TEST SET 4 - ANSWER KEYS AND SCORE CONVERSION TABLE

	1	2	3	4	5	6	7	8	9	10	11
Module 1	A	B	C	A	B	D	A	B	A	C	B
	12	13	14	15	16	17	18	19	20	21	22
	D	B	A	C	B	B	A	A	C	C	A
	1	2	3	4	5	6	7	8	9	10	11
Module 2	B	A	A	46	B	2	D	C	B	D	B
	12	13	14	15	16	17	18	19	20	21	22
	C	C	0	B	1/5	B	B	C	9	B	1/11

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 4 (Module 1)

1. A)
   The margin of error means that the actual value likely falls within the margin from the expected value. Therefore, the actual percentage prefers brand A likely falls within the range of $68 - 72\%$.

2. B)
   Solve for d. subtract a_1 on both sides. $a_n - a_1 = (n-1)d$ and divide $(n-1)$ on both sides. You get $d = \frac{a_n - a_1}{n-1}$ or $\frac{a_1 - a_n}{1-n}$.

3. C)
   Multiply LCM $(2x^2)$ on both sides of the equation. Then, $-6 = x - x^2$. Reorder the equation and solve. $x^2 - x - 6 = 0$. And you get $x = 3 \ or -2$. Those x values in the domain, which are valid solutions. Now, the sum of 3 and -2 is 1.

4. A)
   If one of the participants is selected at random without any condition, the denominator must be the total number of participants (600). Now, the number of participants who chose "Like" and the person is asked about vanilla flavor is 120 in the table. Therefore, the probability should be $\frac{120}{600}$.

5. B)
   Plug x=12 into the equation given, $r = 2^{\frac{1}{12}} - 1 = 0.0595 \cong 0.06$. so the percent interest rate will be 6%.

6. D)
   The function f has two zeros in the graph shown. Thus, the discriminant must be positive, $b^2 - 8 > 0$. Now, plug the answer choices to find the possible b values.

7. A)
   Use the process of elimination by using the answer choices. Only A) (2, 5) works for both equations.

8. B)
   50% of students sampled doesn't have to be less than or equal to $15 to satisfy the given conditions. However, 50% of students must be less than or equal to $17 because the median of the sample was $17.

9. A)
   First, a, b, and c are positive constants. It means all y values in the table are above x-axis. Eliminate B) and D). Since $a < b < c$, y values increase as x values increase. So, the answer is A).

10. C)
    The critical condition for a simple random sample is that everyone in the population has an equal possibility of being chosen. Its participants were volunteered or communicate with other participants or participate more than once could bring about some biased results.

11. B)
    The volume of rectangular solid is $2x^3 - 2x^2 - 4x = 2x(x^2 - x - 2) = 2x(x - 2)(x + 1)$.
    Since the height is 2x and the volume of the rectangular solid is calculated by the product of the height of the solid and the area of the base. the area of base should be $(x - 2)(x + 1)$.

12. D)

$$3 + x - \frac{1}{x-2} = \frac{(x-2)(3+x)}{x-2} - \frac{1}{x-2} = \frac{x^2+x-7}{x-2}.$$

13. B)

$$\frac{x^{-\frac{2}{3}}(x^3)^3}{x^5} = \frac{x^{-\frac{2}{3}} \cdot x^9}{x^5} = x^{-\frac{2}{3}+9-5} = x^{\frac{10}{3}} = \sqrt[3]{x^{10}} = \sqrt[3]{x^9 \cdot x^1} = x^3\sqrt[3]{x}.$$
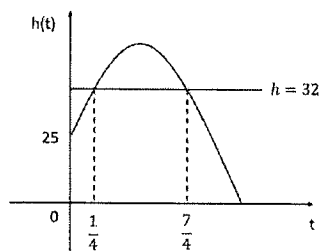
14. A)

The monthly paycheck = basic monthly pay + m% of the selling price of cars as commission.

Based on the given information, the monthly paycheck = $500 + \frac{m}{100} \cdot 12 \cdot 25{,}000$.

15. C)

Set $32 = -16t^2 + 32t + 25$. And set one side equals to zero. $0 = -16t^2 + 32t - 7$. And factor.

$(4x - 7)(4x - 1) = 0$. And you get $x = \frac{1}{4}$ and $\frac{7}{4}$.

In the figure on the left, the time stayed above 32ft above the ground after it was launched would be $\frac{7}{4} - \frac{1}{4} = \frac{6}{4}$ or $1.5\ sec$.
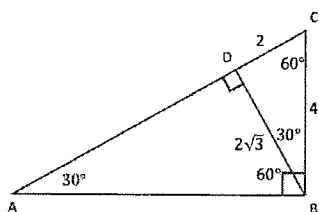
16. B)

Use the answer choices to find the answer. Only B) works for both inequalities.

