TEST SET 9- ANSWER KEYS AND SCORE CONVERSION TABLE

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

1. D)
I is false because both single men and married men have the same amount of time for media, not the same percent. For recreation, single men is $\frac{5}{27.5} \times 100 = 18.2\%$ and married men is $\frac{3.75}{18.75} \times 100 = 20\%$. Thus, II is true. The number of hours spent on recreation, media, and other leisure for married men is 11.25 hours and the number of hours spent on social life for sing men is 12.5 hours. Therefore, III is true.

2. C)
I is false. The regions for both B-C and C-D are 25% of the entire data. II is true because 25% of data is located at A-B and another 25% of the data is located B-C. so 50% of the data is located at A-C. III is also true. The Interquartile range B-D has 50% of the data.

3. D)
$$\left(\sqrt{4x} + \sqrt{16y}\right)^{\frac{2}{5}} = \left(\left(\sqrt{4x} + \sqrt{16y}\right)^2\right)^{\frac{1}{5}} = \left(4x + 2 \cdot \sqrt{4x} \cdot \sqrt{16y} + 16y\right)^{\frac{1}{5}}$$
$$= \sqrt[5]{4x + 8\sqrt{xy} + 16y}$$

4. D)
To find the y-intercept, set x=0 into the function and solve for y. $y = -2(3)^0 - 6 = -8$.
Therefore, the coordinate of y-intercept is (0, -8).

5. B)
To find the fraction of the length of an arc to the entire circumference of the circle A, you can use the fraction of the central angle of the arc to the entire measure of the circle 2π. Thus, $\frac{\frac{3}{4}\pi}{2\pi} = \frac{3}{8}$.

6. A)
There will be no more than 50 people in the party. So, $a + c \leq 50$, where a is the number of adults and c is the number of children. Since food catering charges \$20 for a child and \$25 for an adult, $25a + 20c \leq 1200$ considering her budget limit.

7. B)
$(x + y)^2 = x^2 + 2xy + y^2$. So, plug the given values to the equation. $17^2 = x^2 + y^2 + 2(24)$. Therefore, $x^2 + y^2 = 241$.

8. A)
Set up an equation. $\frac{5\times 12 - x}{4} = 13.5$. Now, solve for x. then, $x = 6$.

9. C)
The ratio could be found using the percent. The ratio $= \frac{100-68}{68} = \frac{32}{68} = \frac{8}{17}$.

10. C)
The real measures of angles would be 4x, 5x, 6x. so, you can set up an equation $4x + 5x + 6x = 180$. so, $x = 12$. Thus, the largest angle is $6 \times 12 = 72°$.

11. C)
Use the answer choices to find the answer. C) (-1, -5) works for both inequalities.
$-5 < 2 \text{ and } -5 < -\frac{7}{4}$.

12. B)
Let's say the length of the longer piece as x. then the length of the shorter piece is $l-x$.
Now, you can set up $x = 2+2(l-x)$. Solve for x. $x = 2+2l-2x$. $3x = 2+2l$. Therefore, $x = \frac{2+2l}{3}$.

13. D)
The mean $= \frac{90+50+40+20+30+80}{6} = 51.67$. The median is the average of 3rd and 4th numbers. The median $= \frac{40+50}{2} = 45$. Therefore, $51.67 - 45 = 6.67$.

14. A)
$(2-x)^2 - (2-x) + 11 = 0$. Simplify it first and put it as the standard form. $x^2 - 3x + 13 = 0$. To find the number of solutions for a quadratic equation, use the discriminant $D = b^2 - 4ac = (-3)^2 - 4(13) = -43 < 0$. Therefore, no real solution.

15. A)
Divide the equation be -1 first. $x^2 - 6x + y^2 + 4y = -k$. To complete the square, add $\left(\frac{b}{2}\right)^2$ on both sides of the equation for both x and y. $x^2 - 6x + 9 + y^2 + 4y + 4 = -k + 9 + 4$. And you get $(x-3)^2 + (y+2)^2 = 13 - k$. And we know that $r^2 = 13 - k$. We know that the radius is 7 from the given information. So, $49 = 13 - k$. $k = -36$.

