

### TEST SET 3 - ANSWER KEYS AND SCORE CONVERSION TABLE

Module 1	1	2	3	4	5	6	7	8	9	10	11
	C	C	D	B	A	B	A	4	B	C	B
	12	13	14	15	16	17	18	19	20	21	22
	8	D	A	B	C	B	B	D	D	B	10.5
Module 2	1	2	3	4	5	6	7	8	9	10	11
	B	B	C	D	C	C	C	A	D	A	10.5
	12	13	14	15	16	17	18	19	20	21	22
	B	2	B	A	A	B	90	D	A	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 3 (Module 1)

1. C)

$$\frac{3x-9}{x^2-x-20} \cdot \frac{x^2-25}{x^2+2x-15} = \frac{3(x-3)}{(x-5)(x+4)} \cdot \frac{(x-5)(x+5)}{(x+5)(x-3)} = \frac{3}{x+4}$$

2. C)

The probability both dice show the same number is  $\frac{6}{36} = \frac{1}{6}$ . The probability both dice show different numbers is  $1 - \frac{1}{6} = \frac{5}{6}$ . Now, the expected value by playing a game will be calculated as follows:  $\frac{1}{6} \times (70 - 10) + \frac{5}{6} \times (4 - 10) = \$5$ .

3. D)

Substitute points (2, 0) and (0, 2) into the function.  $0 = \frac{k}{2+m} + 3$  and  $2 = \frac{k}{m} + 3$ . Now, you get  $k = -6 - 3m$  and  $k = -m$ . And you get  $k = 3$  and  $m = -3$ . So,  $k + m = 0$ .

4. B)

The maximum value of  $m$  is the same expression as the value of  $m$  is less than or equal to. So, we can set up inequality as follows.  $m \leq 2(n - 4) - 8$ .

5. A)

You can use two reasonable points to get the equation of the line of best fit. (40, 4.5) and (60, 6).  $m = \frac{6-4.5}{60-40} = 0.075$ . so, we get  $y = 0.075x + 1.5$ . now, plug  $x=120$  into the equation. Then you get  $\$10.5 \approx \$11$ .

6. B)

When substitute  $x=0$  into the function, you should get the coefficient only. So, only answer choice B) works because  $-2(0.9)^0 = -2$  (this is the coefficient of  $f(x) = -2(0.9)^x$ ).

7. A)

First,  $120 + (-x + 20) = 180$  (a linear pair is supplementary angles). So,  $x = -40$ . Since the vertical angles are congruent, you can set up  $x + 2y = -x + 20$ . then,  $2y = -2x + 20 = -2(-40) + 20 = 100$ . So,  $y=50$ .  $x + y = -40 + 50 = 10$ .

8. 4

If a quadratic equation has no real solution, then discriminant should be less than zero.

$b^2 - 4ac = 4^2 - 4 \cdot 1 \cdot k < 0$ . Therefore,  $k > 4$ . So, the greatest possible value of  $m$  should be 4.

9. B)

The probability PSA test generates one false positive out of 20 tests.  $P(\text{false}) = \frac{1}{20}$ . Therefore, the probability none of three patients generate false positive is  $\left(1 - \frac{1}{20}\right)\left(1 - \frac{1}{20}\right)\left(1 - \frac{1}{20}\right) = \left(\frac{19}{20}\right)\left(\frac{19}{20}\right)\left(\frac{19}{20}\right)$ .

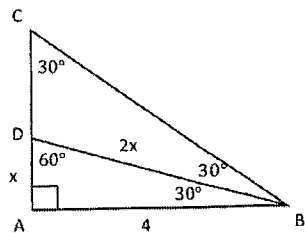
10. C)

The slope of the line represents the annual decrease rate of the car value. The unit of slope also shows the meaning of slope which is the decrease in dollars/year.

11. B)

You will need to solve for  $D$ . First, multiply  $2a$  on both sides.  $2ax = -b \pm \sqrt{D}$ . Add  $b$  on both sides.  $2ax + b = \pm\sqrt{D}$ . Square both sides. You get  $D = (2ax + b)^2$ .

12. 8



In the figure on the left, the right triangle ABD is  $30^\circ - 60^\circ - 90^\circ$  triangle because the ratio of sides  $AD:BD = 1:2$ . And  $\overline{BD}$  bisects  $\angle ABC$ . So,  $\angle ABC = 60^\circ$ . Now you can use  $30^\circ - 60^\circ - 90^\circ$  Pythagorean triple again. Therefore,  $BC=8$ .

