#1 –Sec. 2

If $10 + x$ is 5 more than 10, then $10 + x$ = 15. This implies $x = 5$ and $2x = 10$.

Answer C

#2 –Sec. 2

If a certain number n divided by 2 is equal to the same number n divided by 4, then $\frac{n}{2} = \frac{n}{4}$. This implies $n = 0$.

Answer C

#3 –Sec. 2

Since the letters A, I, O, and U all have symmetry across the y-axis, or vertical axis, folding these letters along a vertical line through the center of the letter would create symmetrical right and left halves of each letter. The letter E is not symmetrical across any vertical axis, so E cannot be folded so that its left and right halves coincide.

Answer E

#4 –Sec. 2

When two lines intersect at a point, opposite angles of the intersection are congruent. This implies that angle m is equal to the sum of angles p and x, or rather $m = p + x$. Since $m = 40$ and $p = 25$, this means $40 = 25 + x$ and $x = 15$.

Answer A

#5 –Sec. 2

An easy solution to this problem is to pick simple values of x and check the y value to see which functions do not fit the five pairs of numbers. Let us start with $x = 0$. We can see right away that the only functions that fit for $(x, y) = (0, 3)$ are $y = x^3 + 3$ and $y = 3x + 3$. Let us check another simple x value, say $(x, y) = (1, 6)$. Since $(1)^3 + 3 = 4$ and $3(1) + 3 = 6$, we can see that only possible correct solution to the table of values is $y = 3x + 3$.

Answer B

#6 –Sec. 2

If David spends \$450 per month on food, and food accounts for 25% of his spending, then $\frac{\$450}{\$X} = \frac{25\%}{100\%}$ where $\$X$ is David's total spending. If we cross multiply the equation, we get $\$X = \$1800$. Since 20% of his total spending is on his car and $20\% \times \$X = .2 \times \$X = .2 \times \$1800 = \$360$. David spends $\$360$ per month on his car.

Answer C

#7 –Sec. 2

Since $8^n = 2^k$, and $2^3 = 8$, this implies $(2^3)^n = 2^k$. Since $(2^3)^n = 2^{3n}$, we conclude that $2^{3n} = 2^k$. This means $3n = k$ and $\frac{n}{k} = \frac{1}{3}$.

Answer B

#8 –Sec. 2

If an item worth $\$600$ is 20% off, then the item costs $\$600 \times (100\% - 20\%) = \$600 \times .8 = \$480$. If the same item worth $\$600$ is 10% off, and then 10% off the sale price, then the item costs $\$600 \times (100\% - 10\%) \times (100\% - 10\%) = \$600 \times .9 \times .9 = \$486$. The difference in the two sale prices is $\$486 - \$480 = \$6$.

Answer A

#9 –Sec. 2

If $f(x) = 3x + 4$, then $2f(x) + 4 = 2(3x + 4) + 4 = 6x + 8 + 4 = 6x + 12$.

Answer E

#10 –Sec. 2

The greatest area of a triangle with two given side lengths 7 and 10 and is a right triangle with the legs of length 7 and 10 (remember that every right triangle has two legs and a hypotenuse). Since the Area of a Triangle $=$ Base $\times$ Height $\times \frac{1}{2}$, the Area of the Triangle $= 7 \times 10 \times \frac{1}{2} = 35$.

Answer C

#11–Sec. 2

If a total of $120{,}000$ votes were cast between the two candidates, then X is the number of votes cast for Perez, and $120{,}000 - X$ is the number of votes cast for Garcia. If the ratio of Garcia's votes compared to Perez's votes is 5:3, then $\frac{5}{3} = \frac{120{,}000 - X}{X}$. If we cross multiply the equation, we see that $5X = 360{,}000 - 3X$. This simplifies to $X = 45{,}000$.

Answer C

#12 –Sec. 2

If $5n + 3 \leq 14$, this implies that $n \leq 2.2$. Since the possible outcomes of the random number picking are the integers 1 through 10, and only the outcomes 1 and 2 satisfy the equation $5n + 3 \leq 14$. This means that there is a $\frac{2}{10} = \frac{1}{5}$ probability of a random number satisfying the equation.

Answer C

#13 –Sec. 2

The difference between the numbers t^2 and t is $t^2 - t$. If we factor a t out of the equation, we get $t^2 - t = t \times (t - 1)$.

Answer D

#14 –Sec. 2

If the right circular cylinder has a base with diameter 4, then the radius of the base is 2. This means the center of the circular base is 2 units away from the wall of the cylinder. Since the walls of the cylinder form a right angle with the walls of the cylinder, and we know the distance between the two bases of the cylinder is 5, we can use the right triangle equation $A^2 + B^2 = C^2$ to determine the length of the hypotenuse C. C is the distance from the center of one base to the circumference of the other base. This means $2^2 + 5^2 = C^2 \rightarrow C = \sqrt{2^2 + 5^2} = \sqrt{29}$.

