = \dfrac{a^2 b}{3}$, then $2 \otimes (3 \otimes -1) =$

(A) 4

(B) 2

(C) $-\dfrac{4}{3}$

(D) -2

(E) -4

12. A factory that employs 1,000 assembly-line workers pays each of these workers $5 per hour for the first 40 hours worked during a week and $1\frac{1}{2}$ time that rate for hours in excess of 40. What was the total payroll for the assembly-line workers for a week in which 30 percent of them worked 20 hours, 50 percent worked 40 hours, and the rest worked 50 hours?

(A) $180,000
(B) $185,000
(C) $190,000
(D) $200,000
(E) $205,000

13. If $x$   2, then $\dfrac{3x^2(x-2) - x + 2}{x-2} =$

(A) $3x^2 - x + 2$

(B) $3x^2 + 1$

(C) $3x^2$

(D) $3x^2 - 1$

(E) $3x^2 - 2$

14. In a certain school, 40 more than $\dfrac{1}{3}$ of all the students are taking a science

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

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

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

I. $c > 0$

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

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

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

16. The inside dimensions of a rectangular wooden box are 6 inches by 8 inches by 10 inches. A cylindrical cannister is to be placed inside the box so that it stands upright when the closed box rests on one of its six faces. Of all such cannisters that could be used, what is the radius, in inches, of the one that has maximum volume?

(A) 3
(B) 4
(C) 5
(D) 6
(E) 8

1. $\dfrac{\dfrac{1}{2}}{\dfrac{1}{4} + \dfrac{1}{6}} =$

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

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

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

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

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

2. Kelly and Chris packed several boxes with books. If Chris packed 60 percent of the total number of boxes, what was the ratio of the number of boxes Kelly packed to the number of boxes Chris packed?

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

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

(A) 4:00
(B) 5.00
(C) 6:00
(D) 7.00

(E) 8:00

4. Of the following, which is the closest approximation of $\dfrac{50.2 \times 0.49}{199.8}$ ?

(A) $\dfrac{1}{10}$

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

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

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

(E) $\dfrac{25}{2}$

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

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

6. A certain pair of used shoes can be repaired for $12.50 and will last for 1 year. A pair of the same kind of shoes can be purchased new for $28.00 and will last for 2 years. The average cost per year of the new shoes is what percent greater than the cost of repairing the used shoes?

(A) 3%
(B) 5%
(C) 12%

(D) 15%
(E) 24%

7. In a certain brick wall, each row of bricks above the bottom row contains one less brick than the row just below it. If there are 5 rows in all and a total of 75 bricks in the wall, how many bricks does the bottom row contain ?

(A) 14
(B) 15
(C) 16
(D) 17
(E) 18

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

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

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

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

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

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

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

(E) $\dfrac{1}{11}$

10. $(\sqrt{2}+1)(\sqrt{2}-1)(\sqrt{3}+1)(\sqrt{3}-1) =$

(A) 2
(B) 3

(C) $2\sqrt{6}$

(D) 5

(E) 6

11. In a certain calculus class, the ratio of the number of mathematics majors to the number of students who are not mathematics majors is 2 to 5. If 2 more mathematics majors were to enter the class, the ratio would be 1 to 2. How many students are in the class?

(A) 10

(B) 12

(C) 21

(D) 28

(E) 35

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

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

(B) 3

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

(D) $2\frac{1}{3}$

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

13. In the *xy*-coordinate system, if (*a, b*) and (*a* + 3, *b* + *k*) are two points on the line defined by the equation $x = 3y - 7$, then $k =$

(A) 9

(B) 3

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

(D) 1

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

14. What is the units digit of
$(13)^{4}(17)^{2}(29)^{3}$

(A) 9      (B) 7      (C) 5      (D) 3      (E) 1
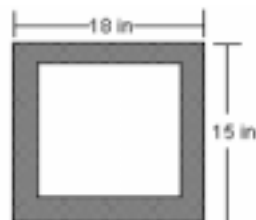


Note : Figure not drawn to scale.

15. The shaded region in the figure above represents a rectangular frame with length 18 inches and width 15 inches. The frame encloses a rectangular picture that has the same area as the frame itself. If the length and width of the picture have the same ratio as the length and width of the frame, what is the length of the picture, in inches?

(A) $9\sqrt{2}$

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

(C) $\frac{9}{\sqrt{2}}$

(D) $15\left(1 - \frac{1}{\sqrt{2}}\right)$

(E) $\frac{9}{2}$
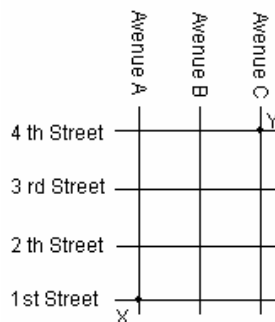
16. Pat will walk from intersection *X* to intersection *Y* along a route that is confined to the square grid of four streets and three avenues shown in the map above. How many routes from *X* to *Y* can Pat take that have the minimum possible length?

(A) 6
(B) 8
(C) 10
(D) 14
(E) 16

1. If $\dfrac{4}{5 - \dfrac{a}{b}} = 1$, which of the following

must be true ?

(A) $a = 0$
(B) $b = 0$
(C) $a = 1$
(D) $b = 1$
(E) $a = b$

2.                            y = kx + 3

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

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

3. In 1989 the price of a new model *S* car was *x* dollars. If the price of the model *S* car increased each year by 10 percent of the previous year's price, what was the price of the car, in dollars, in 1991 ?

