TEST SET 7 - ANSWER KEYS AND SCORE CONVERSION TABLE

	1	2	3	4	5	6	7	8	9	10	11
Module 1	C	460	C	B	C	C	A	B	2	D	A
	12	13	14	15	16	17	18	19	20	21	22
	B	C	C	B	D	B	C	1	C	C	B
Module 2	1	2	3	4	5	6	7	8	9	10	11
	46	A	D	D	B	A	C	B	B	C	A
	12	13	14	15	16	17	18	19	20	21	22
	B	37.5	B	C	A	D	B	C	A	A	D

MATH SCORE COVERSION TABLE (SCALED SCORES: 200-800)

Raw Score	Scaled Score	Raw Score	Scaled Score	Raw Score	Scaled Score	Raw Score	Scaled Score
44	800	33	680	22	530	11	350
43	800	32	660	21	520	10	320
42	800	31	650	20	500	9	300
41	800	30	630	19	480	8	270
40	790	29	620	18	460	7	260
39	780	28	610	17	450	6	260
38	770	27	600	16	430	5	260
37	750	26	590	15	420	4	250
36	730	25	570	14	410	3	230
35	710	24	560	13	390	2	210
34	690	23	550	12	370	1	200

*RAW SCORE = The total number of problems correct on both module 1 (0-22) and module 2 (0-22).

Answers and explanations for Test 7 (Module 1)

1. C)

   From the diagram shown in the problem, if r represents the radius of the small circles, we get $6r = 36$. So, $r = 6$. the area of the shaded region = the area of big semi-circle – 3 X the area of small semi-circle. So, $\frac{1}{2}\pi(18)^2 - 3 \times \frac{1}{2}\pi(6)^2 = 108\pi$.

2. 460

   To find the total distance traveled from the V-T graph, the area under the curve will represent the total distance. Therefore, you can split the area into 3 regions as follows.
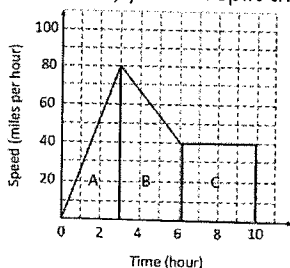
   A: $\frac{1}{2} \cdot 3 \cdot 80 = 120$. B: $\frac{1}{2} \cdot (80 + 40) \cdot 3 = 180$. C: $4 \cdot 40 = 160$.
   Therefore, the total area = $120 + 180 + 160 = 460$.

3. C)

   If a quadratic function displays the maximum or minimum value of the function as a constant, the form of the quadratic function is the vertex form because the function will have the maximum or minimum at its vertex.

4. B)

   The slope of a perpendicular line to $y = -\frac{1}{2}x + 3$ is 2 (the opposite reciprocal). Now plug the point (0, -3) into $y = 2x + b$. And we get $b = -3$.

5. C)

   Set each factor equal to zero and solve for x. then, $x = 0, 3x + 1 = 0, and\ x - 1 = 0$. And you will get $x = 0, -\frac{1}{3}, 1$.

6. C)

   0.95 means the luxury vehicle has 95% of its value the previous year after 2000. Or you can say the value of car decreases by 5% every year after 2000.

7. A)

   $10^x \cdot 1000^{2x} = 100^{4x} \cdot 10$. Let's make base 10 on both sides of the equation. The left-hand side of the equation = $10^x \cdot (10^3)^{2x} = 10^{7x}$. The right-hand side of the equation = $(10^2)^{4x} \cdot 10^1 = 10^{8x+1}$. Compare the exponents. $7x = 8x + 1$. $x = -1$

8. B)

   The probability the first dart will land on C is $\frac{1}{4}$. The probability the second dart will land on even numbers is $\frac{2}{5}$. So, the probability that both events will happen is $\frac{1}{4} \times \frac{2}{5} = \frac{1}{10}$.

9. 2

   Let's change the second equation into the slope intercept form. $ky = 4x - 10$. Divide by k on both sides. $y = \frac{4}{k}x - \frac{10}{k}$. Compare the slope. $2 = \frac{4}{k}$. Therefore, $k = 2$.

10. D)

From the graph of $y = h(x)$, the maximum value of the function h will be located at x=4. So, k=4. Plug that into F(k-2). F(2). From the table, F(2)=12.

11. A)

Cross-multiply. $8x = 3x - x^2$. Reorder the equation. $x^2 + 5x = 0$. $x(x + 5) = 0$. Thus, $x = 0 \ or - 5$.

