TEST SET 2 - ANSWER KEYS AND SCORE CONVERSION TABLE

Module 1	1	2	3	4	5	6	7	8	9	10	11
	B	A	C	D	D	D	C	A	C	5	A
	12	13	14	15	16	17	18	19	20	21	22
	50	D	D	B	5	C	B	C	B	C	C
Module 2	1	2	3	4	5	6	7	8	9	10	11
	B	B	B	A	B	26	A	3	C	C	C
	12	13	14	15	16	17	18	19	20	21	22
	A	C	7	16	A	D	B	2	305	C	A

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).

CONTINUE

Answers and explanations for Test 2 (Module 1)

1. B)
   For quadratic equation, the discriminant $(b^2 - 4ac)$must be zero to have only one real solution. $10^2 - 4 \cdot m \cdot 1 = 0$. Therefore, $m = 25$.

2. A)
   The range for group A is 10-0=10 and the range for group B is 8-0=8. I is true. If the data has outliers, then the median would represent better than the mean. So, II is a false statement.

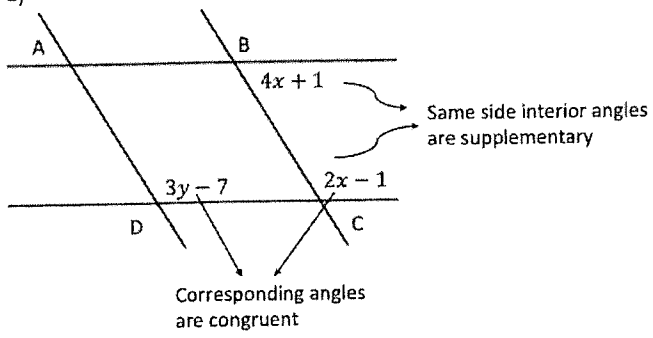
3. C)
   If y decreases by a factor of 4 for every increase by 1 in the value of x, it means the value of y will be $\frac{1}{4}$ of the previous value of y for every increase in the value of x. so, it is an exponential decay.

4. D)
   He earns k dollars annually. Now, he pays r percent for income tax. So, he net income after income tax will be $k - k \times \frac{r}{100}$. Or you can write it as $k - k \times 0.01r$ or $k(1 - 0.01r)$

5. D)
   The data in the given scatter plot spread everywhere without showing any pattern.

6. D)
   $75 - 25 = 50\%$ of total number of people surveyed should be more than 20 years old but at most 50 years old. Therefore, you can set up $0.5 \times x = 120$. So, $x = 240$.

7. C)



   From the diagram, the same side angles are supplementary. We get $4x + 1 + 2x - 1 = 180$. Solve for x. $x = 30$. Next, the corresponding angles are congruent. So we also get $3y - 7 = 2x - 1$. Substitute $x = 30$ and you will get $y = 22$. Therefore, $x + y = 52$.

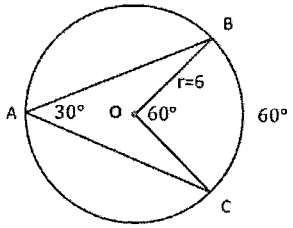
8. A)
   Let's say Julie's income was 100 in year 2020. Then her income in 2021 would be 140 because its 40% higher. The ratio of her income in 2021 to 2020 would be $\frac{140}{100} = \frac{7}{5}$.

9. C)
   To change time unit from hours to minutes, simply multiply it by 60. So, the answer is C).

10. 5

For a quadratic function, it has a maximum value at the vertex. The x-coordinate of the vertex is $-\frac{b}{2a} = -\frac{4}{2\cdot(-2)} = 1$. Therefore, the maximum value of the function is $f(1) = -2 + 4 + 3 = 5$.

11. A)



Since the inscribed angle is $30°$, the measure of arc BC is $60°$ because the measure of an arc is twice the inscribed angle. The measure of angle BOC is also $60°$ because the central angle must be congruent to the measure of the arc as shown in the figure above. Now, the length of arc BC is $2\pi r \cdot \frac{\theta}{360} = 2\pi(6) \cdot \frac{60}{360} = 12\pi \cdot \frac{1}{6} = 2\pi$.

12. 50

We can set up an equation $\frac{a+b+c}{3} = 32$ since the average of three integers is 32. $b + c = 46$ since the sum of two smaller numbers is 46 ($c < b < a$). Now, substitute the second equation into the first equation. We get $\frac{a+46}{3} = 32$. Solve for a. Then you get $a = 50$.

13. D)

When $x = 1, y = f(1) + 1 = 0 + 1 = 1$. ($f(1) = 0$ from the given function). So, the answer is D). You can check the other x values. When x=3, $y = f(3) + 1 = 0 + 1 = 1$.
Its correct on the answer choice D).

14. D)

Use the proportion for this problem. Three bathrooms require to cover 3t square feet. So, $\frac{100}{50} = \frac{x}{3t}$. Now cross-multiply and solve for $x. then, x = 6t$.