Answer C

#15 –Sec. 2

The equation $p^2 - n^2$ is equivalent $(p - n) \times (p + n)$. Since $p^2 - n^2 = (p - n) \times (p + n) = 12$, this implies $p + n = \frac{12}{p - n}$. If p and n are integers, then $(p + n) + (p - n) = 2p$, and p is an even number. If $p - n = 1$, then $p + n = 12$. This disagrees with $(p + n) + (p - n)$ being an even number and is incorrect. If $p - n = 2$, then $p + n = 6$. This agrees with $(p + n) + (p - n)$ being even, and is correct. If $p - n = 4$, then $p + n = 3$. This disagrees with $(p + n) + (p - n)$ being an even number and is incorrect. Thus, the only correct solution for $(p - n)$ is 2.

Answer B

#16 –Sec. 2

Since the firehouse F is a horizontal distance of 2 and a vertical distance of 1.5 from W, the m-distance from W is $2 + 1.5 = 3.5$.

Answer D

#17 –Sec. 2

Since the firehouse F is a horizontal distance of 2 and a vertical distance of 2 from Z, the m-distance from Z is $2 + 2 = 4$. To travel the m-distance means that you cannot backtrack and must always get closer to your destination. From F to Z, the possibilities are (left, left, down, down), (left, down, left, down), (left, down, down, left), (down, down, left, left), (down, left, down, left), or (down, left, left, down). These are the only 6 possibilities.

Answer A

#18 –Sec. 2

If we continually mark the buildings exactly 3 away from F, we begin to see a pattern emerge. The shape of the coordinates is a square with F at its center. The corners of the square lie directly north, south, east, and west of F.

Answer B

#19 –Sec. 2

The term $(2x)^y$ can be factored out of the equation $(2x)^{3y}$ -$(2x)^y$. Once factored, $(2x)^{3y}$ - $(2x)^y = (2x)^y((2x)^{2y} - 1)$. (Remember: $A^n \times A^t = A^{(n+t)}$)

Answer C

#20 –Sec. 2

Since j, k, n are positive integers where $0 < j < k < n$, (j,k,n) must be of the form (0,1,2), (1,2,3), (2,3,4), and so on. The only product of integer pairs that has a 9 as the unit digit are the pairs of ones digits (3,3), (1,9), and (7,7). Since $jn = 9$, and j and n do not have the same unit digits, the only possible pair is (1,9). This means k must be between j and n . Thus, (j,k,n) must be of the form (9,10,11), (19,20,21), (29,30,31), and so on. The unit digit of k is 0.

Answer A

#1 –Sec. 6

The sequence 4, 11, 18, 25, … is of the form $S(t) = -3 + 7t$ where $t = 1$ is the first term, $t = 2$ is the second term, and so on. The 12th term is $S(12) = -3 + 7(12) = 81$.

Answer B

#2 –Sec. 6

If $(x-2)^2 = 49$, then $\sqrt{(x-2)^2} = \sqrt{49}$. This implies $(x-2) = \pm 7 \rightarrow x = -5$ or $x = 9$.

Answer E

#3 –Sec. 6

If the average of t and y is 15 , then $\frac{t+y}{2} = 15$. This implies $t + y = 30$. If the average w and x is 15 , then by the same process $w + x = 30$. The average of t , w , x , and y is equal to $\frac{t+w+x+y}{4} = \frac{(30)+(30)}{4} = 15.$

Answer B

#4 –Sec. 6

“All of Kay’s brothers can swim.” This statement is equivalent to the two statements, “If a boy is Kay’s brother, then he can swim.” or “If a boy cannot swim, then he is not Kay’s brother.” (Remember: for events P and Q, the statement “P implies Q” is equivalent to “not Q implies not P”)

Answer A

#5 –Sec. 6

Since O is the center of the circle, $AO = BO$. Since we also know that $AB = AO$, it is true that $BO = AO = AB$. If a triangle has equal side lengths, then the triangle is equilateral, and each angle is $60°$. Thus, angle $ABO = 60°$.

Answer D

#6 –Sec. 6

We can see that $\frac{a}{b}(bc+k) = \frac{a}{b}(k+bc) = \frac{abc+ak}{b} = ac + \frac{ak}{b} = a\left(c + \frac{k}{b}\right)$. This includes all answers except $a\left(\frac{c+k}{b}\right) = \frac{a}{b(c+k)} \neq \frac{a}{b}(bc+k)$.

