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**Academic  
Success Center**

# TSIA MATH TEST PREP

# Texas Success Initiative: Mathematics

The TSI Assessment is a program designed to help Lone Star College determine if you are ready for college-level coursework in the general areas of reading, writing and mathematics. This program will also help determine what type of course or intervention will best meet your needs to help you become better prepared for college-level course work if you are not ready.

## Math Topics Covered:

- Elementary Algebra and Functions
  - Linear equations, inequalities, and systems
  - Algebraic expressions and equations
  - Word problems and applications
- Intermediate Algebra and Functions
  - 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
  - Plane geometry
  - Transformations and symmetry
  - Linear, area and three-dimensional measurements
- Data Analysis, Statistics and Probability
  - Interpreting categorical and quantitative data
  - Statistical measures
  - Probabilistic reasoning

## Approaching Math Word Problems:

- Identify the question being asked
- Be sure to know what the question is asking
- Identify “clue words”
- Develop an advanced plan, with each stage handled by a “math tool”
- Create a diagram, chart, list, graph, etc.
- Make sure information is in the same units

## Free Math Practice Websites:

[www.tsipracticetest.com](http://www.tsipracticetest.com)

[www.khanacademy.org](http://www.khanacademy.org)

[www.math.com](http://www.math.com)

[www.purplemath.com](http://www.purplemath.com)

## FORMULA SHEET

### Properties of Equality

If  $A$ ,  $B$ , and  $C$  represents algebraic expressions, then:

1. If  $A = B$ , then  $A + C = B + C$ .      Addition Property
2. If  $A = B$ , then  $A - C = B - C$ .      Subtraction Property
3. If  $A = B$ , then  $CA = CB$ .      Multiplication Property
4. If  $A = B$ , and  $C \neq 0$  then  $\frac{A}{C} = \frac{B}{C}$ .      Division Property
5.  $C(A + B) = (A + B)C = AC + BC$       Distribution Property

### Strategy for Solving Linear Equation in One Variable

- Eliminate parentheses using the distributive property, and then combine any like terms.
- Use the addition or the subtraction property of equality to write the equation with all variable terms on one side, and all constants on the other side. Simplify each side.
- Use the multiplication or the division property of equality to obtain an equation of the form  $x$  is a constant.

### Strategy for Solving Word Problems

- **Gather and organize information.**  
Read the problem several times, forming a mental picture as you read. *Highlight any key phrases.* List given information, including any related formulas. *Clearly identify what you are asked to find.*
- **Make the problem visual.**  
*Draw and label a diagram* or create a table of values, as appropriate. This will help you see how different parts of the problem fit together.
- **Develop an equation model.**  
*Assign a variable* to represent what you are asked to find and build any related expressions referred to in the problem. Write an equation model based on the relationships given in the problem. *Carefully re-read the problem to double-check your equation model.*
- **Use the model and given information to solve the problem.**  
Substitute given values, then simplify and solve. State the answer in sentence form, and check that the answer is reasonable. Include any units of measure as indicated.

### Special Factorizations

$$x^2 - y^2 = (x + y)(x - y)$$

$$x^2 \pm 2xy + y^2 = (x \pm y)^2$$

$$x^3 - y^3 = (x - y)(x^2 + xy + y^2)$$

$$x^3 + y^3 = (x + y)(x^2 - xy + y^2)$$

A polynomial that cannot be factored is called a *prime polynomial*.

## Linear Equation

- Given the two points  $(x_1, y_1)$  and  $(x_2, y_2)$ , the slope of the line passing through these points is

$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

- Standard form of the equation of a line is given by

$$Ax + By = C$$

- Slope-intercept form of a line is given by

$$y = mx + b$$

- Point-slope form of a line is given by

$$y - y_1 = m(x - x_1)$$

- $x$ -intercept:  $(x, 0)$
- $y$ -intercept:  $(0, y)$
- Two lines are parallel if  $m_1 = m_2$ .
- Two lines are perpendicular if  $m_1 = -\frac{1}{m_2}$ , where  $m_2 \neq 0$ .

## Quadratic Equation

- Standard form of a quadratic equation:

$$ax^2 + bx + c = 0$$

where  $a, b$ , and  $c$  are real numbers with  $a \neq 0$ .