15. B)

First, the slope must be negative in the graph. Eliminate C). The slope is -1 and the y-intercept is 10. Therefore, the answer is B).

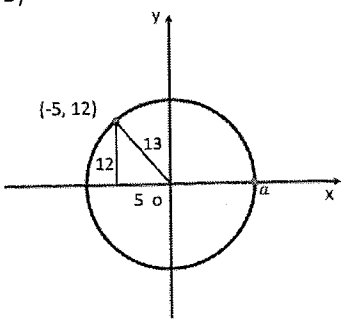
16. 5

$\frac{(m^{-2}n^3)(m^2n^{-2})^2}{(mn^{-1})^{-1}} = \frac{m^{-2}n^3m^4n^{-4}}{m^{-1}n^1} = \frac{m^{-2+4+1}}{n^{1-3+4}} = \frac{m^3}{n^2}$. Now, compare it to $\frac{m^x}{n^y}$. Then, you get $x = 3\ and\ y = 2$. therefore, $x + y = 5$.

17. C)

$\frac{1}{r_t} = \frac{1}{r_a} + \frac{1}{r_b} = \frac{r_a+r_b}{r_a\cdot r_b}$. Now, solve for r_t by cross-multiplying. $r_t = \frac{r_a\cdot r_b}{r_a+r_b}$.

18. B)



In the figure at the left, use Pythagorean triples 5-12-13 after drawing a right triangle. Thus, the radius of the circle O is 13. The coordinates of the point a is $(13, 0)$.

19. C)

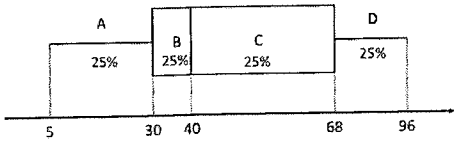
	Male	Female	Total
Less than high school	8	5	13
High school degree	30	26	56
College degree	22	50	72
Bachelor's degree or higher	40	19	59
Total	100	100	200

The complete data in the table is shown. There are 100 female participants. So, the probability would be $\frac{26+50}{100} = \frac{76}{100} = 0.76$.

20. B)

The range of the data is $96 - 5 = 91$. So, the statement III is wrong.

ULTRA POWER COMPANY'S BATTERY LIFE



All regions A, B, C, and D have 25% of data values. So, the statement I is wrong. Therefore, only the statement II is correct.

21. C)

The slope of perpendicular line would be opposite reciprocal of $-\frac{1}{2}$. Thus, the slope is 2. Now, plug (1, 4) into $y = 2x + b$ to find the y-intercept. $4 = 2 + b$. So, $b = 2$. The answer is C).

22. C)

The total cost = one-time basic fee + hourly charge. We can set up equation such as $y = ht + b$, where h is the hourly rate and t is the number of hours worked, and b is the one-time basic fee. So, the y-intercept should be the one-time basic fee. The answer is C).

Answers and explanations for Test 2 (Module 2)

1. B)

   The formula for the compound interest is $A = P\left(1 + \frac{r}{n}\right)^{n \cdot t}$, where P is the deposit, r is the interest rate in decimal, n is the compound number, t is time in year, and A is the balance in the account after t years. This CD account is compounded annually.
   So, $n = 1$. Therefore, 0.05 (5% interest rate) in the equation means the annual interest rate in decimal for the account.

2. B)

   You can choose any two points to compute the slope. $m = \frac{25-22}{2-1} = 3$. And to find the y-intercept, plug the point (1, 22) into $y = 3x + b$. Then, $22 = 3 + b$. $b = 19$. Now, you get $y = 3x + 19$.

3. B)

   The scatter plot shows very strong positive relationship between grade point index and weekly hours of study. It means that more hours of study could result in higher grade point index. However, we cannot guarantee for any results.

4. A)

   Since $\sqrt{75} = 5\sqrt{3}$, we know that the triangle is a right triangle because 3-4-5 ratio. So two legs of the right triangle is $3\sqrt{3}\ and\ 4\sqrt{3}$. Thus, the area of triangle is $\frac{1}{2} \cdot 3\sqrt{3} \cdot 4\sqrt{3} = 18$.

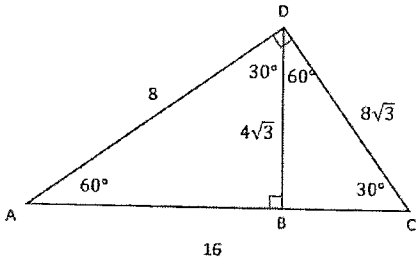
5. B)

   Distribute and simplify the equation. $8 - 2x - 5 = 3 - 3y$. And $3 - 2x = 3 - 3y$. We get finally $2x = 3y\ or\ \frac{x}{y} = \frac{3}{2}\ or\ \frac{y}{x} = \frac{2}{3}$. Therefore, the answer is B).

