#1 –Sec. 4

If Dave owns 44 comic books, and there are a total of 128 books, then Fred and Norman have a total of $128 - 44 = 84$ comics books. This means that the average of Fred and Norman's comic books is $\frac{Fred\ and\ Norman's\ total}{2} = \frac{84}{2} = 42$ books.

Answer A

#2 –Sec. 4

Because the circle has points of tangency on the perpendicular $(90°)$ x-axis and y-axis, and one of the points of tangency is $(6,0)$, this means the circle has a radius of 6 . If the circle has a radius of 6, then the point of tangency, which is exactly half way up the circle, could only have a y-value of 6 . Since the point lies on the y-axis, it must have an x-value of 0 . So point P is at $(0,6)$.

Answer B

#3 –Sec. 4

If n is the number of copies made in one day, and the equation sought after is only being considered over one day, then there is exactly one $\$1.00$ charge and n $\$0.10$ charges. This means that the total charge is $1 \times \$1.00 + n \times \$0.10 = 1.00 + .10n$.

Answer D

#4 –Sec. 4

There are six combinations of letters. Two pairs that have two a 's that have a value of 2 , three pairs that have one a that have a value of 1 , and one pair that has zero a 's that have a value of 0 . This means the total value is $2 \times 2 + 1 \times 3 + 0 \times 1 = 7$.

Answer B

#5 –Sec. 4

Because $ABCD$ is a square, $AD = CD$. This means angle $CAD =$ angle ACD . Angle ADC is a right angle, so angle CAD and angle ACD are $45°$ each. Triangle ACD is a right triangle, and, thus, the sides of the triangle are in a $x:x:x\sqrt{2}$ ratio where x is the leg of the right triangle. This means $x = \frac{4}{\sqrt{2}}$, and since the area of the square is x^2, the area is $\left(\frac{4}{\sqrt{2}}\right)^2 = \frac{16}{2} = 8$.

Answer A

#6 –Sec. 4

If x is inversely proportional to y, then $x = \frac{k}{y}$ where k is a constant. This implies that $\frac{1}{x} = \frac{y}{k}$. From here we can square both sides of the equation to get $\frac{1}{x^2} = \frac{y^2}{k^2}$. Thus, $\frac{1}{x^2}$ is proportional to y^2.

Answer E

#7 –Sec. 4

To approach this problem, we need to know the number of diagonals in a regular octagon from a given point. Once the diagonals are drawn in (there should be five in all), there are six triangular sections left.

Answer C

#8 –Sec. 4

We know that $(x-8)(x-k) = x^2 - 5kx + m$. We can also foil the original equation so that $(x-8)(x-k) = x^2 - (8+k)x + 8k$. Setting the two equations equal, we have . This means $-(8+k) = -5k$ and $8k = m$. Simplifying the first equation shows that $k = 2$, and plugging $k = 2$ into the second equation shows that $m = 16$.

Answer B

#9 –Sec. 4

We set up equal proportions and solve for X, the amount of miles flown in 3 hours. This equation is $\frac{62\ miles}{4\ hours} = \frac{X\ miles}{3\ hours}$. We cross multiply to get $X = 46.5$ or $\frac{93}{2}$ miles.

Answer $\frac{93}{2}$

#10 –Sec. 4

Any point is one radius length from the center of the circle. This means each of the lengths of $PQ, PR, PS,$ and PT is 1, since the radius of the circle is 1. This implies $PQ + PR + PS + PT = 1 + 1 + 1 + 1 = 4$.

Answer 4

#11 –Sec. 4

Since we know that $10^{ab} = 10{,}000$ and $10{,}000 = 10^4$, we can show $ab = 4$. The factors of 4 are $1, 2,$ and 4. This means the possible values of a are $1, 2,$ and 4.

Answer $1, 2,$ or 4

#12 –Sec. 4

If $2x - 3y = c$ passes through the point $(5, -1)$, then $c = 2(5) - 3(-1) = 13$.

Answer 13

#13 –Sec. 4

From the scatter plot, we can see that if the there is a difference of 0 between the number of male and female students in a year, then the respective point would lie on the line $x = y$. Thus, the greatest difference in male and female students would be the point that is farthest away from the line $y = x$. It becomes apparent that the point pertaining to the year 1992 is farthest away from the line $y = x$.

Answer 1992

#14 –Sec. 4

Five times a certain number n is equal to that same number added to five. This means that $5n = n + 5$. This simplifies to $n = \frac{5}{4}$.