(A) 1.10*x*
(B) 1.20*x*
(C) 1.21*x*
(D) 1.25*x*
(E) 1.33*x*

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

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

5. NOT SCORED

6. If a subscription for 10 issues of a magazine costs $24.00 and represents a saving of 20 percent of the cover prices, what is the cover price per issue?

(A) $1.98
(B) $2.40
(C) $2.80
(D) $2.86
(E) $3.00

7. Each edge of a cubical block of wood measures 2 inches. What is the surface area of the block in square inches ?

(A) 4
(B) 8
(C) 12
(D)16
(E)24

---

CREATE YOUR OWN SUNDAE
12 Ice Cream Flavors
10 Kinds of Candies
8 Liquid Toppings
5 Kinds of Nuts
With or Without Whipped Cream

---

8. If a customer makes exactly one selection from each of the five categories shown in the table above, what is the greatest possible number of different ice cream sundaes that a customer can create ?

(A) 9,600
(B) 4,800
(C) 2,400
(D) 800
(E) 400

9. The average (arithmetic mean) of 4 positive integers is 50. If the average of 2 of these integers is 45, what is the greatest possible value that one of the other 2 integers can have ?

(A) 55
(B) 65
(C) 100
(D) 109
(E) 115

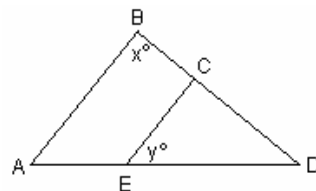10. Machine $A$ working alone can complete a job in $3\frac{1}{2}$ hours. Machine $B$ working alone can do the same job in $4\frac{2}{3}$ hours. How long will it take both machines working together at their respective constant rates to complete the job?

(A) 1 hr 10 min
(B) 2 hr
(C) 4 hr 5 min
(D) 7 hr
(E) 8 hr 10 min

11. What is the smallest positive integer $n$ for which 324 is a factor of $6^n$ ?

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



Note: Figure not drawn to scale.

12. In the figure above, if *AB // CE, CE = DE,* and *y* = 45, then *x* =

(A) 45
(B) 60
(C) 67.5
(D) 112.5
(E) 135

| From\To | A | B | C | D | E | F |
|---------|---|---|---|---|---|---|
| A |   | 3 | 3 | 2 | 7 | 3 |
| B | 3 |   | 3 | 4 | 5 | 5 |
| C | 3 | 3 |   | 1 | 2 | 4 |
| D | 2 | 4 | 1 |   | 5 | 5 |
| E | 7 | 5 | 2 | 5 |   | 6 |
| F | 3 | 5 | 4 | 5 | 6 |   |

13. The table above shows the cost, in dollars, of traveling to and from cities *A, B, C, D, E*, and *F*. *A* sales representative wants to leave from *A*, travel to *C, E*, and *F*, and return to *A*. If the first city that the sales representative travels to must be *E*, what is the minimum possible cost for the entire trip?

(A) $ 13
(B) $14
(C) $16
(D) $18
(E) $20

14. A retailer sold an appliance for 30 percent above cost, which represented a gross profit of $21.00. For what price did the retailer sell the appliance?

(A) $27.30,
(B) $51.00
(C) $63.00
(D) $70.00
(E) $91.00

15. How many integers between 324,700 and 458,600 have tens digit 1 and units digit 3?

(A) 10,300
(B) 10,030
(C) 1,353
(D) 1,352
(E) 1,339

16. A breakfast that consists of 1 ounce of corn puffs and 8 ounces of fruit *X* provides 257 calories. When 8 ounces of fruit *Y* is substituted for the 8 ounces of fruit *X*, the total number of calories is reduced to 185. If fruit *X* provides 1.8 times as many calories as fruit *Y*, how many calories does 8 ounces of fruit *Y* alone provide ?

(A) 11.25
(B) 72
(C) 90
(D) 95
(E) 129.6

**Section 36
25 Minutes    16 Questions**

1. Of the people who responded to a market survey, 120 preferred Brand *X* and the rest preferred Brand *Y*. If the respondents indicated a preference for Brand *X* over Brand *Y* by a ratio of 3 to 1, how many people responded to the survey ?

(A) 80
(B) 160
(C) 240
(D) 360
(E) 480

2. $(x + 3y)^2 =$

(A) $x^2 + 3y^2$
(B) $x^2 + 9y^2$
(C) $x^2 + 3xy + 3y^2$
(D) $x^2 + 3xy + 9y^2$
(E) $x^2 + 6xy + 9y^2$

3. At Company *K*, 15 percent of the employees are secretaries and 60 percent are salespeople. If there are 45 other employees of Company *K*, how many employees does Company *K* have?

(A) 160
(B) 180
(C) 190
(D) 200
(E) 400

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

(A) $-\dfrac{1}{3}$

(B) $-\dfrac{1}{6}$

(C) $-\dfrac{1}{12}$

(D) $\dfrac{1}{12}$

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

5. If *x* and *y* are negative integers, which of the following must be true?

I. $x - y < 0$
II. $\dfrac{x}{y} > y$
III. $x^2 > y$
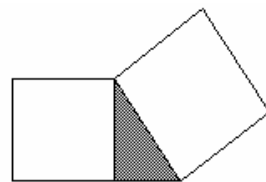
(A) I only
(B) II only
(C) III only
(D) I and III
(E) II and III

6. A certain hotel has 1,400 single rooms and 420 double rooms. Each room is cleaned by one person. If one person can clean a single room every 15 minutes and a double room every 20 minutes, how many cleaning persons are needed to clean all the rooms if each person works for exactly 7 hours?