13. D)

Since two x-intercepts are 0 and 6, the x-coordinate (h value) of the vertex should be the midpoint of the two x-intercepts. So,  $h = 3$ . The vertex is (3, -4). You can set up an quadratic function  $y = a(x - 3)^2 - 4$ . Plug (0, 0) to get the value  $a$ .  $a = \frac{4}{9}$ . To find the point of intersection, set two equations equal to each other.  $4x = \frac{4}{9}(x - 3)^2 - 4$ . Now, solve for x.

You will get  $x = 0$  and 15. Therefore, (15, 60).

14. A)

$$\frac{m^{\frac{2}{3}}(m^{-2}m^4)^3}{m^4} = \frac{m^{\frac{2}{3}}(m^2)^3}{m^4} = \frac{m^{\frac{2}{3}} \cdot m^6}{m^4} = m^{\frac{2}{3}+6-4} = m^{\frac{8}{3}} = \sqrt[3]{m^8}.$$

15. B)

The number of people who gave 5 or higher is 7 and the number of people who gave less than 5 is 3. So the fraction will be  $\frac{7}{3}$ .

16. C)

The range of numbers of vacation days of company C is the largest. I is true.

The mode of any of data is unknown. II is false.

The median value of vacation days for company B is the smallest. III is true.

17. B)

Use answer choices. Process of elimination! If you use (0, 4), you can eliminate A) and C). and if you use (2, 36), you know the answer is B).

18. B)

In the context, the average price per pound started at \$7.20. and the average price was increased at a constant rate weekly. So, 0.25 in the equation must stand for the weekly rate of change, \$0.25/week, in the average price per pound of lamb meat.

19. D)

Percent increase =  $\frac{\text{increment}}{\text{original}} \times 100$ . Let's say the monthly payment in 2020 is 100. Then the monthly payment in 2021 is  $1.45 \times 100 = 145$ . So, percent change =  $\frac{145-100}{100} \times 100 = 45\%$  increase.

20. D)

Let's change the equation into the slope-intercept form.  $y = \frac{2a}{b}x + \frac{3}{b}$ . Since  $2a + b = 0$ ,  $b = -2a$ . Now, substitute  $b = -2a$  into  $y = \frac{2a}{b}x + \frac{3}{b}$ . Then,  $y = \frac{2a}{-2a}x + \frac{3}{-2a}$ . Thus,  $y = -x - \frac{3}{2a}$ . So, the slope of the graph is -1.

21. B)

This survey could be biased because only those who feel strongly for or against will call voluntarily, not randomly.

22. 10.5

The median value will be the value in the middle after the data are put in order.

Since the total number of data is 14, the median must be the average of 7<sup>th</sup> and 8<sup>th</sup> numbers from the data. So,  $\frac{10+11}{2} = 10.5$ .

## Answers and explanations for Test 3 (Module 2)

1. B)

The ball reaches out  $\frac{2}{3}$  the previous height after each bounce. So, keep multiplying  $\frac{2}{3}$  from the previous height.

2. B)

The chance of the weather being rainy today is 30%. So, the chance of not being rainy today is 70%. Therefore, the probability that there would be an accident on the freeway 23 is  $0.30 \times 0.005 + 0.70 \times 0.001 = 0.0022$ .

3. C)

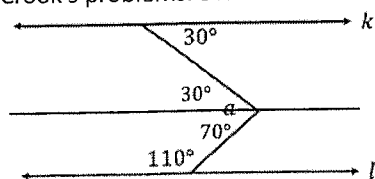
$$4r^2q^4 + r^3 - 4(q^2 + rq^2)^2 = 4r^2q^4 + r^3 - 4(q^4 + 2rq^4 + r^2q^4) = r^3 - 4q^4 - 8rq^4.$$

4. D)

$y = kx$  is a line passes through the origin. So, the closest line of best fit would be D).

5. C)

Crook's problems. Draw an additional parallel line between two lines as follows.



in the diagram on the left, if two parallel lines are cut by a transversal, the alternate interior angles are congruent and the same side interior angles are supplementary. Therefore,  $a = 30 + 70 = 100^\circ$

6. C)

Use quadratic formula.  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-5 \pm \sqrt{5^2 - 4(-1) \cdot 3}}{2 \cdot (-1)} = \frac{-5 \pm \sqrt{37}}{-2} = \frac{5 \pm \sqrt{37}}{2}.$

7. C)

$|x - 2| = 8$ . Solve for  $x$ . then  $x = 10$  or  $-6$ . And  $|y + 3| = 4$ . Solve for  $y$ .  $y = 1$  or  $-7$ . the least possible value of  $x + y = (-6) + (-7) = -13$ .