Answer $\frac{5}{4}$

#15 –Sec. 4

OB bisects angle AOD, so angle BOD is equal to x. OD bisects angle AOF so angle DOF is equal to 2x because angle AOB added to angle BOC is equal to 2x. This implies

angle BOE = angle BOF – angle EOF = 3x – y = 3(40) – (30) = 90

Answer 90

#16 –Sec. 4

Before the first 12 appears, there are one 1 , two 2 ’s, three 3 ’s, four 4 ’s, …, and eleven 11 ’s. The amount of terms is

$$1 + 2 + 3 + 4 + 5 + \cdots + 11 = (1 + 11) + (2 + 10) + (3 + 9) + (4 + 8) + (5 + 7) + (6) =$$

$$12 + 12 + 12 + 12 + 12 + 6 = 66$$ terms

This means the first 12 is the 67 th term.

Answer 67

#17 –Sec. 9

There is one notch for every 4 inches of paper. This means there are $\frac{80}{4} = 20$ one inch notches. The perimeter of each notch is 2 , in terms of the paper strip. This means the perimeter of the notches is $20 \times 2 = 40$ inches in all. There are $80 - 20 = 60$ inches of “un-notched” paper. This implies the perimeter of the bold edge is $40 + 60 = 100$ inches.

Answer 100

#18 –Sec. 9

If the area of the square is 64 , then one side length is $\sqrt{64} = 8$. Points P and S lie equally away from the origin due to the symmetry of the parabola intersecting the upper corners. This means P and S have x-values of -4 and 4 respectively. Since each side is 8 , point Q has coordinates $(-4,8)$ and point R has coordinates $(4,8)$. When plugged into the equation $y = ax^2$, we generate $a = \left(\frac{8}{4^2}\right) = \left(\frac{8}{(-4)^2}\right) = \frac{1}{2}$.

Answer $\frac{1}{2}$

#1 –Sec. 7

If $20y - 5y = 15 = 15y$, then $y = 1$. Since we know that $y = x - 5$, this shows that x must equal 6 .

Answer A

#2 –Sec. 7

If there are 3 red buttons, 4 blue buttons, and y yellow buttons out of a total of 9 buttons, the there are $y = 9 - 3 - 4 = 2$ yellow buttons. This means there is a $\frac{2}{9}$ probability of getting a yellow button.

Answer C

#3 –Sec. 7

The best idea for a fill in the missing piece problem is to draw in the rest of the shape and examine the missing piece from the sketch you drew. After sketching the rest of the circle, you will see that the answer could only be shape B.

Answer B

#4 –Sec. 7

On a circular graph, a portion that is less that 25% would be less than a quarter of a circle since $\frac{1\ quarter}{4\ quarters} = 25\%$. Since there are 4 flavors that are less than a quarter of a circle, there are 4 flavors that represent less than 25% .

Answer D

#5 –Sec. 7

Since the sums of the angles of a triangle are $180°$, the missing angle is $180° - 58° - 37° = 85°$. Also we know that supplementary angles add up to $180°$. This means that $x + y + z = (180 - 58) + (180 - 37) + (180 - 85) = 540 - 180 = 360$.

Answer E

#6 –Sec. 7

Since we know that $6x - 4 = (6x + 4) - 8$, we can show that $6x - 4 = (7) - 8 = -1$.

Answer B

#7 –Sec. 7

Since we know that the pentagon inscribed within the circle is equilateral, we also know that the lengths arcs formed by the points of the pentagon are equal. This means that the ratio of $\frac{arc\ ABC}{arc\ ABC} = \frac{2\ arc\ lengths\ of\ x}{3\ arc\ lengths\ of\ x} = \frac{2}{3}$.

Answer B

#8 –Sec. 7

We know that $\left(\frac{-1}{2}\right)^2 = \frac{1}{4}$. This means that we ec. 7 are looking for the tick mark that pertains to the $\frac{1}{4}$ mark. Since there are 4 equally spaced sections between 0 and 1, we can see that tick marks will be spaced $\frac{1}{4}$ away from each other. This means that the tick mark D is at the point $\frac{1}{4}$.

Answer D

#9 –Sec. 7

The difference between the sums of s and t and the sums of s and w is $(s+t)-(s+w) = t-w$.

