TEST SET 14- ANSWER KEYS AND SCORE CONVERSION TABLE

Module 1	1	2	3	4	5	6	7	8	9	10	11
	C	B	B	C	D	B	C	C	A	4	6
	12	13	14	15	16	17	18	19	20	21	22
	C	D	D	C	6	D	8	12	C	75	B
Module 2	1	2	3	4	5	6	7	8	9	10	11
	D	A	B	D	B	A	B	B	B	B	C
	12	13	14	15	16	17	18	19	20	21	22
	B	10	1.05	8	C	D	C	75	36	B	B

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 14 (Module 1)

1. C)
   Use working rate formula. (Assume that all cows have the same rate)
   $working\ rate = \frac{Amount\ of\ work}{numnber\ of\ workforce \times time}$. Now, plug in all information given.
   $\frac{b\ gallons}{a\ cows \times k\ days} = \frac{n\ gallons}{m\ cows \times x\ days}$. Ignore the units in the equation and cross multiply. Then, you get $bmx = ank$, lastly, isolate the variable x. $x = \frac{ank}{bm}$.

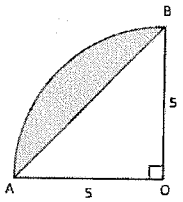
2. B)
   The number of children is x and the number of adults is y. so we can get the system of equations as follows. $x + y = 450$ and $7x + 12y = 4{,}150$.

3. B)
   If a triangle is dilated by a factor of 2, all the interior angles must be the same. So, the answer is B). All the sides will be dilated (expanded) by a factor of 2, even the perimeter.

4. C)
   Since three points $(0, -4), (2, 0), and\ (6, 0)$ are on the function, you can write them as $f(0) = -4$ $or - f(4) = 4, f(2) = 0, and\ f(6) = 0$. Therefore, only I and II true.

5. D)
   Let's complete the square of $f(x)$. $f(x) = (x^2 - 2x + 1) + 2 = (x - 1)^2 + 2$. Now, we know $f(x)$ is formed by translating 1 unit right and 2 units up from $g(x) = x^2$.

6. B)
   Since the area of circle is $25\pi = \pi r^2$. r = 5. The area of shaded region can be found by subtracting the area of triangle ABO from the area of a quarter circle.



   Area of the shaded region$= \frac{1}{4}\pi \cdot 5^2 - \frac{1}{2}5 \cdot 5 = \frac{25\pi - 50}{4} = \frac{25(\pi - 2)}{4}$.

7. C)
   The slope of f(x) = $\frac{6-9}{-1-\frac{1}{2}} = 2$. And you can set up $f(x) = 2x + b$. Now, plug $(-1, 6)$ into the f(x). then, $6 = 2(-1) + b$. $b = 8$. we get $f(x) = 2x + 8$. Plug 0 into f(x) and solve for x. $0 = 2x + 8$. Therefore, $x = -4$.

8. C)
   Let's multiply the LCM, $(x + 2)(x - 2)$on both sides of the equation. Then you get $5x^2 - 16 - 8(x - 2) = x + 2$. Simplify the equation and factor. $5x^2 - 9x - 2 = (5x + 1)(x - 2) = 0$. Solve for x. you get $x = 2\ or - \frac{1}{5}$. But 2 is not in the domain. So, the answer is only $-\frac{1}{5}$.

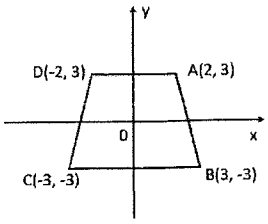
9. A)
   Exponent's rules: 1. $(m^x)^y = m^{xy}$, 2. $m^x \cdot m^y = m^{x+y}$, 3. $\frac{m^x}{m^y} = m^{x-y}$, 4. $m^{-x} = \frac{1}{m^x}$
   Now, applies all the exponent's rule above. $\frac{m^{\frac{2}{3}} \cdot m^{-\frac{1}{2}}}{\left(m^{\frac{3}{2}}\right)^{-2}} = \frac{m^{\frac{2}{3}-\frac{1}{2}}}{m^{-3}} = \frac{m^{\frac{1}{6}}}{m^{-3}} = m^{\frac{1}{6}+3} = m^{\frac{19}{6}}$

10. 4

His budget is \$300. First, subtract \$25 (one-time cleaning & set fee) from it. Then you get \$275. now, divide 275 by 65 (hourly cost) to get how many hours of ride. $275 \div 65 \approx 4.23$. so, the maximum whole number of hours is 4.