(A) 65
(B) 70
(C) 80
(D) 90
(E) 265

7. In the figure above, the two square regions have areas 16 and 25, respectively. What is the area of the shaded triangular region?

(A) 6
(B) 8
(C) 9
(D) 12
(E) 15

8. If the consumer price index for a sample of goods and services purchased in Dallas rose from 100 at the end of 1967 to $x$ at the end of 1985, what was the average (arithmetic mean) annual increase in the index over this period ?

(A) $\dfrac{x+100}{18}$

(B) $\dfrac{x}{18}$

(C) $\dfrac{100-x}{18}$

(D) $\dfrac{x-100}{18}$

(E) $\dfrac{100x}{18}$

9. At a certain instant in time, the number of cars, $N$, traveling on a portion of a certain highway can be estimated by the formula $N = \dfrac{20Ld}{600 + s^2}$, where $L$ is the number of lanes in the same direction, $d$ is the length of the portion of the highway, in feet, and $s$ is the average speed of the cars, in miles per hour. Based on the formula, what is the estimated number of cars traveling on a $\dfrac{1}{2}$ mile portion of the highway if the

highway has 2 lanes in the same direction and the average speed of the cars is 40 miles per hour?

(5,280 feet =1 mile)

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

10. In how many different ways can 3 people be assigned to fill 3 different positions so that each person is assigned to exactly one position?

(A) Twelve
(B) Nine
(C) Six
(D) Three
(E) One

11. A point on the edge of a fan blade that is rotating in a plane is 10 centimeters from the center of the fan. What is the distance traveled, in centimeters, by this point in 15 seconds when the fan runs at the rate of 300 revolutions per minute ?

(A) 750
(B) 1,500
(C) 1,875
(D) 3,000
(E) 7,500

12. A 2-year certificate of deposit is purchased for $k$ dollars. If the certificate earns interest at an annual rate of 6 percent compounded quarterly, which of the following represents the value, in dollars, of the certificate at the end of the 2 years ?

(A) $(1.06)^2 k$
(B) $(1.06)^8 k$
(C) $(1.015)^2 k$
(D) $(1.015)^8 k$
(E) $(1.03)^4 k$

13. If the sum of the first $n$ positive integers is $S$, what is the sum of the first $n$ positive <u>even</u> integers, in terms of $S$ ?

(A) $\dfrac{S}{2}$

(B) $S$

(C) $2S$

(D) $2S + 2$

(E) $4S$

14. If $x$ and $y$ are positive numbers and $z = xy^2$, a 50 percent increase in $x$ and a 20 percent decrease in $y$ would result in which of the following changes in $z$?

(A) A decrease of 4%

(B) A decrease of 14%

(C) An increase of 4%

(D) An increase of 20%

(E) An increase of 30%

15. If it is 6:27 in the evening on a certain day, what time in the morning was it exactly 2,880,717 minutes <u>earlier</u>? (Assume standard time in one location.)

(A) 6:22

(B) 6:24

(C) 6:27

(D) 6:30

(E) 6:32

16. If $n$ is an integer, which of the following CANNOT be a factor of $3n + 4$ ?

(A) 4

(B) 5

(C) 6

(D) 7

(E) 8

**Section 37**
**25 Minutes 16 Questions**

1. A bakery opened yesterday with its daily supply of 40 dozen rolls. Half of the rolls were sold by noon, and 80 percent of the remaining rolls were sold between noon and closing time. How many dozen rolls had not been sold when the bakery closed yesterday ?

(A) 1

(B) 2

(C) 3

(D) 4

(E) 5

2. What is the combined area, in square inches, of the front and back of a rectangular sheet of paper measuring $8\dfrac{1}{2}$ inches by 11 inches ?

(A) 38

(B) 44

(C) 88

(D) 176

(E) 187

3. 150 is what percent of 30 ?

(A) 5%

(B) 20%

(C) 50%

(D) 200%

(E) 500%

4. $\dfrac{7}{\frac{1}{5}} + \dfrac{5}{\frac{1}{7}} =$

(A) $\dfrac{35}{74}$

(B) $\dfrac{74}{35}$

(C) 35

(D) 70
(E) 74

5. From January 1, 1991, to January 1, 1993, the number of people enrolled in health maintenance organizations increased by 15 percent. The enrollment on January 1, 1993, was 45 million. How many million people, to the nearest million, were enrolled in health maintenance organizations on January 1, 1991 ?

(A) 38
(B) 39
(C) 40
(D) 41
(E) 42

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

(A) $\sqrt{\dfrac{p}{q}}$

(B) $\dfrac{p}{q^2}$

(C) $\dfrac{p}{2q}$

(D) $\dfrac{q}{p^2}$

(E) $\dfrac{q}{p}$

7. If a 2-digit positive integer has its digits reversed, the resulting integer differs from the original by 27. By how much do the two digits differ?

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

(E) 7

8. It would take one machine 4 hours to complete a large production order and another machine 3 hours to complete the same order. How many hours would it take both machines, working simultaneously at their respective constant rates, to complete the order ?