- Quadratic formula is given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- Given that  $f(x) = ax^2 + bx + c$ , where  $a, b$ , and  $c$  are real numbers with  $a \neq 0$ , the vertex of  $f(x)$  is given by the point  $(h, k) = \left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$ .

## Statistics and Probability

- Mean:** The mean of a set of quantitative data is equal to the sum of all the measurements in the data set divided by the total number of measurements in the set.
- Median:** The median is the middle measurement when the measurements are arranged in ascending or descending order.
- Mode:** The mode is the most frequently occurring measurement in a data set.

**Academic  
Success Center****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.

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- If  $3t - 7 = 5t$ , then  $6t =$ 
  - 21
  - 7
  - 21
  - 42
- If variables  $x$  and  $y$  are directly proportional, and  $y = 2$  when  $x = 3$ . What is the value of  $y$  when  $x = 9$ ?
  - 4
  - 6
  - 8
  - 12
- Find the equation of a line passing through  $(6, 9)$  and  $(0, 0)$ .
  - $y = x - 3$
  - $y = x + 3$
  - $y = \frac{2}{3}x$
  - $y = \frac{3}{2}x$
- 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?
  - $21x - 18$
  - $21x - 14$
  - $8x$
  - 8
- 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?
  - 7
  - 8
  - 9
  - 10
- Which of the following equations has both 1 and  $-3$  as solutions?
  - $x^2 - 2x - 3 = 0$
  - $x^2 + 2x - 3 = 0$
  - $x^2 - 4x + 3 = 0$
  - $x^2 + 4x + 3 = 0$

7. In the  $xy$ -plane, what is the  $y$ -intercept of the graph of the equation  $y = 2(x + 3)(x - 4)$ ?
- 24
  - 12
  - 2
  - 12
8.  $x^4 - 1 =$
- $(x + 1)(x - 1)(x^2 + 1)$
  - $(x + 1)^2(x - 1)^2$
  - $(x + 1)^3(x - 1)$
  - $(x - 1)^4$
9.  $(3x^2y^3)^3$
- $3x^5y^6$
  - $9x^6y^9$
  - $27x^5y^6$
  - $27x^6y^9$
10. If  $\sqrt{5 - x} = 4$ , then  $x =$
- 21
  - 11
  - 1
  - 11
11. If  $\frac{x-1}{x} = 20$ , then  $x =$
- 21
  - 19
  - $-\frac{1}{19}$
  - $\frac{1}{21}$
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 is given by the equation  $y(t) = -16t^2 + 32t + 20$ . What was the maximum height, in feet, of the ball above the ground after it was kicked?
- 32
  - 34
  - 36
  - 40
13. The yard behind 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?
- 36
  - 144
  - 243
  - 486

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

14. The table above shows the high temperature last Thursday for five cities, A through E. If the median of the Thursday high temperature for these cities was  $81^{\circ}\text{F}$ , which of the following could NOT have been the high temperature last Thursday for city A?
- $85^{\circ}\text{F}$
  - $75^{\circ}\text{F}$
  - $65^{\circ}\text{F}$
  - $55^{\circ}\text{F}$
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?
- $\frac{2}{5}$
  - $\frac{1}{2}$
  - $\frac{3}{5}$
  - $\frac{3}{4}$

## Supplemental Practice for TSIA Mathematics Test

### Directions for questions 16-40

For each of the questions below, choose the best answer from the four choices given.

#### Variation

16. The variables  $x$  and  $y$  are directly proportional, and  $y = 4$  when  $x = 9$ . What is the value of  $y$  when  $x = 18$ ?