Answer A

#7 –Sec. 6

If $u = 45$ and $w = 50$, then angle $APD = 180 - 45 - 50 = 85$. Angle $APD =$ angle BPC because opposite angles are congruent. If $s = 50$ and $t = 60$, then angle $BPF = 180 - 50 - 60 = 70$. We can now find angle CPE because angle $BPF +$ angle BPC + angle $CPE = 180$. This implies angle $CPE = 180 - 85 - 70 = 25$. Since we know $r = 90$, we can find r by setting $x + r +$ angle $CPE = 180$. This implies $r = 180 - 25 - 90 = 65$.

Answer C

#8–Sec. 6

Since the inequality $g(x) > f(x)$ implies the y value of $g(x)$ is greater that the y value $f(x)$ along some interval. By examining the graphs of the functions we can see that $f(x) = g(x)$ at $x = -3$ and $x = 0$. On the x interval (-3,0), $g(x)$ is greater than $f(x)$.

Answer B

#9 –Sec. 6

The total magazine count would be 4 subscriptions $\times$ 12 issues $+ 2$ subscriptions $\times 4$ issues $+ 1$ subscription $\times 52$ issues $= 4 \times 12 + 2 \times 4 + 1 \times 52 = 108$ magazines.

Answer 108

#10 –Sec. 6

If 3 more than twice a certain number n is equal to 4, then $3 + 2n = 4$. This implies that $n = \frac{1}{2}$.

Answer $\frac{1}{2}$

#11 –Sec. 6

The number of books sold during the third week is equivalent to the total number of books sold through the end of the second week subtracted from the total number of books sold through the end of the third week. Thus, $6800 - 5500 = 1300$ books.

Answer 1300

#12 –Sec. 6

If $\frac{f}{k} = 32$, then $f = 32k$. Since $k = \frac{3}{2}$, $f = 32 \times \frac{3}{2} = 48$. This means $\frac{1}{2}f = 24$.

Answer 24

#13 –Sec. 6

Let us subtract one equation from the other like so: $x + y + 3z = 600$

$$-(x + y + z = 400)$$

$$2z = 200$$

This means $z = 100$. Since we know the value of z , we can deduce the value of $x + y$ using either of the equations. $x + y + z = x + y + (100) = 400 \rightarrow x + y = 300$

Answer 300

#14 –Sec. 6

Since there are 15 cups and 21 plates, there are $15 + 21 = 36$ total items that need to be distributed over 25 trays. Since each tray must have either one or two items, The amount of trays that must hold two items is $36 - 25 = 11$.

Answer 11

#15 –Sec. 6

The line ℓ intersects the points $(-2,0)$ and $(0,-3)$. This means the slope m of the line ℓ is $\frac{(0)-(-3)}{(-2)-(0)} = \frac{-3}{2}$.

Any slope perpendicular to the line ℓ will have slope $\frac{1}{-m}$. This means the slope of the perpendicular line is $\frac{2}{3}$.

Answer $\frac{2}{3}$

#16 –Sec. 6

Since $x < 0$, $x - 3$ will always be less than 0 . Thus, when $x < 0$, $|x - 3| = 3 - x$. This implies that

$6 < 3 - x < 7$ $\rightarrow$

$6-3 \leq 3-x-3 \leq 7-3$ →

$3 \leq -x \leq 4$ →

Answer $3 \leq |x| \leq 4$

#17 –Sec. 6

A prime number is a positive integer that is only divisible by 1 and itself. A number that is divisible by more than just 1 and itself is a composite number. A few composite numbers are 9, 24, and 51. The prime numbers in ascending order are $2,3,5,7,11,13,17,19,23,29,31,37,41,43,47,53,59,\ldots$
The least prime number greater than 50 is 53, and the greatest prime number less than 50 is 47.
The product of $53 \times 47 = 2491$.

Answer 2491

#18 –Sec. 6

If $PT = \frac{2}{5}PS$, then $TS = \frac{3}{5}PS$. A rectangle with side lengths equal to the legs of a right triangle has double the area of the respective right triangle. Thus, the rectangle formed by RS and TS has area $TS \times RS \times \frac{1}{2} \times 2 = TS \times RS = 7 \times 2 = 14$. This mean

$$TS \times RS = \left(\frac{3}{5}PS\right) \times RS \rightarrow PS \times RS = \frac{5}{3} \times (TS \times RS) = \frac{5}{3} \times (14) = \frac{70}{3}.$$

Answer $\frac{70}{3}$

#1 –Sec. 8

If Heather ran 3 miles in 30 minutes, then she runs x amount of miles in 45 minutes at the same rate, where $\frac{3\ miles}{30\ minutes} = \frac{x\ miles}{45\ minutes}$. We cross multiply to get $x = 4.5$ miles.