Answer C

#10 –Sec. 7

We can see the difference in population between $t = 4$ and $t = 16$ by using the equation $P(16) - P(4)$. Since $P(16) = 3000 \times 2^{\frac{16}{4}} = 48000$ and $P(4) = 3000 \times 2^{\frac{4}{4}} = 6000$, we know that the population increase was $48000 - 6000 = 42000$.

Answer D

#11 –Sec. 7

If the average of $3, s,$ and t is 5 , then $\frac{3+s+t}{3} = 5$. This simplifies down so that $s + t = 12$.

Answer E

#12 –Sec. 7

To know the amount of elements that are represented by both A and B, we need to count the elements that occur in circle A as well as Circle B. The two sections that represent all of the (A and B) sector have 5 elements and 2 elements respectively. Thus, the number of elements in (A and B) is $2+5=7$.

Answer D

#13 –Sec. 7

There are going to be 1000 students in the total accepted number of students. For half the total number of students to be male, State University must accept $\frac{1000}{2}=500$ male students in all. Since 40% of the 800 already accepted students are male, there are $40\% \times 800 = .4 \times 800 = 320$ male students already accepted. Thus, there needs to be $500-320=180$ more male students accepted out of the last 200 .

Answer D

#14 –Sec. 7

First we need to acknowledge the fact that $t^2 - k^2 = (t+k)(t-k)$. Now we can use this to show $(t+k)(t-k) < 6$. This implies $(t+k) < \frac{6}{(t-k)}$. Since we also know that $4 < (t+k)$, we can now set up the inequality $4 < (t+k) < \frac{6}{(t-k)}$. This also means that $4 < \frac{6}{(t-k)}$. The problem also tells us that t and k are integers where $t > k$. This means that $t-k \geq 1$. For the inequality, $4 < \frac{6}{(t-k)}$, to hold true, $t-k$ must equal 1 . This means that $t+k$ must equal 5 for the inequality to hold true. If $t-k=1$ and $t+k=5$ it becomes apparent that $t=3$ and $k=2$.

Answer C

#15 –Sec. 7

To find the equivalent of $\frac{1}{2}$ of 23% of 618 we multiply the three terms together. This means $\frac{1}{2} \times 23\% \times 618 = \frac{23\%}{2} \times 618 = 23\% \times \frac{618}{2} = 23\% \times 309$.

Answer A

#16 –Sec. 7

If $g(x) = f(3x+1)$, then $g(2) = f(3 \times 2 + 1) = f(7) = -5$.

Answer A

#17 –Sec. 7

If the total diameter equals 6 and is split into 6 parts, then each notch is $\frac{6}{6} = 1$ away from any adjacent notch. From a few observations of the circle, we can see that the area for the total shaded are is

$(Circle\ with\ radius\ 3) - (Circle\ with\ radius\ 2) + (Circle\ with\ radius\ 1) =$
$\pi 3^2 - \pi 2^2 + \pi 1^2 = 6\pi$

Answer C

#18 –Sec. 7

Assuming that no points are collinear, we can assume that a line through any two points is a unique line that only contains those two points out of the original six points in the set. From any particular point in the set of 6 , there are 5 lines connected to the other points in the set. One would think that this would lead to there being $6 \times 5 = 30$ total lines in all, but actually we must divide by 2 because each line is counted twice due to the fact that two points are connected to each line. This means there are $\frac{30}{2} = 15$ lines.

Answer A

#19 –Sec. 7

Let us check each statement. Statement I , $f(a+b) = f(a+a) = f(a) + f(a) = 2f(a)$, is correct. Statement II , $f(a+b) = [f(a)]^2$, is incorrect because the first statement does not agree with this. Statement III , $f(b) + f(b) = f(a) + f(a) = f(a+a) = f(2a)$, is correct.

Answer C

#20 –Sec. 7

Since the total area of the beach is $4000 = xy$, we also know that $x = \frac{4000}{y}$. There are 4 sections of rope length x and one section of rope length y , so the total length of rope is

$4x + y = 4\left(\frac{4000}{y}\right) + y = \frac{16000}{y} + y$.

Answer B

#1 –Sec. 9

If $\frac{3}{4}$ of a certain number x is 18, then $\frac{3}{4}x = 18$. This implies that $\frac{1}{4}x = 6$.

Answer C

#2 –Sec. 9

Let k $* = k(k-1)$. Then 5 $* = 5(5-1) = 5(4) = 20.$

Answer B

#3 –Sec. 9

If the two scatter plots with connecting lines of successive years represent the average pupil dilation for day and for night, the average pupil dilation for day will equal the average pupil dilation for night where the connecting lines intersect. The lines approximately intersect at 45 years of age.

