

Mathematics

The Texas Success Initiative (TSI) Mathematics and Statistics test contains questions that measure proficiency in four content areas. The four content areas are as follows:

Elementary Algebra and Functions — Topics covered in this category include:

- Linear equations, inequalities and systems
- Algebraic expressions and equations
- Word problems and applications

Intermediate Algebra and Functions — Topics covered in this category include:

- Quadratic and other polynomial expressions, equations and functions
- Expressions, equations and functions involving powers, roots and radicals
- Rational and exponential expressions, equations and functions

Geometry and Measurement — Topics covered in this category include:

- Plane geometry
- Transformations and symmetry
- Linear, area and three-dimensional measurements

Data Analysis, Statistics and Probability — Topics covered in this category include:

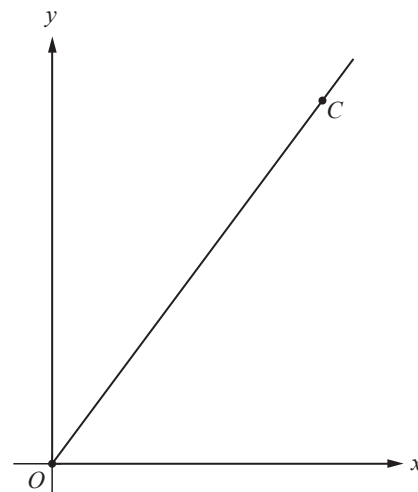
- Interpreting categorical and quantitative data
- Statistical measures
- Probabilistic reasoning

Mathematics Sample Questions

Directions for questions 1–15

For each of the questions below, choose the best answer from the four choices given. You may use the paper you received as scratch paper.

1. If $3t - 7 = 5t$, then $6t =$
A. 21
B. -7
C. -21
D. -42
2. The variables x and y are directly proportional, and $y = 2$ when $x = 3$. What is the value of y when $x = 9$?
A. 4
B. 6
C. 8
D. 12



3. In the xy -plane above, point C has coordinates $(6, 9)$. Which of the following is an equation of the line that contains points O and C ?
A. $y = x - 3$
B. $y = x + 3$
C. $y = \frac{2}{3}x$
D. $y = \frac{3}{2}x$

4. There are $3x - 2$ trees planted in each row of a rectangular parcel of land. If there are a total of $24x - 16$ trees planted in the parcel, how many rows of trees are there in the parcel?
- A. $21x - 18$
 B. $21x - 14$
 C. $8x$
 D. 8
5. A group of 18 people ordered soup and sandwiches for lunch. Each person in the group had either one soup or one sandwich. The sandwiches cost \$7.75 each and the soups cost \$4.50 each. If the total cost of all 18 lunches was \$113.50, how many sandwiches were ordered?
- A. 7
 B. 8
 C. 9
 D. 10
6. Which of the following equations has both 1 and -3 as solutions?
- A. $x^2 - 2x - 3 = 0$
 B. $x^2 + 2x - 3 = 0$
 C. $x^2 - 4x + 3 = 0$
 D. $x^2 + 4x + 3 = 0$
7. In the xy -plane, what is the y -intercept of the graph of the equation $y = 2(x + 3)(x - 4)$?
- A. -24
 B. -12
 C. -2
 D. 12
8. $x^4 - 1 =$
- A. $(x + 1)(x - 1)(x^2 + 1)$
 B. $(x + 1)^2(x - 1)^2$
 C. $(x + 1)^3(x - 1)^1$
 D. $(x - 1)^4$
9. $(3x^2y^3)^3 =$
- A. $3x^5y^6$
 B. $9x^6y^9$
 C. $27x^5y^6$
 D. $27x^6y^9$
10. If $\sqrt{5 - x} = 4$, then $x =$
- A. -21
 B. -11
 C. 1
 D. 11
11. If $\frac{x - 1}{x} = 20$, then $x =$
- A. -21
 B. -19
 C. $-\frac{1}{19}$
 D. $\frac{1}{21}$
12. A ball was kicked into the air from a balcony 20 feet above the ground, and the ball's height above the ground, in feet, t seconds after the ball was kicked was $h(t) = 20 - 16t^2 + 32t$. What was the maximum height, in feet, of the ball above the ground after it was kicked?
- A. 32
 B. 34
 C. 36
 D. 40
13. The yard behind the Cindy's house is rectangular in shape and has a perimeter of 72 feet. If the length ℓ of the yard is 18 feet longer than the width w of the yard, what is the area of the yard, in square feet?
- A. 36
 B. 144
 C. 243
 D. 486