11. 6

Find the coordinates of C and D using the y-axis symmetry.



now, find the slope of the segment CD: $\frac{3+3}{-2+3} = 6.$

12. C)

The greatest rate of change means the greatest slope of the segment. So, the slope between 2013-2014 is $\frac{80-50}{1} =$ 30 is the greatest compared to other years.

13. D)

Let x be the weight on Venus. The weight of the object on mars is $0.4 \times 180 = 72$. The weight of the object on Mars is $\frac{1}{9}$ the weight on Venus. So, $72 = \frac{1}{9}x$. therefore, $x = 648$.

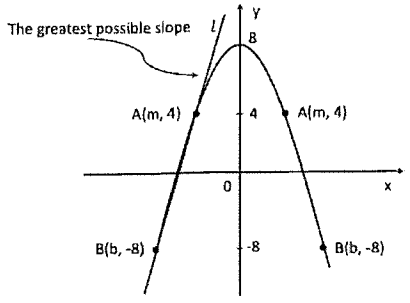
14. D)

The school increases x classes every six months. In other words, it increases 2x classes every year. Thus, it is a linear function. In the beginning, the school has p classes and t is the number of years from now. So, we can set up equation as $y = 2x \cdot t + p$.

15. C)

One professor is chosen at random out of 800 professors and the number of professors at teaching in technical major is 200. So the probability is $\frac{200}{800} = \frac{1}{4} = 0.25$

16. 6



In the graphs at the left, we can find the x-coordinates of intersections between the parabola and the line l by plugging points A and B, respectively. $4 = -m^2 + 8$. Solve for m. $m = \pm 2$. and also $-8 = -b^2 + 8$. Solve for b, $b = \pm 4$. Now, the greatest slope the line l can have is when the line passes through two points $(-2, 4)$ *and* $(-4, -8)$. Therefore, the greatest slope is $\frac{4-(-8)}{-2-(-4)} = 6.$

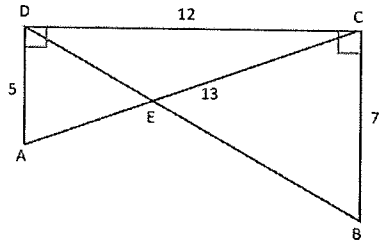
17. D)

The strong words, "MUST", "IS", "SHOULD", or "ALWAYS" in statistics problems are most likely wrong expressions. There is no guarantee that another survey will get the same result nor you can say "must" for your projection to the entire population.

18. 8

Let's plug x=4 into the equation given. Then, $f(5) = \frac{f(2)\cdot f(3)}{f(4)}$. But we don't know $f(4)$ value yet. So, use the equation once more. Plug in x=3 into the equation. $f(4) = \frac{f(1)\cdot f(2)}{f(3)}$. Now, plug the values given. $f(4) = \frac{(2)\cdot(3)}{(4)} = \frac{3}{2}$. Plug $f(4)$ value into the first equation we found above. $f(5) = \frac{(3)\cdot(4)}{\left(\frac{3}{2}\right)} = 8$.

19. 12



in the figure at the left, we know CD=12 by Pythagorean triples. We know that the difference in areas between ΔBCE and ΔBCE is the same as the difference in areas between ΔBCD and ΔACD since the area of triangle CDE is common area on both triangles. Therefore, $\frac{1}{2}\cdot 12\cdot 7 - \frac{1}{2}\cdot 12\cdot 5 = 42 - 30 = 12$.

20. C)

You can plug your choice of x and y values into the given equation. So, let's say x=-1 and y=-2 since both values must be negative integers. Then, you get $\frac{-1}{(-1)+(-2)} = \frac{1}{3}$ which belongs to the answer choice C).