(A) $\dfrac{7}{12}$

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

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

(D) $3\dfrac{1}{2}$

(E) 7

9. $R$ is the set of positive odd integers less than 50, and $S$ is the set of the squares of the integers in $R$. How many elements does the intersection of $R$ and $S$ contain ?

(A) None
(B) Two
(C) Four
(D) Five
(E) Seven

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

(A) Combined, with a saving of $x - y$ cents
(B) Combined, with a saving of $y - x$ cents
(C) Combined, with a saving of $x$ cents

(D) Separately, with a saving of $x - y$ cents

(E) Separately, with a saving of $y$ cents

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

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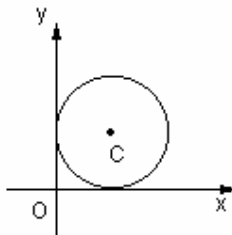


12. The circle with center $C$ shown above is tangent to both axes. If the distance from $O$ to $C$ is equal to $k$, what is the radius of the circle, in terms of $k$ ?

(A) $k$

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

(C) $\dfrac{k}{\sqrt{3}}$

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

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

13. On a recent trip, Cindy drove her car 290 miles, rounded to the nearest 10 miles, and used 12 gallons of gasoline, rounded to the nearest gallon. The actual number of miles per gallon that

Cindy's car got on this trip must have been between

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

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

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

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

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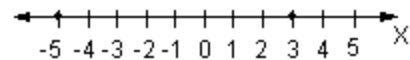


14. Which of the following inequalities is an algebraic expression for the shaded part of the number line above?

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

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

(A) $xy$
(B) $x + y$

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

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

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

16. Xavier, Yvonne, and Zelda each try independently to solve a problem. If their individual probabilities for

success are $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{5}{8}$,
respectively, what is the probability
that Xavier and Yvonne, but not Zelda,
will solve the problem ?

(A) $\frac{11}{8}$

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

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

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

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

## Section 38
## 25 Minutes    16 Questions

1. A retail appliance store priced a video
recorder at 20 percent above the
wholesale cost of $200. If a store
employee applied the 10 percent
employee discount to the retail price to
buy the recorder, how much did the
employee pay for the recorder?

(A) $198
(B) $216
(C) $220
(D) $230
(E) $240

2. The ratio 2 to $\frac{1}{3}$ is equal to the ratio

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

3.                       $y = 248 - 398x$

Which of the following values of $x$ gives
the greatest value of $y$ in the equation
above?

(A) 200
(B) 100
(C) 0.5
(D) 0
(E) -1

4. A factory has 500 workers, 15 percent
of whom are women. If 50 additional
workers are to be hired and all of the
present workers remain, how many of
the additional workers must be women
in order to raise the percent of women
employees to 20 percent?

(A) 3

123

(B) 10
(C) 25
(D) 30
(E) 35

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

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

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

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

7. A certain country had a total annual expenditure of $1.2 \times 10^{12}$ last year. If the population of the country was 240 million last year, what was the per capita expenditure ?

   (A) $500
   (B) $1,000
   (C) $2,000
   (D) $3,000
   (E) $5,000

8. A certain rectangular window is twice as long as it is wide. If its perimeter is 10 feet, then its dimensions in feet are
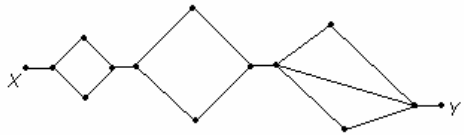
   (A) $\dfrac{3}{2}$ by $\dfrac{7}{2}$

   (B) $\dfrac{5}{3}$ by $\dfrac{10}{3}$
   (C) 2 by 4
   (D) 3 by 6
   (E) $\dfrac{10}{3}$ by $\dfrac{20}{3}$



9. The diagram above shows the various paths along which a mouse can travel from point $X$, where it is released, to point $Y$. where it is rewarded with a food pellet. How many different paths from $X$ to $Y$ can the mouse take if it goes directly from $X$ to $Y$ without retracing any point along a path?

   (A)    6
   (B)    7
   (C)    12
   (D)    14
   (E)    17



10. The rectangular region above contains two circles and a semicircle, each with a radius of 7. If $\dfrac{22}{7}$ is used as an approximation for    , then the area of the shaded region is approximately

   (A) 105
   (B) 210
   (C) 380
   (D) 385
   (E) 405

11. If the operation     is defined by $x$    $y$

$= \sqrt{xy}$ for all positive numbers $x$ and $y$, then $(5 \quad 45) \quad 60 =$

(A) 30
(B) 60
(C) 90
(D) $30\sqrt{15}$
(E) $60\sqrt{15}$

12. A bar over a sequence of digits in a decimal indicates that the sequence repeats indefinitely. What is the value of $(10^4 - 10^2)(0.00\overline{12})$ ?

(A) 0
(B) $0.\overline{12}$
(C) 1.2
(D) 10
(E) 12

13. At a loading dock, each worker on the night crew loaded $\dfrac{3}{4}$ as many boxes as each worker on the day crew. If the night crew has $\dfrac{4}{5}$ as many workers as the day crew, what fraction of all the boxes loaded by the two crews did the day crew load?

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

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

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

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

(E) $\dfrac{5}{8}$

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

(A) $\left(\dfrac{1}{2}\right)^{-18}$

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

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

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

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

15. In a certain game, a large container is filled with red, yellow, green, and blue beads worth, respectively, 7, 5, 3, and 2 points each. A number of beads are then removed from the container. If the product of the point values of the removed beads is 147,000, how many red beads were removed?

