Texas Success Initiative
Sample Questions

CollegeBoard

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
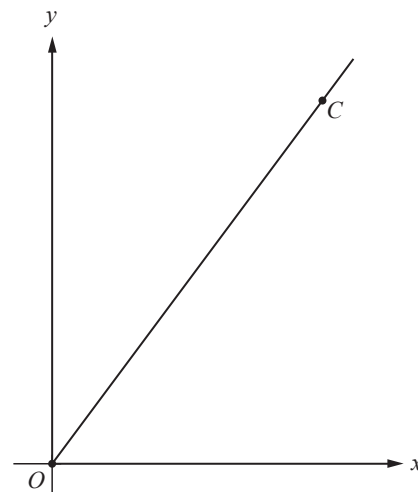
3. In the xy-plane above, point C has coordinates (6, 9). Which of the following is an equation of the line that contains points O and C ?

    A. $y = x - 3$

    B. $y = x + 3$

    C. $y = \dfrac{2}{3}x$

    D. $y = \dfrac{3}{2}x$

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 $\dfrac{x-1}{x}=20$, then $x=$

    A. -21
    B. -19
    C. $-\dfrac{1}{19}$
    D. $\dfrac{1}{21}$

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 wasw 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

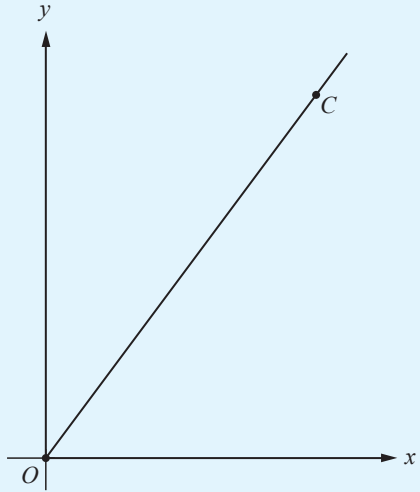| City	High Temperature
A	$t°$F
B	87°F
C	81°F
D	62°F
E	93°F

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 <u>not</u> 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. $\dfrac{2}{5}$

    B. $\dfrac{1}{2}$

    C. $\dfrac{3}{5}$

    D. $\dfrac{3}{4}$

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 $k = \dfrac{2}{3}$. Therefore, $y = \dfrac{2}{3}x$, and so when $x = 9$, the value of y is $y = \dfrac{2}{3}(9) = 6$.
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 $\dfrac{9-0}{6-0} = \dfrac{3}{2}$. The y-intercept of any line through point O is 0. Therefore, an equation of the line that contains points O and C is $y = \dfrac{3}{2}x$.
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 $\dfrac{24x - 16}{3x - 2}$, which can be rewritten as $\dfrac{8(3x - 2)}{3x - 2} = 8$.

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 $n = \dfrac{32.5}{3.25} = 10$. 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, $(3x^2 y^3)^3$ is equivalent to $(3x^2 y^3)(3x^2 y^3)(3x^2 y^3)$. By the commutative law of multiplication, this expression is equivalent to $(3)(3)(3)(x^2 x^2 x^2)(y^3 y^3 y^3)$. Since $(3)(3)(3) = 27$, $x^2 x^2 x^2 = (x \cdot x) \cdot (x \cdot x) \cdot (x \cdot x) = x^6$ and $y^3 y^3 y^3 = (y \cdot y \cdot y) \cdot (y \cdot y \cdot y) \cdot (y \cdot y \cdot y) = y^9$, it follows that $(3x^2 y^3)^3 = 27 x^6 y^9$.
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 $\dfrac{x-1}{x} = 20$, then $x - 1 = 20x$. It follows that $-1 = 19x$, or $x = -\dfrac{1}{19}$.
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 $t = \dfrac{2-0}{2} = 1$. Therefore, the maximum height, in feet, of the ball above the ground after it was kicked was $h(1) = 20 - 16(1)^2 + 32(1) = 36$.

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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	

City	High Temperature
A	$t°F$
B	87°F
C	81°F
D	62°F
E	93°F

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.

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 not 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 $\dfrac{8}{20} = \dfrac{2}{5}$.