12. B)

The solution of a system of 3 equations occurs at the intersection of all 3 graphs. So, in the given graphs, there is only one intersection which all 3 graphs intersect.

13. C)

Use the answer choices to find the answer. C) (0, -1) works for both inequalities.

14. C)

Use the answer choices to find the answer. x=3 won't work but x=-1 works.

15. B)

Count all possible outcomes. For example, the sum is 2 only if each spinner lands on 1. And the sum is 6 when (1, 5), (5, 1), (2, 4), (4, 2), (3, 3). Thus, 5 cases. So, we see those results only on B).

16. D)

When you plug $a = 2 \ and \ b = 1$ for example, you will see $|1 - 2| = |2 - 1|$ always true. Therefore, I and III are true for sure. II is true only when $a = 0$.

17. B)

Complete the square for y. $(x - 2)^2 + y^2 + 2y + 1 = 4 + 1$. And it becomes $(x - 2)^2 + (y + 1)^2 = 5$. Therefore, the center of the circle is (2, -1).

18. C)

Unit change from kilometers to miles.

$164.8 \ kilometers \times \frac{0.6214 \ miles}{1 \ kilometer} = 102.407 \ miles \approx 102 \ miles.$

19. 1

Let's simplify the given expression first. $(2 - 3ax)(x + 3) + x^2 - 6 = (1 - 3a)x^2 + (2 - 9a)x$. This last expression should be equivalent to $-kx$. So, $1 - 3a = 0$ and $2 - 9a = -k$. So, you get $a = \frac{1}{3}$ and $k = 1$.

20. C)

The purchasing cost for the robot automation system is $500,000. Since the company saves $70,000 every six months. The company saves $140,000 a year. So, the equation would be $y = 500,000 - 140,000t$, where t is the number of years the company started to use the automation system.

21. C)

The poll could obtain a biased result on the poll because the respondents were most likely volunteered to answer the question with strong opinions. So, the results are unlikely to represent the sentiments of the entire population.

22. B)

Let's multiply $x(x + 1)$ on both numerator and denominator. Then, $\frac{9x+9}{x^3-3x^2-4x} = \frac{9(x+1)}{x(x-4)(x+1)} = \frac{9}{x(x-4)}.$

Answers and explanations for Test 7 (Module 2)

1. 46
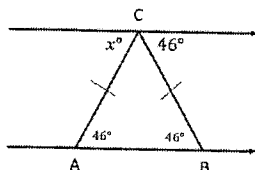
since the alternate interior angles are congruent and two base angles of an isosceles triangle are congruent. So, $x = 46°$

2. A)

By the axis of symmetry, the other x-intercept is -6. So, the line passes through two points (-6, 0) and (0, 4). The slope is $\frac{4-0}{0+6} = \frac{2}{3}$ and the y-intercept is 4. Therefore, the equation of the line is $y = \frac{2}{3}x + 4$.

3. D)

First, Plug the changes into the formula. $F = G\frac{M\cdot(2m)}{\left(\frac{r}{2}\right)^2} = GM\cdot(2m)\cdot\frac{4}{r^2} = 8\cdot G\frac{Mm}{r^2}$.

So, F will be 8 times the previous value.

4. D)

Let's expand the right side of the equation. $(2x+m)(x+1) = 2x^2 + (2+m)x + m$. This must be equal to the left side of the equation. So, compare the coefficients of the polynomials.

You get $3k = 2+m$ and $k-3 = m$. Now, solve the system of equations. Substitute the second equation into the first one. $3k = 2 + k - 3$. And $k = -\frac{1}{2}$, $m = -3\frac{1}{2} = -3.5$.
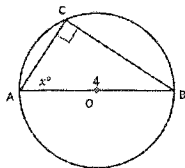
5. B)

Since the parabola opens upwards, $a > 0$. I is true. The y-intercept is zero. So, $c = 0$. III is false. The x-coordinate of the vertex is zero. $-\frac{b}{2a} = 0$. So, $b = 0$. II is true.

6. A)

First, transform the right side to have the same base k. $\left(\frac{1}{k}\right)^{4x} = k^{-4x}$. Now, compare the exponents on both sides of the equation. Then, $x^2 - 4x - 1 = -4x$. Solve for x. $x^2 - 1 = 0$. Therefore, $x = 1$ or -1.

7. C)

Segment AB must be a diameter because it passes through the center of the circle. So, AB=4. And $\angle ACB = 90°$ because it is the inscribed angle of the semi-circle. Using SOH-CAH-TOA, we can write $cosx° = \frac{\overline{AC}}{4}$. Therefore, $\overline{AC} = 4cosx°$.