(A) 5
(B) 4
(C) 3
(D) 2
(E) 0

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

(A) 10%

(B) $33\dfrac{1}{3}\%$

(C) 40%

(D) 50%

(E) $66\dfrac{2}{3}\%$

**Section 39**
**25 Minutes   16 Questions**

1.  $\sqrt{784} =$

   (A) 28
   (B) 32
   (C) 38
   (D) 56
   (E) 112

2. A total of $x$ tourists were transported by bus to a certain museum. If there were $y$ tourists on each bus, which of the following expresses the number of buses used?

   (A) $xy$

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

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

   (D) $x - y$

   (E) $y^{x}$

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

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

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

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

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

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

6. The dimensions of a rectangular floor are 16 feet by 20 feet. When a rectangular rug is placed on the floor, a strip of floor 3 feet wide is exposed on all sides. What are the dimensions of the rug, in feet?

   (A) 10 by 14
   (B) 10 by 17
   (C) 13 by 14
   (D) 13 by 17
   (E) 14 by 16

7. Harry started a 6-mile hike with a full 10-cup canteen of water and finished the hike in 2 hours with 1 cup of water remaining in the canteen. If the canteen leaked at the rate of 1 cup per hour and Harry drank 3 cups of water during the last mile, how many cups did he drink per mile during the first 5 miles of the hike?

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

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

   (C) 1

   (D) $\dfrac{6}{5}$

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

8. The original retail price of an appliance was 60 percent more than its wholesale cost. If the appliance was actually sold

for 20 percent less than the original
retail price, then it was sold for what
percent more than its wholesale cost?

(A) 20%
(B) 28%
(C) 36%
(D) 40%
(E) 42%

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

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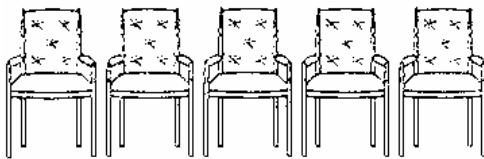


10. The president of a country and 4 other
dignitaries are scheduled to sit in a
row on the 5 chairs represented above.
If the president must sit in the center
chair, how many different seating
arrangements are possible for the 5
people?

(A) 4
(B) 5
(C) 20
(D) 24
(E) 120

11. If the sum of two positive integers is
24 and the difference of their squares
is 48, what is the product of the two
integers?

(A) 108
(B) 119
(C) 128
(D) 135
(E) 143

12. The volume of a sphere with radius *r*
is $\frac{4}{3}\pi r^3$ and the surface area is
$4\pi r^2$. If a spherical balloon has a

volume of $972\pi$ cubic centimeters,
what is the surface area of the balloon
in square centimeters?

(A) 324
(B) 729
(C) 243
(D) 324
(E) 729

13. On a certain scale of intensity, each
increment of 10 in magnitude
represents a tenfold increase in
intensity. On this scale, an intensity
corresponding to a magnitude of 165
is how many times an intensity
corresponding to a magnitude of 125?

(A) 40
(B) 100
(C) 400
(D) 1,000
(E) 10,000

14. If the perimeter of square region S and
the perimeter of circular region C are
equal, then the ratio of the area of S to
the area of C is closest to

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

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

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

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

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

15. On a Saturday night, each of the
rooms at a certain motel was rented
for either $40 or $60. If 10 of the
rooms that were rented for $60 had
instead been rented for $40, then the
total rent the motel charged for that
night would have been reduced by 25
percent. What was the total rent the
motel actually charged for that night ?

(A) $600
(B) $800
(C) $1,000
(D) $1,600
(E) $2,400

16. If *n* and *k* are integers whose product
    is 400, which of the following
    statements must be true?

    (A) $n + k > 0$
    (B) $n \qquad k$
    (C) Either *n* or *k* is a multiple of 10.
    (D) If *n* is even, then *k* is odd.
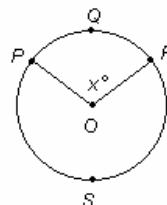    (E) If *n* is odd , then *k* is even.

1. If *x* is negative, which of the following
   must be positive ?

   I.  $x^2$
   II. $(-1)\,x$
   III. $\dfrac{1}{x}$

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

2. The employees of Smith Enterprises
   received wage increases ranging from
   30 cents to $87\dfrac{1}{2}$ cents per hour. What
   was the maximum wage increase for a
   40-hour week?

   (A) $12.00
   (B) $23.00
   (C) $34.80
   (D) $35.00
   (E) $35.20



3. If *O* is the center of the circle above
   and the length of arc *RSP* is twice the
   length of arc *PQR*, then *x* equals

   (A) 60
   (B) 100
   (C) 120
   (D) 150
   (E) 240

4. The sum of 3 hours 45 minutes and 2 hours 55 minutes is approximately what percent of a day ?

   (A) 14%
   (B) 16%
   (C) 24%
   (D) 28%
   (E) 72%

5. A salesman makes a 20 percent commission on the selling price of each set of encyclopedias he sells. If he sells 12 identical sets of encyclopedias and makes $1,800 in commissions, what is the selling price of each set?

   (A) $300
   (B) $600
   (C) $750
   (D) $900
   (E) $1,080

6. If $x < 12$, then it must be true that

   (A) $- x < - 12$
   (B) $- x - 2 < 14$
   (C) $- x + 2 < -10$
   (D) $x + 2 < 10$
   (E) $x - 2 < 11$

7. The 10 households on a certain street have household incomes that range from $34,000 to $150,000 and an average (arithmetic mean) household income of $60,000. If the household with the highest income and the one with the lowest income are excluded, what is the average household income for the remaining 8 households?