17. B)

The median number of children in 100 households would be the average of 50th and 51st numbers in the data. Both 50th and 51st numbers are located in 2 in the frequency bar graph. Therefore, the median is 2.

18. A)

In the right triangle BCD, since CD=2 and CB=4, we know that the triangle BCD is $30° - 60° - 90°$ triangle. We can use the triples $x - \sqrt{3}x - 2x$ ratio to find the length of BD. Now, *since* $\angle A \cong \angle CBD$, we can calculate $cos\angle A = cos\angle CBD = \frac{2\sqrt{3}}{4} = \frac{\sqrt{3}}{2}$.

19. A)

The players' Weight in pounds
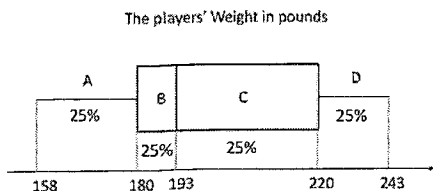
193 pounds is the median weight from the box plot. And all regions A, B, C, and D are 25% of data, respectively. Note: even though the region C is wider than the region B, they have the same amount of data in each region. Therefore, the percent above 193 pounds in the plot indicates 50% of data. $0.5 \times 24 = 12$.

20. C)

The increasing rate ($x\%$) was constant yearly. So, you can set up $144 = 100\left(1 + \frac{x}{100}\right)^2$. Now, solve for x. $1 + \frac{x}{100} = \sqrt{\frac{144}{100}}$. Then you get $x = 20$.

21. C)

$$\frac{The\ number\ of\ public\ colleges}{The\ number\ of\ private\ colleges} = \frac{The\ percent\ of\ public\ colleges}{The\ percent\ of\ private\ colleges} = \frac{10+23}{38+29} = \frac{33}{67}.$$
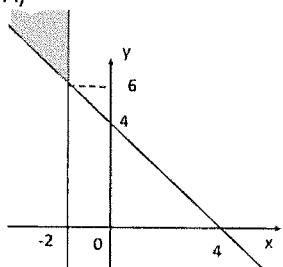
22. D)

Complete the square. Divide by 4 on both sides of the equation. $x^2 - 2x + y^2 = 2$. Now, add $\left(\frac{b}{2}\right)^2 = \left(\frac{-2}{2}\right)^2 = 1$ on both sides. $(x-1)^2 + y^2 = 3$. So, we know that $r^2 = 3$. The area of the circle is $\pi r^2 = 3\pi$.

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Answers and explanations for Test 4 (Module 2)

1. B)

   Since triangle ABC is an isosceles triangle, segment CD is the segment bisector of AB. So AD=BD. $tan\theta = \frac{h}{BD}$. So, $BD = \frac{h}{tan\theta}$. Therefore, $AB = 2BD = \frac{2h}{tan\theta}$.

2. A)

   Graph both inequalities in the XY-plane. All points in the shaded region will satisfy the system. The intersection of two graphs is (-2, 6). Therefore, $y > 6$.

3. A)

   We can get the coordinates of two points. (0, 200) and (30, 80) based on the information. Now, we can compute the slope $\frac{200-80}{0-30} = -4$. the water leaks at a constant rate. So, it is linear decrease. Therefore, we can set up $y = -4m + 200$, $where$ m is the minutes after it started to leak.

4. 46

   We can set up the table based on information. We have 110 members and $\frac{5}{11} \times 110 = 50$ $males$ and 60 females. The number of members who have kids to the number of members who don't = 66: 44. And $\frac{3}{5} \times 50 = 30$ males who don't have kids.

   Let's set up table.

	kids	No kids	total
male	20	30	50
female	46	14	60
total	66	44	110

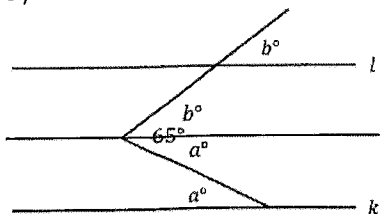   now, we know that 46 female members have kids.

5. B)

   The total number of students is 17. So, the median is 9th student's age. Thus, the median is 19. The mode is the most frequent number. So, the mode is 19.

   The mean $= \frac{17 \times 2 + 18 \times 1 + 19 \times 6 + 20 \times 5 + 21 \times 2 + 25 \times 1}{17} = 19.6$. therefore, mode=median<mean.