21. 75

The formula of volume of cone is $\frac{1}{3}\pi r^2 h$, where r is the radius of circular base and h is the height of the cone. We can substitute 2r instead of r in the formula because the radius is increased by 100%. Now, you can set up equation, $\frac{1}{3}\pi(2r)^2(kh) = \frac{1}{3}\pi r^2 h$. Cancel out $\frac{1}{3}\pi r^2 h$ on both sides. Then, you get $4k = 1$. Therefore, $k = \frac{1}{4}$ or 0.25. it means that the new height is only 25% of the original. Thus, you will need to decrease 75% of the original height in order to keep the same volume.

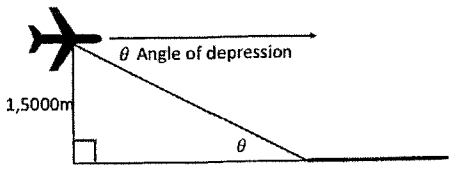
22. B)

The pendulum is released from A and going to lower position to B and going up to C and come back down to B and so on... This motion must be smooth curve (sinusoidal function). Only B) matches the description in the problem.

Answers and explanations for Test 14 (Module 2)

1. D)
   If x is the original price of the property, 10% off the discounted price (30% off) will be $(1-0.1)(1-0.3)x$. so, the equation is $(1-0.1)(1-0.3)x = 250{,}000$. And solve for x. then, $x = 396{,}825$. thus, the best approximation is D)

2. A)
   If the length of a side of a cube is x, then the perimeter of one face is 4x. so we can set up $4x = \frac{a}{4}$, so $x = \frac{a}{16}$. Now, the volume of a cube is $x^3 = \left(\frac{a}{16}\right)^3 = \frac{a^3}{4096}$.

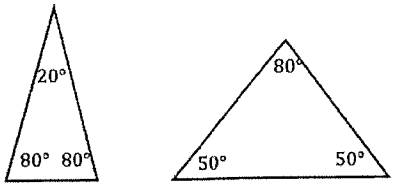
3. B)
   

   From the diagram, $tan\theta = \frac{1{,}5000}{x}$. So, solve for x. then, $x = \frac{1{,}5000}{tan\theta}$

4. D)
   The given expression $\frac{x^2+10x+24}{x^3-x^2-20x} = \frac{(x+6)(x+4)}{x(x-5)(x+4)}$. Reduce the same factor. Then, it will be $\frac{x+6}{x(x-5)}$

5. B)
   Let x is the lowest individual score. The new mean will be $\frac{9\times150-x}{8} = 160$. (Note: 9 x 150 stands for the sum of scores for 9 players) And solve for x. then, $x = 70$.

6. A)
   When you plug in t=3, N=4 rings, plug in t=6, N=6 rings, and plug in t=9, you get N=8 rings, and so on. You notice that the tree will gain 2 rings every 3 years of its age.

7. B)
   

   From the diagram left, those two possible cases give $20°$ and $50°$ for other angles possible.

8. B)
   The median age out of 35 students will be 18th student when the ages were put in order. So, the 18th one is located in the class Blue. So, the possible range for ages in the class Blue will be $10 \leq age < 15$. Therefore, only age 10 belongs to the age range.

9. B)
   It's an obvious bias for the place when the researcher interviewed people in the local pub who were watching sports. Its highly likely they will choose to watch sports in the pub with friends.

10. B)

From the general form of absolute equation, $|x-a|=b$. a is the center and b is the distance from the center. Thus, the problem says two points are both 4 units from the center -2. So, plug in $a=-2$ and $b=4$. Then, $|x+2|=4$. You can also check when you solve for x in this absolute equation. $x+2=4$ or $x+2=-4$. Then you get $x=2\ and\ -6$ which are 4 units away from the number -2.

11. C)

Check how many time the horizontal line $y=3$ will across the trajectory of the ball. Then you see it across three times.

12. B)

The function f is a linear. So, find the slope first. $m=\frac{0+1}{4-2}=\frac{1}{2}$. So, $f(x)=\frac{1}{2}x+b$. Now, you plug in $(4,0)$ into the equation to find the value of b. $b=-2$. You get $f(x)=\frac{1}{2}x-2$. Therefore, $f(20)=\frac{1}{2}(20)-2=8$.