   (A) $41,600
   (B) $47,000
   (C) $52,000
   (D) $61,000
   (E) $75,000

8. If $x = y + 4$ and $x = 20 - y$, then $x^2 - y^2 =$

   (A) 16
   (B) 80
   (C) 144
   (D) 256
   (E) 384

9. On level farmland, two runners leave at the same time from the intersection of two country roads. One runner jogs due north at a constant rate of 8 miles per hour while the second runner jogs due east at a constant rate that is 4 miles per hour faster than the first runner's rate. How far apart, to the nearest mile, will they be after $\dfrac{1}{2}$ hour ?

   (A) 6
   (B) 7
   (C) 8
   (D) 12
   (E)     14

10. A square playground has the same area as a rectangular playground that is 30 meters longer but 20 meters narrower. What is the length, in meters, of a side of the square playground?

    (A) $10\sqrt{5}$
    (B) $10\sqrt{6}$
    (C) 25
    (D) 50
    (E) 60

11. The price of a dress was first discounted by a certain percent and later by 25 percent of the discounted price. If these two discounts are equivalent to a single discount of 40 percent of the original price, what was the first discount ?

    (A) 10%

(B) 15%
(C) 20%
(D) 30%
(E) 65%

12. If it is assumed that each of the $n$ production workers in a factory assembles one instrument every $t$ minutes, how many instruments does the factory assemble in 7.5 hours of production?

(A) $\dfrac{450n}{t}$

(B) $\dfrac{450t}{n}$

(C) $450nt$

(D) $\dfrac{7.5tn}{60}$

(E) $\dfrac{7.5n}{60t}$

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

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

14. Which of the following could be the sum of the reciprocals of two different prime numbers?

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

(B) $\dfrac{10}{21}$

(C) $\dfrac{11}{30}$

(D) $\dfrac{23}{50}$

(E) $\dfrac{19}{77}$

15. The rear wheels of a car crossed a certain line 0.5 second after the front wheels crossed the same line. If the centers of the front and rear wheels are 20 feet apart and the car traveled in a straight line at a constant speed, which of the following gives the speed of the car in miles per hour? (5,280 feet = 1 mile)

(A) $\left(\dfrac{20}{5,280}\right)\left(\dfrac{60^2}{0.5}\right)$

(B) $\left(\dfrac{20}{5,280}\right)\left(\dfrac{60}{0.5}\right)$

(C) $\left(\dfrac{20}{5,280}\right)\left(\dfrac{0.5}{60^2}\right)$

(D) $\dfrac{(20)(5,280)}{(60^2)(0.5)}$

(E) $\dfrac{(20)(5,280)}{(60)(0.5)}$

16. Working alone, a small pump takes twice as long as a large pump takes to fill an empty tank. Working together at their respective constant rates, the pumps can fill the tank in 6 hours. How many hours would it take the small pump to fill the tank working alone ?

(A) 8
(B) 9
(C) 12
(D) 15
(E) 18

## Section 41
## 25 Minutes    16 Questions

1. A study based on a random sample revealed that, on average, 2 out of 5 adults have high blood pressure. If these results hold true for the 580,000 adults in City *A*, approximately how many adults in City *A* have high blood pressure ?

(A) 116,000
(B) 145,000
(C) 232,000
(D) 250,000
(E) 290,000

2. The sum $\frac{7}{8} + \frac{1}{9}$ is between

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

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

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

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

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

3. A certain state legislature consists of 124 members, each of whom is either a Democrat or a Republican. If there are 18 more Republicans than Democrats, how many Republicans are in the legislature ?

(A) 44
(B) 53
(C) 71
(D) 80
(E) 106

4. A certain psychologist charges $30 more for the first hour of therapy than for each additional hour. If the total charge to a patient who receives 6 hours of therapy is $300, what is the total charge to a patient who receives only 3 hours of therapy ?

(A) $120
(B) $135
(C) $150
(D) $165
(E) $192

5. If $x + y = 1$ and $x - y = -1$, what is the value of $xy$?

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

6. NOT SCORED

7. If $(x^2 + 6x + 9) + 6(x + 3) + 9 = 0$, then $x =$

(A) -6    (B) -3    (C) 0    (D) 3    (E) 6

8. In 1982 and 1983, Company *B*'s operating expenses were $12.0 million and $14.0 million, respectively, and its revenues were $15.6 million and $18.8 million, respectively. What was the percent increase in Company *B*'s profit (revenues minus operating expenses) from 1982 to 1983 ?

(A) 3%
(B) $16\frac{2}{3}$ %
(C) 25%
(D) $33\frac{1}{3}$ %
(E) 60%

9. If $a$ and $b$ are integers and $b$ ___ 0 which of the following CANNOT equal 0 ?

(A) $ab$
(B) $a - b$
(C) $a + b$
(D) $ab - b^2$
(E) $a^2 + b^2$



AB = BC
AC = BD
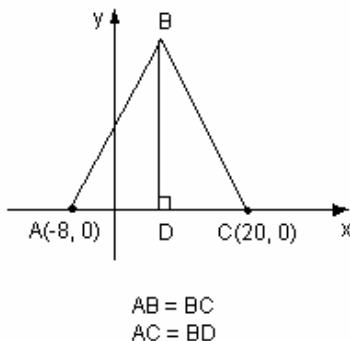
10. What are the coordinates of point $B$ in the $xy$-plane above ?