Answer D

#4 –Sec. 9

The total number of hours in five 24 hour days is $5 \times 24 = 120$. Since Toni spends 2 hours in a day total in commuting, he spends $5 \times 2 = 10$ hours per week in total commuting. This means he spends $\frac{10\ hours}{120\ hours} = \frac{1}{12}$ of each week commuting.

Answer A

#5 –Sec. 9

If $\sqrt{8} = x + 1$ and we square both sides of the equation, then $(\sqrt{8})^2 = (x+1)^2 = 8$.

Answer C

#6 –Sec. 9

In a triangle, if we are given the length of the three sides, we know that the largest side is opposite the largest angle, the smallest side across from the smallest angle, and the middle side across from the middle angle. Since $8 < 9 < 10$, we know that $t < r < x$.

Answer A

<u>#7 –Sec. 9</u>

We know that $|6-5y|>20$. This also means that $6-5y>20$ or $6-5y<-20$. Solving the first equation leads to the conclusion that $y<-2.8$. Solving for the second equation leads to the conclusion that $y>5.1$. The only solution that fits the criteria is $y=-8$.

Answer A

<u>#8 –Sec. 9</u>

If the legs of a right triangle are 3 and 4 , then the hypotenuse is 5 . If all the sides were double the length, then the triangle would be a 6-8-10 triangle. The perimeter would be $6+8+10=24$.

Answer D

<u>#9 –Sec. 9</u>

We approach this problems by taking ratios for each of the five pairs. The first ratio is $\frac{4000}{1400}=2.857$. The second ratio is $\frac{3300}{1300}=2.538$. The third ratio is $\frac{3618}{1012}=3.575$. The fourth ratio is $\frac{2268}{1242}=1.826$. The fifth ratio is $\frac{2100}{762}=2.756$. The greatest ratio of the five pairs is the third pair.

Answer C

<u>#10 –Sec. 9</u>

Since line l goes through the points $(0,1)$ and $(8,0)$, the slope for line l is $\frac{(1)-(0)}{(0)-(8)}=\frac{-1}{8}$. The slopes of perpendicular lines are negative reciprocals. This means the slope for line n is $-1/\left(\frac{-1}{8}\right)=8$.

Answer E

<u>#11 –Sec. 9</u>

If $2x+5=3kx+5$, then $2x=3kx$ and $k=\frac{2}{3}$.

Answer E

<u>#12 –Sec. 9</u>

First, we must recognize that not all of the numbers can be negative and not all of the numbers can be positive. Let us let 10 of the integers be negative and 1 be positive. For any combination of negative numbers, there is a positive number that is equal in magnitude to the sum of the negative values. This means the minimum number of positive numbers is 1 .

Answer B

#13 –Sec. 9

If points can only take on values of one, five, and ten, then to receive 17 points there must be at least 2 one points in each combination. The possible combinations are (1 ten, 1 five, 2 ones), (1 ten, 0 fives, 7 ones), (0 tens, 3 fives, 2 ones), (0 tens, 2 fives, 7 ones), (0 tens, 1 five, 12 ones), (0 tens, 0 fives, 17 ones). There are six possible combinations.

Answer E

#14 –Sec. 9

When a transformation is made on a graph with out adding or subtracting a constant, such as transforming $y = f(x)$ to $y = 2f(x)$, the y-value of the transformed function is a certain proportion larger or smaller than the original function. In the case where the proportion is 2 , the y-value for the transformed function would be double that of the original function.

Answer D

#15 –Sec. 9

We can examine the first few terms of the sequence to get a generalization of which terms will be less than 100 . The sequence is $2, -4,$ $8, -16, 32, -64, 128, -256, \ldots$ Since half of the terms in the sequence are negative, we can be assured that at least 25 terms are less than 100 . Out of the positive terms, only $2, 8,$ and 32 are positive and less than 100 . This means there are a total 28 terms less than 100 .

Answer C

#16 –Sec. 9

If a cube has volume 8 cubic inches, then each side is $\sqrt[3]{8} = 2$ inches. If the cube is inscribed in the sphere, then the diagonal of the cube is the diameter of the sphere. To find the diagonal and diameter length, we use the formula $\sqrt{2^2 + 2^2 + 2^2} = 2\sqrt{3}$.

Answer D