

**TMATYC - Survey of Mathematics Test - 2018**

1. The polynomial  $x^2 - x - 56$  factors as  $(x + a)(x - b)$  where  $a$  and  $b$  are positive real numbers. Find these two numbers and use them to find the value of  $3a - 2b + 1$ .

A. -1      B. 6      C. 15      D. 11      E. 38

2. If  $x$  and  $y$  have a linear relationship, then what number goes in the missing entry in the table of values below?

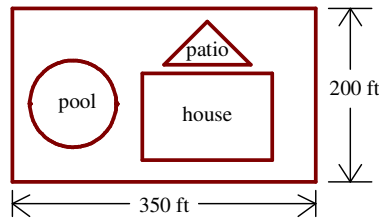
$x$	0	2	4	8
$y$	2		10	14

A. 4      B. 5      C. 6      D. 7      E. 8

3. Write the number 3,560,000,000 in scientific notation.

A.  $3.56 \times 10^{-8}$       B.  $3.56 \times 10^{-9}$       C.  $3.56 \times 10^7$       D.  $3.56 \times 10^8$       E.  $3.56 \times 10^9$

4. A house, patio, and swimming pool are to be constructed on a rectangular grassy lot that measures 350 feet by 200 feet as shown below. The house is rectangular and measures 150 feet by 100 feet, the patio is triangular with base 100 feet and altitude 50 feet, and the pool is circular with a radius of 50 feet. What is the area of the grass remaining after construction to the nearest square foot?



A. 42,146      B. 44,646      C. 47,500      D. 52,186      E. 52,343

5. You pick a real number, add six to it, and multiply the result by 4. You then take away 8 from this result. Finally, you take the result so far and divide by 2. If your answer is 10, what was the original number you picked?

A. -3      B. -1      C. 1      D. 5.5      E. 18

6. A shirt is on sale for 35% off the regular price. If you join the store's free rewards program, you will receive an additional 10% off of the sales price. If you join the rewards program and buy the shirt, what percentage of its original price will you actually pay before any taxes?

A. 35%      B. 45%      C. 51.5%      D. 55%      E. 58.5%

7. The distance from an observer on the shore to a boat on the water is equal to the square root of the quantity that is 25 feet more than twice this distance. What is this distance to the nearest foot?

A. 3      B. 4      C. 5      D. 6      E. 7

8. The statement  $(a + b) + c = a + (b + c)$  is an illustration of the

A. commutative law of addition      B. associative law of addition      C. distributive law  
 D. reflexive property of equality      E. symmetric property of equality

9. Which of the following would be closest to the measure of the angle shown below?



- A.  $45^\circ$       B.  $60^\circ$       C.  $95^\circ$       D.  $135^\circ$       E.  $225^\circ$

10. If the number 3421 in base five is written in base 7 as  $abcd$ , where  $a$ ,  $b$ ,  $c$ , and  $d$  are digits, then  $c =$

- A. 2      B. 3      C. 4      D. 5      E. 6

11. Each letter in TMATYC is written on a separate  $3 \times 5$  notecard. If the cards are scrambled up and one is randomly selected, what is the probability of not drawing the letter T?

- A.  $\frac{4}{5}$       B.  $\frac{1}{5}$       C.  $\frac{1}{3}$       D.  $\frac{2}{3}$       E.  $\frac{1}{6}$

12. If the mean for the set of data  $\{2, 3, 3, 8, 12, 25, x\}$  is 12, then what is the value of  $x$ ?

- A. 17      B. 19      C. 29      D. 31      E. 42

13. A doorway is 3 feet wide and 7 feet high. What is the radius of the largest circular table that can be rolled through the doorway? Express your answer rounded to the nearest tenth of a foot.

- A. 3.1      B. 3.5      C. 3.7      D. 3.8      E. 4.0

14. Each state has 2 senators in the U.S. Senate. There are only 11 senators older than Tennessee Senator Lamar Alexander. Knowing only this information, what is the least number of states that could have a senator older than Lamar Alexander?

- A. 5      B. 6      C. 7      D. 10      E. 11

15. Subtract and simplify:  $\frac{x+4}{x-2} - \frac{x-5}{x+3}$

- A.  $\frac{14x+2}{x^2+x-6}$       B.  $\frac{22}{x^2+x-6}$       C.  $\frac{9}{x^2+x-6}$       D.  $\frac{-1}{x^2+x-6}$       E.  $-\frac{9}{5}$

16. Solve for  $M$  if  $y = \left(4 - \left(\frac{1}{M}\right)^{1/3}\right)^{1/5}$

- A.  $M = \left(4 - \frac{1}{y}\right)^{3/5}$       B.  $M = \frac{1}{64 - y^{15}}$       C.  $M = \frac{1}{15}y - \frac{4}{3}$

- D.  $M = \frac{1}{(4^{1/5} - y)^{15}}$       E.  $M = \frac{1}{(4 - y^5)^3}$

17. Which of the following best describes deductive reasoning?
- A. Using logic to draw conclusions based on accepted statements.  
 B. Accepting the meaning of a term without definition.  
 C. Defining mathematical terms to correspond with physical objects.  
 D. Inferring a general truth by examining a number of specific examples.  
 E. Using mathematics to investigate claims of truth.
18. An airplane travels 95 miles in 10 minutes. How fast is it going in miles per hour?  
 A. 950 mph      B. 760 mph      C. 630 mph      D. 570 mph      E. 475 mph
19. There are three kinds of apples all mixed up in a basket. How many apples must you draw (**without looking**) from the basket to be sure of getting at least two of one kind?  
 A. 2      B. 3      C. 4      D. 5      E. 6
20. The table below summarizes the results for 10,000 mammograms (in which 150 of the women have malignant tumors and 9,850 have benign tumors):

	Tumor is Malignant	Tumor is Benign
Positive Mammogram	125	1455
Negative Mammogram	25	8395

- Based upon this data, if a woman's mammogram comes back negative, what is the probability her tumor is malignant? Round to three significant digits.
- A. 0.00250      B. 0.00254      C. 0.00297      D. 0.0150      E. 0.167
21. The  $y$ -intercepts of two perpendicular lines add to zero. If the lines intersect at the point  $(-6, 8)$ , what is the product of their  $x$ -intercepts?  
 A.  $-9$       B.  $-1$       C. 36      D. 100      E. 144
22. How many distinct four-digit numbers can be formed by arranging the digits 2, 1, 1, and 0?  
 A. 6      B. 9      C. 12      D. 15      E. 24
23. At age  $x$ , with  $0 \leq x \leq 80$ , the average remaining life expectancy of a male is approximately  $70.5 - 0.8x$ . What is the difference in years between the maximum and minimum ages for which average remaining life expectancy of a male is between 42.5 and 54.5 years?  
 A. 6.5      B. 9.6      C. 15      D. 20      E. 35
24. Let  $f$  be a function. If  $f(2x + 1) = x^2 - 3x + 6$  then  $f(5) =$   
 A. 2      B. 4      C. 11      D. 16      E. 94
25. If the points  $(-1, -4)$ ,  $(2, 5)$ , and  $(3, 0)$  all lie on the graph of the equation  $y = ax^2 + bx + c$ , then  $a + b + c =$   
 A. 1      B. 2      C. 4      D. 6      E. 9