Answer C

#2 –Sec. 8

We know $(2m)k - 2(mk) - 6$. We divide both sides of the equation by 2 to get $mk = 3$.

Answer A

#3 –Sec. 8

If 3 times a certain number Q is equal to $\frac{3}{2}$, then $3 \times Q = \frac{3}{2}$. This means $Q = \frac{1}{2}$.

Answer B

#4 –Sec. 8

Rectangle $ABCE$ has sides of length 1. This means the equilateral triangle has sides of length 1. Since 2 sides of the triangle are on the circumference and 3 sides of the square are on the circumference, the circumference has a length of 5.

Answer B

#5 –Sec. 8

There are 5 tick marks equally spaced between the numbers -8 and 10. This means there are 6 equal intervals with equal length between the tick marks. The difference between -8 and 10 is $10 - (-8) = 18$. The interval between tick marks is $\frac{18}{6} = 3$. This means $a = -5$, $b = -2$, $c = 1$, $d = 4$, and $e = 7$. The smallest positive tick mark value is $c = 1$.

Answer C

#6 –Sec. 8

If x is the median of a list of number odd numbers, then half of the remaining numbers are greater than x and half the numbers are less than x. This means x must be greater than or equal to 10 and must beless than or equal to 15.

Answer D

#7 –Sec. 8

Spheres with radii 7 and 4 have diameters 14 and 8 respectively. If two spheres are tangent to one another, then the maximum distance of any two points on opposite spheres is the diameter of one sphere added to the diameter of another sphere. So the maximum distance is $14 + 8 = 22$.

Answer E

#8 –Sec. 8

If the average amount of rentals in Store B is 12 for the year 2000, 15 for the year 2001, and 20 for the year 2002, and the approximate number of total movie rentals each year is the average amount of movies per year multiplied by the amount of customers that year, then $12 \times 500 = 6000$ movie rentals during 2000, $15 \times 1000 = 15000$ movie rentals during 2001, and $20 \times 1250 = 25000$ movie rentals during 2002. The total number of movie rentals over the 3 year period is $6000 + 15000 + 25000 = 46000$ movie rentals.

Answer B

#9 –Sec. 8

Since $AB = AD$, and E and D are the respective midpoints of each side, then $AE = AD$ (also $AE = \frac{1}{2}AB$). We can show that triangle ADE is similar to triangle ACB because angle $ADE =$ angle AED = angle $ACB =$ angle ABC . Since $ED = 4$, we know BC must be double ED . Thus, $EC = 8$.

Answer B

#10 –Sec. 8

The first student must keep half the rope and hand half the rope to the second person. The second student must take half the remaining rope (one fourth of the original rope) and hand one fourth of the original rope to the next student. The process continues and each successive student starting from the third will keep one eighth of the remaining rope, one sixteenth of the remaining rope, one thirty second of the remaining rope, and so on…

Answer C

#11 –Sec. 8

When a function $f(x) = 0$, it implies that $y = 0$ or that the $f(x)$ is crossing the x axis. The only graph that crosses the x axis exactly twice for $-5 < x < 5$ is graph D.

Answer D

#12 –Sec. 8

The unknown angle of the quadrilateral is equal to $360 - z$, since there are $360°$ around any given point in 2 dimensional space. We also know that the 4 interior angles of a quadrilateral sum to $360°$. This means $y + x + x + (360 - z) = 360$. Since $x = 20$ and $y = 30$, $(30) + (20) + (20) + (360 - z) = 360$. This simplifies to $z = 70$.

Answer B

#13 –Sec. 8

We know that $\frac{x}{y} = \frac{2}{5} = \frac{4}{10} = \frac{6}{15} = \frac{8}{20} = \cdots$ These are all of the integer solutions to (x,y). There are only two integer values for x where $7 < y < 16$.

Answer B

#14 –Sec. 8

If the radius of the small circle is half of the radius if the bigger circle, then the circumference of the small circle should be half the circumference of the big circle. The circumference of the small circle is 18 . The length of the darkened arc d is can be found by the equal proportions $\frac{360°}{80°} = \frac{18}{d}$. This means $d = 4$.

Answer D

#15 –Sec. 8

Two definite points on the graph are $(0,120)$ and $(10,0)$. The only equation that holds true for both points is $y = 120 - 12x$. Also note that the slope on the graph is negative, so the corresponding slope in the equation must be negative.

Answer E

#16 –Sec. 8

Since $\nabla x = x + \frac{1}{x}$, we know that the only possible integers that would give integer solutions to $\nabla x = x + \frac{1}{x}$ is $x = 1$ or $x = -1$. We know this because $\frac{1}{x}$ is only an integer at these two values. If $x = 1$, then $\nabla x = 2$. If $x = -1$, then $\nabla x = -2$.

Answer D