(A) (6, 12)
(B) (6, 28)
(C) (8, 20)
(D) (12, 20)
(E) (14, 28)

11. Last year 31 percent of Ace Book Company's sales revenue came from the sale of novels. Of the remaining revenue, $\dfrac{1}{3}$ was from the sale of biographies. The company's revenue from the sale of novels was approximately how many times its revenue from the sale of biographies?

(A) 1.3
(B) 1.5
(C) 2.1
(D) 2.5
(E) 3.1

12. Three musical tones have frequencies $x, y,$ and $z$, respectively. If $x, y,$ and $z$

are positive, $\dfrac{x}{y} = \dfrac{y}{z}$, and $2x = z$, what is $y$ in terms of $x$ ?

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

LEAGUE RESULTS

| Team | Number of Games Won |
|------|---------------------|
| A | 4 |
| B | 7 |
| C | 9 |
| D | 2 |
| E | 2 |
| X | |

13. According to the incomplete table above, if each of the 6 teams in the league played each of the other teams exactly twice and there were no ties, how many games did team $X$ win? (Only 2 teams play in a game.)

(A) 4
(B) 5
(C) 6
(D) 8
(E) 10

14. When the integer $k$ is divided by 12, the remainder is 3. Which of the following, when divided by 12, will have a remainder of 6 ?

   I. $2k$
   II. $6k$
   III. $4k + 6$

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

(D) I and II only
(E) I, II, and III

15. A rectangular tabletop consists of a piece of laminated wood bordered by a thin metal strip along its four edges. The surface area of the tabletop is $x$ square feet, and the total length of the strip before it was attached was $x$ feet. If the tabletop is 3 feet wide, what is its approximate length, in feet ?

(A) 12
(B) 10
(C) 9
(D) 8
(E) 6

16. For all real numbers $v$, the operation $v*$ is defined by the equation $v* = v - \dfrac{v}{3}$. If $(v*)* = 8$, then $v =$

(A) 15
(B) 18
(C) 21
(D) 24
(E) 27

**Section 42**
**25 Minutes    16 Questions**

(D) $-x$
(E) $20 - x$

1. Which of the following fractions is equal to 0.16 ?

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

   (B) $\dfrac{4}{25}$

   (C) $\dfrac{5}{8}$

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

   (E) $\dfrac{25}{4}$

2. There is a total of 120 marbles in a box, each of which is red, green, blue, or white. If one marble is drawn from the box at random, the probability that it will be white is $\dfrac{1}{4}$ and the probability that it will be green is $\dfrac{1}{3}$. What is the probability that the marble will be either red or blue ?

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

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

   (C) $\dfrac{2}{7}$

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

   (E) $\dfrac{5}{12}$

3. If $x$ is a positive number less than 10, which of the following is least ?

   (A) $x - 20$
   (B) $x$
   (C) 0

4. A computer programmer needs to print 148 documents. The documents have an average (arithmetic mean) length of 10 pages and the printer takes 15 seconds to print each page. Approximately how many hours will it take to print all the documents if they are printed without interruptions?

   (A) $\dfrac{1}{2}$ hr

   (B) 2 hr

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

   (D) 6 hr

   (E) 24 hr
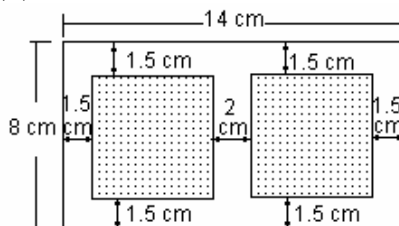


5. The figure above represents a frame; the shaded regions represent the openings in the frame. If all line segments in the figure are either horizontal or vertical and the openings are the same size, what are the dimensions of each opening ?

   (A) 4.5 cm by 5 cm
   (B) 4.5 cm by 6.5 cm
   (C) 5 cm by 5.5 cm
   (D) 5 cm by 9 cm
   (E) 5 cm by 11 cm

6. In the first hour of a two-hour trip, a car traveled $d$ kilometers, and in the second hour of the trip, the car traveled

one-half that distance. What is the average rate at which the car traveled during the trip, in kilometers per hour?

(A) $d$

(B) $\dfrac{1}{3}\,d$

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

(D) $\dfrac{3}{4}d$

(E) $\dfrac{3}{2}d$

7. Jaime earned enough money by selling seashells at 25 cents each to buy several used paperback books at 55 cents each. If he spent all of the money he earned selling seashells to buy the books, what is the least number of seashells he could have sold ?

(A) 5
(B) 11
(C) 17
(D) 25
(E) 30

8. In a certain sequence, the first term is 1, and each successive term is 1 more than the reciprocal of the term that immediately precedes it. What is the fifth term of the sequence?

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

(B) $\dfrac{5}{8}$

(C) $\dfrac{8}{5}$

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

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

9. A wildlife preserve is being planned for 3,000 rhinoceroses. The preserve is to contain a total of 10,000 acres of watering area, plus 100 acres of grazing area for each rhinoceros. If the number of rhinoceroses is expected to increase by 10 percent, how many thousand acres should the preserve have in order to provide for the increased population?