16. C)
Plug all given values into the equation. $Q = 2.0g \times \frac{4.2\,J}{g°C} \times (21-18)°C = 25.2\,J$

17. B)
$\left(-x-\frac{1}{3}\right)(mx+1) - 3x^2 + 1 = -mx^2 - x - \frac{1}{3}mx - \frac{1}{3} - 3x^2 + 1 = -(3+m)x^2 - \left(1+\frac{1}{3}m\right)x + \frac{2}{3}$.
The last expression should be equal to k, where k is a constant. We get $m = -3$. And $k = \frac{2}{3}$. Therefore, $k - m = \frac{2}{3} + 3 = \frac{11}{3}$.

18. D)
Notice that the area of the concaved semi-circle (white portion) is the same as the area of the convex semi-circle (grey portion). So, the area of the shaded area of the figure is equivalent to the area of rectangle. Therefore, $12 \times 6 = 72\ in^2$.

19. A)
$\left(\frac{1}{x}+\frac{1}{y}\right)^2 = \left(\frac{x+y}{xy}\right)^2 = \frac{(x+y)^2}{(xy)^2} = \frac{x^2+y^2+2xy}{(xy)^2} = \frac{70+2(6)}{6^2} = \frac{82}{36} = \frac{41}{18}$.

20. C)
From $m > n$, $\frac{a+b}{2} > \frac{a+c}{2}$. Subtract $\frac{a}{2}$ on both sides and multiply 2. Then, $b > c$.
From $n > k$, $\frac{a+c}{2} > \frac{b+c}{2}$. Subtract $\frac{c}{2}$ on both sides and multiply 2. Then, $a > b$. Therefore, $a > b > c$.

21. 1 or 5
We can set up equation $-\frac{c^2}{3} + 2c - l = -\frac{5^2}{3} + 2 \cdot 5 - l$. You get $-\frac{c^2}{3} + 2c = \frac{5}{3}$. And $c^2 - 6c + 5 = 0$. $(c-5)(c-1) = 0$. Therefore, $c = 5\ or\ 1$.

22. A)
Since $cos\angle B = 0.5 = \frac{1}{2}$, Now, using SOH-CAH-TOA, $cos\angle B = \frac{1}{2} = \frac{x}{2x}$. We use Pythagorean theorem to find the value of x. so, $x^2 + 24^2 = (2x)^2$. $x = 8\sqrt{3}$. So, we get the lengths of all sides. $AB = 8\sqrt{3}\ and\ BC = 16\sqrt{3}$. Therefore, $tan\angle C = \frac{8\sqrt{3}}{24} = \frac{\sqrt{3}}{3}$.

Answers and explanations for Test 9 (Module 2)

1. A)
Since $x - a$ is a factor of the polynomial, use the factor theorem. $f(a) = 3a^3 + 15a^2 - 42a = 0$. Now, factor the equation. $3a(a + 7)(a - 2) = 0$. Thus, $a = 0, -7, or\ 2$.

2. C)
The mean $= \frac{10\times20+12\times18+15\times10+20\times7+22\times5}{60} = 13.6$. The median is the average of 30th and 31st values. The median = 12. The difference = $13.6 - 12 = 1.6$.

3. A)
Let's plug the changes into the given formula. $KE = \frac{1}{2}(4I)\left(\frac{w}{2}\right)^2 = \frac{1}{2}Iw^2$. Therefore, it became the original formula. No effect on KE.

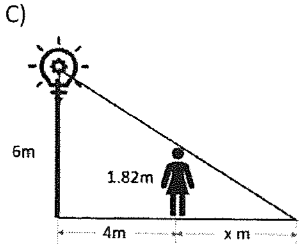
4. C)
Based on the fractions of the survey, the total number of visitors must be the common multiple of the denominators. LCM of 13, 5, and 7 is 455. So, any multiples of 455 could be the number of visitors to the shopping mall on that day.

5. D)
Let's say x = the number of people at her graduation party. You can set up equations. $\frac{x}{8} + \frac{x}{4} + \frac{x}{12} = 77$. Note: $\frac{x}{8}$ stands for the number of $2l$ bottle of soda, $\frac{x}{4}$ stands for the number of large bag of chips, and $\frac{x}{12}$ stands for boxes of assorted bread. Multiply 24 on both sides of equation, you get $3x + 6x + 2x = 1848$. $x = 168$.