8. A)

Since the parabola opens downward, the leading coefficient is negative. Eliminate D). The graph passes through the point  $(2, -3)$ . Plug that into the equation on the answer choices. Only A) works!

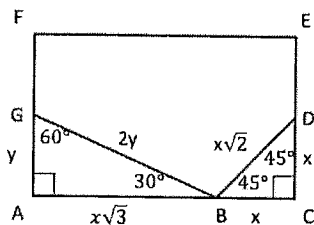
9. D)

The circle equation is  $(x - h)^2 + (y - k)^2 = r^2$ . The center is  $(2, 0)$  and the radius is 3. Therefore,  $(x - 2)^2 + y^2 = 9$ .

10. A)

To find the  $y$ -intercept, put  $x=0$  and solve for  $y$ .  $y = -2^0 + 1 = -1 + 1 = 0$ . And to find the  $x$ -intercept, set  $y=0$  and solve for  $x$ .  $0 = -(2)^x + 1$ . And you get  $2^x = 1$ . Finally, You get  $x=0$  too. Therefore, both  $x$ ,  $y$ -intercepts are  $(0, 0)$ .

11. 105



Based on the description of the sides on the problem, you can put the sides as indicated in the figure above. Using Pythagorean triples, you can find the angles. Therefore, the measure of angle DBG is  $180 - 30 - 45 = 105^\circ$

12. B)

First, put the data in order. 39, 80, 112, 152, 210, 232, 239, 244. The mean of the data is 163.5. the median of the data is 181. Therefore, the difference is  $181 - 163.5 = 17.5$ .

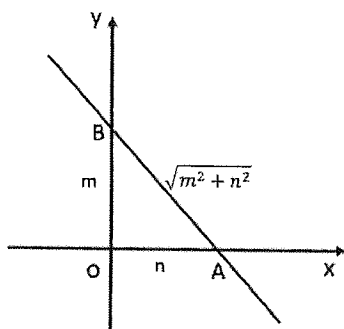
13. 2

$\left(\frac{y}{3x}\right) \cdot (2x)^2 = \frac{y}{3x} \cdot 4x^2 = \frac{4xy}{3}$ . Since  $2xy = 3$ ,  $4xy = 6$ . plug that into the last expression. Then, you get  $\frac{6}{3} = 2$ .

14. B)

$f(x + 1)$  means that  $f(x)$  is translated 1 unit to the left. And  $-f(x)$  means that  $f(x)$  is reflected by x-axis. And also note that horizontal and vertical translation comes after reflection.

15. A)



In the diagram on the left,  $\cos \angle OAB = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{n}{\sqrt{m^2 + n^2}}$

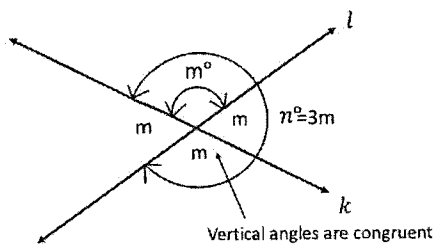
16. A)

For hamburgers, the values are 30, 40, and 60. For pizza, the values are 20, 20, 90. Therefore, only graph A) shows the correct values on both axes.

17. B)

The list price is \$1,200. The sales tax is 9% of the list price. So, the sales tax is  $0.09 \times 1200 = \$108$ . Now, the discounted price is  $0.70 \times 1200 = \$840$ . Therefore, the total amount of cost for her purchase is  $108 + 840 = \$948.00$ .

18. 90



in the diagram on the left,  $n = 3m$  and vertical angles are congruent. Then you know that two line divides the whole circle into 4 equal angles. Therefore,  $360 \div 4 = 90^\circ$

19. D)

In the graph,  $f(2) = -2$  and  $f(-5) = 2$ . Note that the sizes of the grid differ on both axes. So,  $-f(2) + 2f(-5) = -(-2) + 2 \cdot 2 = 2 + 4 = 6$ .

20. A)

If  $\sin A = \cos B$ , then angles A and B are complementary. (co-functions) now, you can set up  $2a - 15 + a + 30 = 90$ . You get  $a = 25$ .

21. B)

You can set up an equation  $120 = \frac{450x}{270-x}$  and solve for x. then,  $x = 56.8\% \approx 57\%$ .

22. B)

0.94 was actually  $(1 - 0.06)$  which means the number of ICU was decreased by 6% yearly since 2020.