6. 26

   $2 \cdot (3^3 \cdot x^{36})^{\frac{1}{3}} \cdot ((-2)^5 \cdot x^{10})^{\frac{1}{5}} = 2 \cdot 3 \cdot x^{12} \cdot (-2) \cdot x^2 = -12x^{14}$. And it must be equal to kx^m. Therefore, $k = -12\ and\ m = 14$. The value of $m - k = 14 - (-12) = 26$.

7. A)



   In triangle ACD, $cosA = 0.5 = \frac{1}{2} = \frac{8}{AC}$. So, AC=16 and use pythagorean triple $1 - \sqrt{3} - 2\ (30° - 60° - 90°)$. You get $CD = 8\sqrt{3}$. And we know that triangle BCD is also $30° - 60° - 90°$ triangle. Therefore, $BD = 4\sqrt{3}$ using pythagorean triple.

8. 3

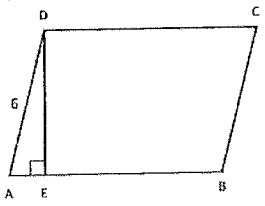
   If the function f is translated down 3 units, the function will be $y = a \cdot b^x - 3$. You can plug (0, 5) an (1,0) into the equation to find the values of $a\ and\ b$. Thus, $5 = a - 3\ and\ 0 = a \cdot b - 3$. You get $a = 8\ and\ b = \frac{3}{8}$. Now, the product of $a\ and\ b = 8 \cdot \frac{3}{8} = 3$.

9. C)
If the data skewed to the left, the mean is located more left than the median. I is true. If an outlier or a value closed to outlier is removed, the mean will change more than the median value. II is true. The range is calculated by subtracting minimum from maximum but we don't know actual value of max or min. thus, III is false.

10. C)
Plug (1, k) into both inequalities. We get $k < 3 \; and \; k > -3$. So, we have -2, -1, 0, 1, 2 as integers. Therefore, 5 integers.

11. C)
Math: 15 min per page. English: 5 min per page. Now, we can set up an equation $15k + 5w$ minutes in total.

12. A)
Calculate inside of the function first. Note that the value of one grid on the y axis goes by 2. So, $f(2) = -2$ from the graph. $f(-f(2)) = f(-(-2)) = f(2) = -2$ from the graph.

13. C)


In the right triangle ADE, $sin\angle A = \frac{DE}{6}$. Therefore, $DE = 6sin\angle A$.

14. 7
We know that $(x + y)^2 = x^2 + 2xy + y^2$. So, $x + y = \sqrt{x^2 + y^2 + 2xy}$. Now, substitute the given values. Then, you get $x + y = \sqrt{26 + 23} = \sqrt{49} = 7$.

15. 16
Since the vertex is at $(0, -8)$, the height of triangle is 8. Next, let's find the x-intercepts. $0 = 2x^2 - 8$. So, $x = \pm 2$. We know that the length of base x_1x_2 is 4. Therefore, the area of triangle will be $\frac{1}{2} \cdot 4 \cdot 8 = 16$.

16. A)
$$Average = \frac{\#\ of\ detp\ A\ workers\ \times average\ of\ dept\ A + \#\ of\ dept\ B\ workers \times average\ of\ dept\ B}{Total\ \#\ of\ workers\ on\ both\ dept\ A\ and\ B}$$
Let's say $x =$ the number of workers in department B.
The average$= \frac{3x \cdot 50{,}000 + x \cdot 54{,}000}{4x} = \frac{204{,}000x}{4x} = 51{,}000.$

17. D)
The net percent change is not zero for store P. let's say its sale was 100. If it was increased by 10%. It became 110. Now, it was decreased by 10% next. Then, it would be 99. So, I statement is false. Since we know percent changes only for stores, we can't compare the actual number of sales of any stores. Therefore, II statement is also false.

CONTINUE

18. B)
$\frac{x+2y+3z}{5} = \frac{x+8x-24x}{5} = \frac{-15x}{5} = -3x$ when you substitute the given relations between x, y, and z. (note: $3z = 3(-2y) = -6y = -6(4x) = -24x$)

19. 2
First, divide the equation by 2. You get $x^2 - 2x + y^2 + 4y = -1$. Now, complete the square on both x and y. $x^2 - 2x + 1 + y^2 + 4y + 4 = -1 + 1 + 4$. Then you get $(x-1)^2 + (y+2)^2 = 4$. Since $r^2 = 4$, the radius is 2.

20. 305
Thomas won by 61 votes on the survey. We can project the result of the survey to the actual votes to find the expected value. So, $\frac{456-395}{456+395} = \frac{61}{851} \times 4255 = 305.$

21. C)
Write an equation for the statement. $f(x) = 0.82x$. so, it is a linear function. And it is increasing because the slope of the line is positive.

22. A)
$\frac{1}{x+1} - \frac{x}{x-2} + \frac{x^2+2}{x^2-x-2} = \frac{x-2}{(x+1)(x-2)} - \frac{x(x+1)}{(x+1)(x-2)} + \frac{x^2+2}{(x+1)(x-2)} = \frac{x-2-x^2-x+x^2+2}{(x+1)(x-2)} = \frac{0}{(x+1)(x-2)} = 0.$