13. 10

20%: HOA administrators. 60%: residents. 20%: construction company members (5 people).
Let x is the total number of people in a meeting. then, $0.2x=5. x=25$. The percent difference between residents and HOA administrators will be 60%-20%= 40% of the total number of people. Therefore, $0.4\times 25=10$ more residents were invited than HOA administrators in the meeting.

14. 1.05

The mean mass of coins collected by Marcus $=\frac{0.90+0.98+0.99+0.90+0.91+1.02}{6}=0.95$. so, the mean mass of coins collected by Francis $=\frac{0.75+0.90+0.80+0.78+0.82+x}{6}=0.95-0.1$ since it is 0.1g less than the mean mass for Marcus. Now, solve for x. then, you get 1.05.

15. 8

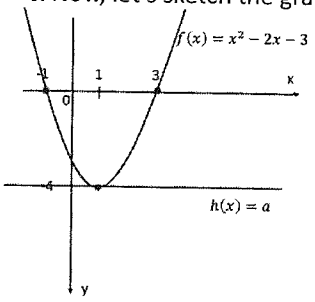
The cost per person originally $=\frac{1200}{x}$ if x is the number of people in the beginning. And then 2 people decided not to go. so, the cost per person will be $=\frac{1200}{x-2}$. Now, we know that the cost per each person will increase by 30 dollars. We can set up equation $30=\frac{1200}{x-2}-\frac{1200}{x}$. Solve for x. multiply $x(x-2)$ on both sides of the equation. $30x(x-2)=1200x-1200(x-2)$. Simplify and collect like-terms. Then, $x^2-2x-80=0$ and factor it. $(x+8)(x-10)=0$. you get $x=10$. Therefore, 10-2= 8 friends were ended up going to travel together.

16. C)

The graph shown is open-upward parabola. Eliminate A). The vertex is located at around x=5, eliminate D). The y-coordinate of the vertex is at around 0.75. so, the answer is C).

17. D)

The x coordinate of the vertex of f is $-\frac{b}{2a}=-\frac{-2}{2\cdot}=1$. And the y-coordinate of the vertex is $f(1)=1^2-2\cdot 1-3=-4$. Now, let's sketch the graphs of f and h.



Since $h(x)\leq f(x)$, the maximum value of a will be -4.

18. C)
The ratio of the number of teeth is $gear\ A: gear\ B = 40:80 = 1:2$. Based on information given, the ratio of the rotational speeds is $speed\ A: speed\ B = 2:1$. The speed of gear A is 50 rpm. So, the speed of gear B will be half the speed of gear A. therefore, the answer is 25.

19. 75
Total traveling time with no traffic delay is 3 hours because $\frac{120}{60} = 2$ hours on the highway and $\frac{30}{30} = 1$ hour on the local. If there is a traffic delay on the local, we expect 40% increase in time. So, the traveling for the local will be 1.4 hours. Now, we need to find the speed, in mph, in order to have the same total traveling time (3 hours). So, Matthew needs to drive in faster speed on the highway. Therefore, Speed $= \frac{120\ miles}{3-1.4\ hours} = 75\ mph$ on the highway.

20. 36
The area of equilateral triangle : $\frac{\sqrt{3}}{4}a^2 = 4\sqrt{3}$. Solve for a. Then, $a^2 = 16$. $a = 4$. Now, the perimeter of the shaded triangles will be $9a = 9 \cdot 4 = 36$ inches.

21. B)
First, distribute a, then you get $2a - ax = 4x - 8$. If $a = -4$, then the equation will be $4x - 8 = 4x - 8$, which is equivalent on both sides. So, it has infinitely many solutions because it is identical on both sides. Thus, II is true. If $a \neq -4$, then, rearrange the equation above. You get $x = \frac{2a+8}{a+4} = \frac{2(a+4)}{a+4} = 2$. Thus, I is true too.

22. B)
The margin of error is related with the sample size. The larger size of sample they have, the smaller margin of error they will have in the survey. So, the correct answer is B).