City	High Temperature
<i>A</i>	$t^{\circ}\text{F}$
<i>B</i>	87°F
<i>C</i>	81°F
<i>D</i>	62°F
<i>E</i>	93°F

14. The table above shows the high temperature last Thursday for five cities, *A* through *E*. If the median of the Thursday high temperatures for these cities was 81°F , which of the following could NOT have been the high temperature last Thursday for City *A* ?
- A. 85°F
 - B. 75°F
 - C. 65°F
 - D. 55°F
15. There are 20 children in the cast of a class play, and 8 of the children are boys. Of the boys, 4 have a speaking part in the play, and of the girls, 8 do not have a speaking part in the play. If a child from the cast of the play is chosen at random, what is the probability that the child has a speaking part?
- A. $\frac{2}{5}$
 - B. $\frac{1}{2}$
 - C. $\frac{3}{5}$
 - D. $\frac{3}{4}$

3. The main authors of The Declaration of Independence and the Constitution are usually thought of as America's "Founding Fathers." Other, less known personages also deserve the title, however, and Noah Webster was one of these. Through his writings, which include the still-influential dictionary that bears his name, Webster sought to legitimize an "American English" that was independent of British spelling and pronunciation. For instance, Webster removed the "u" from "colour," creating the distinct American version of the word.

What is the main purpose of this passage?

- A. To praise the Founding Fathers
- B. To present information about an important American
- C. To define and explain "American English"
- D. To distinguish American dictionaries from British dictionaries

4. If you are committed to healthy, green living and want to reduce your environmental footprint, you might consider expanding your daily diet to include bugs. Supporters of the edible insect initiative rightfully argue that farming insects has a much lower environmental impact than does raising livestock since bugs are easier to harvest and require a fraction of the water and land space that cattle need. Indeed, the high-protein, low-fat health benefits of bug-eating have long been known. For hundreds of years, crickets, silkworms and even tarantulas have been served roasted, stewed and fried at the dinner tables of many cultures.

Which words best describe the author's attitude toward the "edible insect initiative"?

- A. awe and amazement
- B. interest and support
- C. disgust and distaste
- D. fear and apprehension

5. Long thought to be a case of mistaken identity, the discovery of the Bornean rainbow toad by European explorers in 1924 was recently verified by scientists. The explorers had made a black-and-white sketch of an unusual toad they had found in the jungles of Southeast Asia, christening it the Bornean rainbow toad. Skeptical but curious, scientists recently went to look for the toad—and ended up finding three specimens.

The passage implies which of the following about the Bornean rainbow toad?

- A. Some people doubted the existence of the toad.
- B. Scientists were confident that they would find the toad.
- C. The surviving toads have been relocated to Europe.
- D. No human being had seen the toad since 1924.

6. Television has been the primary source of information and entertainment for most Americans over the last 50 years. However, with Internet use on the rise year after year, some may wonder if surfing the net will soon surpass watching television as Americans' primary leisure activity. Indeed, some recent surveys show that time spent on the Internet is now greater than time spent in front of the television. However, this statistic may not tell the whole story, as 59% of Americans say they multitask, using the Internet and watching TV simultaneously.

The main idea of the passage is that television

- A. is only one of many information sources
- B. may have become less popular than the Internet
- C. is watched by more people now than ever before
- D. focuses more on entertainment than on news

7. Plywood, while not the most pleasing wood to look at, has become an incredibly important building material in house construction. It is flexible, inexpensive, and strong. Its strength is due to layers of thin wood glued on top of each other with the grain of each layer making a right angle with the grain of the layer below it. This way of layering the sheets of wood makes plywood difficult to break.