(A) 340
(B) 330
(C) 320
(D) 310
(E) 300

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

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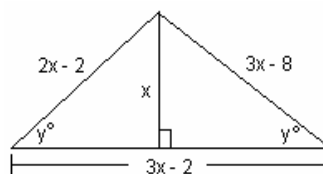


11. The figure above shows the dimensions of an isosceles triangle in terms of $x$. What is the area of the triangle?

(A) 24
(B) 30
(C) 48
(D) 60
(E) 96

12. In a certain animal population, for each of the first 3 months of life, the probability that an animal will die

during that month is $\frac{1}{10}$. For a group of 200 newborn members of the population, approximately how many would be expected to survive the first 3 months of life?

(A) 140
(B) 146
(C) 152
(D) 162
(E) 170
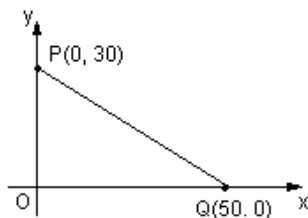


13. In the figure above, how many of the points on line segment *PQ* have coordinates that are both integers?

(A) 5
(B) 8
(C) 10
(D) 11
(E) 20

14. What is the least number of digits (including repetitions) needed to express $10^{100}$ in decimal notation?

(A) 4
(B) 100
(C) 101
(D) 1,000
(E) 1,001

15. A group of 12 people plan to rent a van and agree to share equally the total cost of the rental, which is *E* dollars. If *n* of the people decide not to participate at the last minute, by how many dollars will each remaining person's share of the total cost increase?

(A) $\dfrac{E}{12-n}$

(B) $\dfrac{12-n}{E}$

(C) $\dfrac{E}{12(12-n)}$

(D) $\dfrac{nE}{12(12-n)}$

(E) $\dfrac{(12-n)E}{12n}$

16. The concentration of a certain chemical in a full water tank depends on the depth of the water. At a depth that is *x* feet below the top of the tank, the concentration is $3+\dfrac{4}{\sqrt{5-x}}$ parts per million, where $0 < x < 4$. To the nearest 0.1 foot, at what depth is the concentration equal to 6 parts per million?

(A) 2.4 ft
(B) 2.5 ft
(C) 2.8 ft
(D) 3.0 ft
(E) 3.2 ft

| Section 1: | DBCAE | BBACA | EEDCB | CCADA |
|---|---|---|---|---|
| Section 2: | CADBA | ABEDC | DCCAD | EBEAD |
| Section 3: | ACDBE | CDBDA | ECBEA | DACBB |
| Section 4: | CADAC | BEDAB | EEBCB | DDCBD |

| Section 5:  | CEACD | BECCD | DBDAE | EAEBB |
|-------------|-------|-------|-------|-------|
| Section 6:  | CAEDB | CAEEB | DADBB | CCDCD |
| Section 7:  | EACDB | BDCEB | CADCE | ADBEC |
| Section 8:  | ACBEA | DDEBD | BACEA | CBDCA |
| Section 9:  | CD☐BA | BDEAE | CDAEB | DCEAE |
| Section 10: | ACCDB | CBBDE | ECAEA | DADEC |
| Section 11: | A☐ACD | BEBCD | ACCDC | BEECA |
| Section 12: | CEBDA | CEAAE | DEDBE | BCDBD |
| Section 13: | CEBCD | BBADB | DABEB | DACAE |
| Section 14: | DBBCD | AEBCB | BEBDD | A☐ECD |
| Section 15: | EABCE | DBDAE | CDEEB | AEBBB |
| Section 16: | ADCCD | CDBBE | BEBEA | ABDCA |
| Section 17: | ABCEB | BDAED | ADCDA | DEEDC |
| Section 18: | EBDEE | CDAAB | AEDDC | CBCDE |
| Section 19: | CBEAC | DAEBB | BEACD | CCAED |
| Section 20: | ADEDC | EBBAE | DAACE | BADCD |
| Section 21: | CDBDC | EEDAC | AAEDA | ECBEC |
| Section 22: | DDCDB | ABCAC | DCE E | AECEB |
| Section 23  | CEDAB |  DAEC | BABDE | BCDAC |
| Section 24: | DDEBC | ABDBE | DCAEC | EBDAE |
| Section 25: | CDCDB | AECED | EEBCB | CACDA |
| Section 26: | BCCAE | CAEDD | DEABD | ECCE  |
| Section 27: | ACECB | CACEB | DBEBC | E     |
| Section 28: | BEBED | CDDDD | BEEBA | E     |
| Section 29: | CCDAE | ECECA | ABBAD | D     |
| Section 30: | CDCCB | CEBCC | DBBAE | B     |
| Section 31: | DBECD | ACEAB | CADDB | B     |
| Section 32: | AEECB | BECCE | ACDBB | D     |
| Section 33: | CDDCE | CEEBA | EBDAC | B     |
| Section 34: | AEBBD | CDEDA | DADEA | C     |
| Section 35: | EBCB  | EEADB | CCCEE | C     |
| Section 36: | BEBDE | BADDC | BDCAD | C     |
| Section 37: | DEEDB | EACCA | ABDED | E     |
| Section 38: | BAEEC | DEBCA | AEEBD | B     |
| Section 39: | ABCAC | AABBD | EDECB | E     |
| Section 40: | BDCDC | ECBBE | CAEBA | E     |
| Section 41: | CBCDC |  ADEB | ABCEE | B     |
| Section 42: | BEADA | DBCAB | CBDCD | E     |