8. B)

The average rate of change is the slope of the graph in the time interval. So between 2 and 3, there is the greatest (steepest) slope at around t=2.75 hours.

9. B)
The y-intercept of the line of best fit is at around 1.2. so, eliminate C) and D). You can plug the point (60, 6) to see which equation is most reasonable. Only B) $y = 0.08x + 1.2$ works for the coordinates.

10. C)
Use the dimensional analysis. $\frac{k\ dollars}{10\ crates} \times \frac{1\ crate}{m\ boxes} \times \frac{1\ box}{n\ towels} \times \frac{100\ cents}{1\ dollar} = \frac{100k}{10mn}\ or\ \frac{10k}{mn}\frac{cents}{towels}$.

11. A)
Since the center of the circle is (3, k), the equation of the circle should be in the form of $(x - 3)^2 + (y - k)^2 = r^2$.
So, eliminate B) and D). Now plug two points (0, 8) and (0, -2) to find the unknowns.
$9 + (8 - k)^2 = r^2$ and $9 + (-2 - k)^2 = r^2$. Subtract two equations. You get $(8 - k)^2 = (-2 - k)^2$. Then, $k = 3$.
And plug k value into one of the equations above. You get $r^2 = 34$.

12. B)
The system of manufacturing facilities will lose its value 4% every year. So, the equation would be $f(t) = 55,000 \cdot (1 - 0.04)^t = 55,000(0.96)^t$. therefore, $k = 0.96$.

13. 37.5
Use the definition of average speed. *The average speed* $= \frac{The\ total\ distance}{The\ total\ time}$. We can make up a distance as 150 miles (a multiple of 30 and 50). The time will be 5 hours when the speed is 30 mph and 3 hours when the speed is 50 mph. Thus, the average speed $= \frac{150+150}{5+3} = \frac{300}{8} = 37.5$.

14. B)
The ball was thrown from the ground in the beginning and reached the maximum height in 5 seconds after it was thrown. Considering the axis of symmetry, the ball will hit the ground another 5 seconds after it reached the peak height. Therefore, the ball will hit the ground 10 seconds after it was thrown.

15. C)
We can set up an equation $100 = (2.75 - 0.50)x - 150$, where x is the number of lemonade cups sold. Now, to match the answer choices, add 150 and subtract 2.25x on both sides of the equation. Then you get $100 + 150 - 2.25x = 0$.

16. A)
Graph both inequalities in the XY-plane.
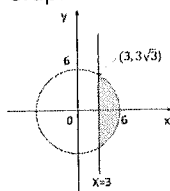
The shaded portion of the graph is the solution area. Thus, the greatest y value of the solution is $3\sqrt{3}$ when you plug x=3 on the first equation.

17. D)
The semi-circle of the graph includes hot-pocket, salad, and sandwich and the central angle for the semi-circle is 180°. You can set up an equation $180 = 30 + 90 + x$, where x is the central angle of sandwich portion. So, $x = 60°$. So the fraction of the sandwich is $\frac{60°}{360°} = \frac{1}{6}$. Therefore, the number of students picked "Sandwich" is $\frac{1}{6} \times 90 = 15$.

18. B)

Choose an easy number you can plug into the equation. For example, N=16. Then you have the quotient q=3 and the remainder r=1. Now plug those numbers to see which one works.

19. C)

EXAM SCORE DISTRIBUTION
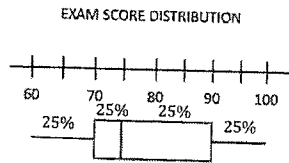
As indicated in the figure, each of the four segments has 25% of the data. Therefore, there is 25% of test scores between 70 and 75.

20. A)

Let's write prime numbers less than 20. $\{2, 3, 5, 7, 11, 13, 17, 19\}$. So, the probability that the number is prime less than 20 is $\frac{8}{40} = \frac{1}{5}$.

21. A)

The answer choices C) and D) are linear functions and B) is an exponential growth function.

22. D)

$\left(\frac{1}{a} - \frac{1}{b}\right)^2 = \frac{1}{a^2} - \frac{2}{ab} + \frac{1}{b^2}$. So, II is false. $\left(\frac{1}{a} + \frac{1}{b}\right)^2 = \frac{1}{a^2} + \frac{2}{ab} + \frac{1}{b^2}$. I is false. And $\left(\frac{1}{a} + \frac{1}{b}\right)^2 - \frac{4}{ab} = \frac{1}{a^2} - \frac{2}{ab} + \frac{1}{b^2}$. So, III is true.