According to the passage, the arrangement of the layers of thin wood explains plywood's

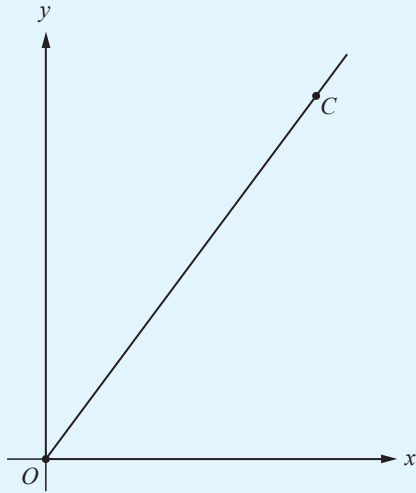
- A. strength
- B. cost
- C. attractiveness
- D. flexibility

8. The 1922 German Expressionist film *Nosferatu*, directed by F. W. Murnau, is considered one of the most influential films in cinematic history—while also being a classic vampire movie. The film is closely based on Bram Stoker's 1897 novel, *Dracula*; however, the villain in the film is called "Count Orlok" rather than "Count Dracula." The reason is that the small studio that produced the film, Prana Film, was unable to secure the rights to Stoker's novel. In fact, shortly after finishing *Nosferatu*, its one and only film, Prana went bankrupt in order to dodge copyright lawsuits from Stoker's widow.

Why does the author say that the vampire in *Nosferatu* is named "Count Orlok" and not "Count Dracula"?

- A. To show that the makers of *Nosferatu* made minor changes to Stoker's novel
- B. To suggest that the characters in *Nosferatu* were based on real people instead of literary characters
- C. To criticize *Nosferatu* for its differences from its source
- D. To praise the makers of *Nosferatu* for their imagination in recreating Stoker's novel

Answer Key

Mathematics and Statistics		
Question Number	Correct Answer	Rationale
1	C	Choice (C) is correct. If $3t - 7 = 5t$, then $5t - 3t = -7$, and $2t = -7$. Therefore, $6t = (3)(2t) = (3)(-7) = -21$.
2	B	Choice (B) is correct. Since the variables x and y are directly proportional, they are related by an equation $y = kx$, where k is a constant. It is given that $y = 2$ when $x = 3$, and so $2 = k(3)$, which gives $k = \frac{2}{3}$. Therefore, $y = \frac{2}{3}x$, and so when $x = 9$, the value of y is $y = \frac{2}{3}(9) = 6$.
3	D	 Choice (D) is correct. The coordinates of point O are $(0, 0)$, and the coordinates of point C are $(6, 9)$. It follows that the slope of the line that contains these two points is $\frac{9-0}{6-0} = \frac{3}{2}$. The y-intercept of any line through point O is 0. Therefore, an equation of the line that contains points O and C is $y = \frac{3}{2}x$.
4	D	Choice (D) is correct. Since there are $3x - 2$ trees planted in each row of the parcel, and a total of $24x - 16$ trees planted in the parcel, it follows that the number of rows in the parcel is $\frac{24x-16}{3x-2}$, which can be rewritten as $\frac{8(3x-2)}{3x-2} = 8$.