6. D)
$\left(\frac{1}{a}\right)^{x^2+2x-1} = a^{-x^2-2x+1}$. And this is equal to the right side. So, $a^{-x^2-2x+1} = a^{-2x}$. Now, compare the exponents. $-x^2 - 2x + 1 = -2x$. It becomes $x^2 = 1$. $x = \pm1$.

7. B)
First, calculate the percent for social life and free time. $100 - 23 - 30 - 25 - 10 = 12\%$. So, 12% of 24 hours will be $0.12 \times 24 = 2.88\ hours$.

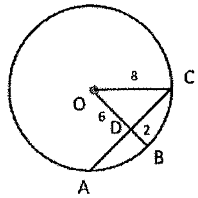
8. C)



Her height is 182 cm. so, 1.82m by dividing it by 100. Use the proportion to find the length of the shadow. $\frac{6}{x+4} = \frac{1.82}{x}$. cross-multiply and solve for x. $6x = 1.82x + 7.28$. therefore, $x = 1.74$.

9. B)
First, the maximum value of $f(x)$ is 8. The graph of $h(x)$ is shifted down 3 units vertically from the graph of $f(x)$. Therefore, the maximum value of $h(x)$ is 8 – 3 = 5.

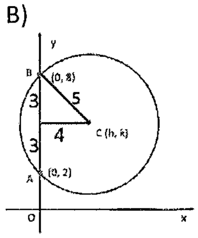
10. B)



In the figure, use Pythagorean theorem to find the length of CD. $6^2 + CD^2 = 8^2$. So, CD = $2\sqrt{7}$. Therefore, the length of AC is $4\sqrt{7}$.

11. D)
Look for the temperature at t=0 on the scatter plot. Then it is 90°C.

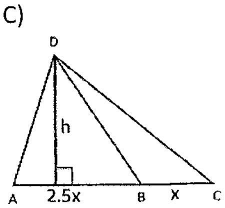
12. B)



The length of AB is 6 from the coordinates. By the axis of symmetry of $y = 5$, we can draw the right triangle as shown. Using 3-4-5 Pythagorean triple, we can find the value of h. h = 4.

13. 10
The probability that the athlete runs for 1,000m is $\frac{1}{5}$. So, $\frac{x}{18+x+7+15} = \frac{1}{5}$. Cross-multiply $5x = x + 40$. Therefore, $x = 10$.

14. C)



The triangle ABD is 30. $\frac{1}{2}(2.5x)(h) = 30$. So, $xh = 24$. Now, the area of triangle BCD = $\frac{1}{2}(x)(h) = \frac{1}{2} \times 24 = 12$.

15. 4
Plug x = 3 into the second equation. $|y - 2| = 3$. $y = 5$ or -1. The sum of y values of the solutions = $-1 + 5 = 4$.

16. C)
We can predict the average increase in women's height in that specific country is 0.133 cm every year. We cannot project this result to the world. And the slope means the average increase, in cm, in women's height every year, not every 10 years.

17. A)
$f(x-a) = \frac{3}{4}(x-a)^2 + 1 = \frac{3}{4}(x^2 - 2ax + a^2) + 1 = \frac{3}{4}x^2 - \frac{3}{2}ax + \frac{3}{4}a^2 + 1$. And the last expression should be equal to $\frac{3}{4}x^2 + 3x + 4$. Compare it and then, $3 = -\frac{3}{2}a$. Therefore, $a = -2$. And we can confirm that the constant term $\frac{3}{4}(-2)^2 + 1 = 4.\surd$

18. C)

Unit conversion. $4.5\ miles \times \frac{1\ km}{0.6214\ miles} = 7.24km$.

19. C)

$\frac{1}{3x-4} + \frac{6x-8}{3x-4} = \frac{6x-7}{3x-4}$.

20. B)

$(4x^2 - ax + 1)(bx - 3) = 4bx^3 - (ab + 12)x^2 + (b + 3a)x - 3$. The last expression should be equal to $28x^3 - 19x^2 + 10x - 3$. So, $4b = 28$ and $b + 3a = 10$. So, $b = 7\ and\ a = 1$. therefore, $a + b = 8$.

21. B)

Even though the highest went up 2 points more, it won't affect the median score (the score in the middle).

22. D)

When you draw a horizontal line $y = a$ on the same graph, you will see $either\ y = 6\ or\ y = 2$ will have three real solutions (three intersections).