6. 2

   The minimum value of the function $h(x)$ is -2 from the graph. $f(-a) = f(-(-2)) = f(2) = 2$ from the table.

7. D)

draw a parallel line between l and k. and use the properties such as corresponding angles are congruent and alternate interior angles are congruent. Then $m\angle a + m\angle b = 65°$ from the drawing.

8. C)
Let's expand the first equation. $x^2 - 2x + 1 + y^2 - 2y + 1 = 25$. Now, multiply 2 on both sides. $2x^2 - 4x + 2 + 2y^2 - 4y + 2 = 50$. And you get $2x^2 - 4x + 2y^2 - 4y = 46$. Therefore, $a = 46$.

9. B)
The percent increase formula: $A = P(1 + \% \ in \ decimal)^t$, where t is the number of years, P is the initial value, A is the final value. So, if compare with the formula, 1.1 means $(1 + 0.1)^{x-1}$. It means that the demand of the brand is increasing 10% every year.

10. D)
t is the number of years after 1990 and the function is linear. So you can find the coordinates of two points from the table. (0, 124) and (10, 156).
The slope is $\frac{156-124}{10-0} = \frac{32}{10} = 3.2$. therefore, the equation is $y = 3.2t + 124$.

11. B)
To make the expression undefined, set the denominator equal to zero and solve for x.
$x^2 - x - 2 = 0$ and $x = 2 \ or -1$.

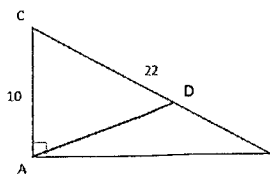12. C)
Make a small table for certain m values.

m	k
7	14
10	$\frac{110}{7}$

set m=7 first and get k=14. And increase m by 3. So m=10 and substitute m=10 into the equation again and get the k value. $k = \frac{110}{7}$. Therefore, it increased by $\frac{12}{7}$ from 14 to $\frac{110}{7}$.

13. C)
This sampling method could be biased because they surveyed children who visited the library where kids usually study or do homework.

14. 0

Since $\angle CAD \ and \ \angle BAD$ are complementary angles, $sin\angle CAD = cos\angle BAD$ (Cofunctions). Therefore, $sin(\angle CAD) - cos(\angle BAD) = 0$.

CONTINUE

15. B)

Since zeros of the function are 1 and 5 and the x-coordinate of the vertex is the midpoint of two x-intercepts. $x = \frac{1+5}{2} = 3$. so, eliminate A) and C). But the answer choice D) does not have any zeros on the graph. So, the answer must be B).

16. $\frac{1}{5}$

In a right triangle XYZ, $\angle X$ is a right triangle. Thus, $\angle Y$ and $\angle Z$ are complementary. Using cofunction property, we know that $cos\angle Y = \sin \angle Z$. Therefore, $sin\angle Z = \frac{1}{5}$.

17. B)

The rate of change in the height of cup A is non-linear but the rate of change in the height of cup B is linear: statement II is True based on the shape of cups. If the water is being poured at the same constant rate, the height of two cups won't go up at the same rate.

18. B)

$f(x)$ is the profit function based on the unit price of the product, x. and the function is open-downward parabola. It has two zeros at 0 and m. so m means that the unit price which will result in f(x)=0, zero profit.

19. C)

To find the x-intercepts, set y=0 and solve for x. $\frac{(x+2)(x-1)}{(x+3)} = 0$. so, we get $(x + 2)(x - 1) = 0$. therefore, $x = -2 \, or \, 1$.

20. 9

$\sqrt[3]{a^x} = a^3$. It can be rewritten as $a^{\frac{x}{3}} = a^3$. So, compare the exponents. $\frac{x}{3} = 3$. Therefore, $x = 9$.

21. B)

Use the fundamental theorem of algebra. $r_1 + r_2 = -\frac{b}{a}$ and $r_1 r_2 = \frac{c}{a}$. So, $a + b = -\frac{-5}{6} = \frac{5}{6}$ and $ab = \frac{-12}{6} = -2$. We are looking for $\frac{1}{b} + \frac{1}{a} = \frac{a+b}{ab} = \frac{\frac{5}{6}}{-2} = -\frac{5}{12}$.

22. $\frac{1}{11}$

The probability of grabbing a dime from a jar $= \frac{4}{12} = \frac{1}{3}$. Not the probability of grabbing another dime without replacement $= \frac{3}{11}$. Therefore, the probability is $\frac{1}{3} \times \frac{3}{11} = \frac{1}{11}$.

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