5	D	Choice (D) is correct. Let n be the number of sandwiches ordered. Then $18 - n$ was the number of soups ordered. Since the sandwiches cost \$7.75 each, the soups cost \$4.50 each and the total cost of all 18 lunches was \$113.50, the equation $113.5 = 7.75n + 4.5(18 - n)$ holds. Multiplying out this equation gives $113.5 = 7.75n + 81 - 4.5n$, which simplifies to $32.5 = 3.25n$, or $n = \frac{32.5}{3.25} = 10$. Therefore, 10 sandwiches were ordered.
6	B	Choice (B) is correct. A quadratic equation that has both 1 and -3 as solutions is $(x - 1)(x + 3) = 0$. Multiplying this equation out gives the equation $x^2 + 2x - 3 = 0$.
7	A	Choice (A) is correct. The y -intercept of the graph of an equation is the y -coordinate of the point in the xy -plane where the graph intersects the y -axis. Thus the y -intercept can be found by setting $x = 0$ and solving the equation $y = 2(x + 3)(x - 4)$ for y . Therefore, $y = 2(0 + 3)(0 - 4) = -24$ is the y -intercept of the graph of $y = 2(x + 3)(x - 4)$.
8	A	Choice (A) is correct. The expression $x^4 - 1$ is the difference of the squares $x^4 = (x^2)^2$ and $1 = 1^2$, and so it can be factored as $x^4 - 1 = (x^2 - 1)(x^2 + 1)$. The factor $x^2 - 1$ is also a difference of squares, and so $x^4 - 1 = (x^2 - 1)(x^2 + 1) = (x + 1)(x - 1)(x^2 + 1)$.
9	D	Choice (D) is correct. By definition, $(3x^2y^3)^3$ is equivalent to $(3x^2y^3)(3x^2y^3)(3x^2y^3)$. By the commutative law of multiplication, this expression is equivalent to $(3)(3)(3)(x^2x^2x^2)(y^3y^3y^3)$. Since $(3)(3)(3) = 27$, $x^2x^2x^2 = (x \cdot x) \cdot (x \cdot x) \cdot (x \cdot x) = x^6$ and $y^3y^3y^3 = (y \cdot y \cdot y) \cdot (y \cdot y \cdot y) \cdot (y \cdot y \cdot y) = y^9$, it follows that $(3x^2y^3)^3 = 27x^6y^9$.
10	B	Choice (B) is correct. Squaring both sides of the equation $\sqrt{5 - x} = 4$ gives $5 - x = 16$, and so $x = -11$. Substituting -11 for x in the original equation, one can see that -11 is a solution of the equation. Therefore, the value of x is -11 .
11	C	Choice (C) is correct. If $\frac{x-1}{x} = 20$, then $x - 1 = 20x$. It follows that $-1 = 19x$, or $x = -\frac{1}{19}$.
12	C	Choice (C) is correct. The equation $h(t) = 20 - 16t^2 + 32t$ is equivalent to $h(t) = 20 - 16t(t - 2)$. It follows that $h(t) = 20$ when $t = 0$ and $t = 2$. Thus the maximum value of this quadratic function occurs when t is halfway between $t = 0$ and $t = 2$, which is when $t = \frac{2-0}{2} = 1$. Therefore, the maximum height, in feet, of the ball above the ground after it was kicked was $h(1) = 20 - 16(1)^2 + 32(1) = 36$.

13	C	Choice (C) is correct. If the length ℓ of the yard is 18 feet longer than the width w of the yard, then $w = \ell - 18$, and so the perimeter P , which is $P = 2(\ell + w)$, can be rewritten as $2(\ell + \ell - 18) = 2(2\ell - 18)$. Since the perimeter of the yard is 72 feet, it follows that $2\ell - 18 = 36$, and so $\ell = 27$ and $w = 27 - 18 = 9$. Therefore, the area of the yard is $(27)(9) = 243$ square feet.												
14	A	<table><tr><th>City</th><th>High Temperature</th></tr><tr><td>A</td><td>$t^{\circ}\text{F}$</td></tr><tr><td>B</td><td>87°F</td></tr><tr><td>C</td><td>81°F</td></tr><tr><td>D</td><td>62°F</td></tr><tr><td>E</td><td>93°F</td></tr></table> Choice (A) is correct. If the median of the Thursday high temperatures for the five cities was 81°F, then when the five high temperatures are listed in order from greatest to least (or least to greatest), 81°F must be the third temperature in the list. Since the three greatest known high temperatures are 93°F, 87°F and 81°F, the unknown high temperature for City A must be less than or equal to 81°F. Of the given choices, only 85°F is NOT less than or equal to 81°F, and therefore only 85°F could NOT have been the high temperature last Thursday for City A.	City	High Temperature	A	$t^{\circ}\text{F}$	B	87°F	C	81°F	D	62°F	E	93°F
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15	A	Choice (A) is correct. Of the 20 children, 8 are boys and so $20 - 8 = 12$ are girls. Of the boys, 4 have a speaking part in the play, and of the girls, 8 do <u>not</u> have a speaking part in the play, so $12 - 8 = 4$ girls do have a speaking part. Therefore, $4 + 4 = 8$ of the children have a speaking part. It follows that if a child from the cast of the play is chosen at random, the probability that the child has a speaking part is $\frac{8}{20} = \frac{2}{5}$.												