- a. 4
- b. 8
- c. 6
- d. 2

#### Evaluating an algebraic expression

17. Evaluate the expression when  $x = 2$ ,  $y = -3$ , and  $z = -1$

$$2x + 3y - z$$

- a. 4
- b. 14
- c. 5
- d. -4

#### Factor

18.  $25x^2 - 36$

- a.  $(25x + 1)(x - 36)$
- b.  $(5x - 6)^2$
- c.  $(5x + 6)^2$
- d.  $(5x - 6)(5x + 6)$

#### Solve the equation

19.  $4x - 5 + 7(x + 1) = 6x + 7$

- a.  $\left\{-\frac{5}{4}\right\}$
- b.  $\{1\}$
- c.  $\{-1\}$
- d.  $\left\{\frac{5}{4}\right\}$

20.  $\frac{3x+6}{3} - \frac{4x}{x-3} = x$

- a.  $\{1\}$
- b.  $\left\{-\frac{3}{11}\right\}$
- c.  $\{-3\}$
- d.  $\{-1\}$

21.  $\sqrt{x+3} = x - 3$

- a.  $\{6\}$
- b.  $\{6, 13\}$
- c.  $\{1, 13\}$
- d.  $\{1, 6\}$



**Solve the inequality**

22.  $-2x - 1 > -3x + 8$

- a.  $9 < x$
- b.  $7 < x$
- c.  $x < 9$
- d.  $x < 7$

**Solve the equation by the square root property.**

23. For what values of  $x$  does  $(x + 9)^2 - 36 = 0$

- a.  $\{3, 15\}$
- b.  $\{-3, -15\}$
- c.  $\{-\frac{2}{3}, -\frac{4}{5}\}$
- d.  $\{-45\}$

**Solve the equation by the zero-factor property.**

24.  $10x^2 + 23x + 12 = 0$

- a.  $\{\frac{2}{3}, \frac{5}{4}\}$
- b.  $\{\frac{3}{2}, \frac{4}{5}\}$
- c.  $\{-\frac{2}{3}, -\frac{4}{5}\}$
- d.  $\{-\frac{3}{2}, -\frac{4}{5}\}$

**Solve the equation using the quadratic formula.**

25.  $4x^2 + 8x + 1 = 0$

- a.  $\{\frac{-2 \pm \sqrt{5}}{2}\}$
- b.  $\{\frac{-8 \pm \sqrt{3}}{2}\}$
- c.  $\{\frac{-2 \pm \sqrt{3}}{2}\}$
- d.  $\{\frac{-2 \pm \sqrt{3}}{8}\}$

**Solve the problem.**

26. The height of a box is 7 inches. Its length is 6 inches more than its width. Find the length if the volume is 280 cubic inches.

- a. 4 in.
- b. 7 in.
- c. 10 in.
- d. 40 in.

27. A ladder is resting against a wall. The top of the ladder touches the wall at a height of 9 feet. Find the length of the ladder if the length is 3 feet more than its distance from the wall.

- a. 18 ft.
- b. 12 ft.
- c. 9 ft.
- d. 15 ft.

28. If an object is propelled upward from a height of 144 feet at an initial velocity of 128 feet per second, then its height after  $t$  seconds is given by the equation  $y(t) = -16t^2 + 128t + 144$ . After how many seconds does the object hit the ground?
- 9 seconds
  - 8 seconds
  - 4.5 seconds
  - 11 seconds
29. A rocket is propelled upward from the top of a building 210 feet tall at an initial velocity of 112 feet per second. The function that describes the height of the rocket in terms of time  $t$  is  $S(t) = -16t^2 + 112t + 210$ . Determine the time at which the rocket reaches its maximum height.
- 2.8 seconds
  - 3.5 seconds
  - 7 seconds
  - 5.6 seconds
30. If an object is propelled upward from a height of 48 feet at an initial velocity of 96 feet per second, then its height after  $t$  seconds is given by the equation  $y(t) = -16t^2 + 96t + 48$ , where height is in feet. After how many seconds will the object reach a height of 192 feet?
- 1.5 seconds
  - 3 seconds
  - 12 seconds
  - 6 seconds
31. Find the length of a rectangular lot with a perimeter of 82 meters if the length is 5 meters more than the width.
- 41 meters
  - 18 meters
  - 23 meters
  - 46 meters
32. Chuck and Dana agree to meet in Chicago for the weekend. Chuck travels 174 miles in the same time Dana travels 159 miles. If Chuck's rate of travel is 5 mph more than Dana's, and they travel the same length of time, at what speed does Chuck travel?
- 58 mph
  - 52 mph
  - 53 mph
  - 64 mph
33. A triangular shaped lake-front lot has a perimeter of 1800 feet. One side is 100 feet longer than the shortest side, while the third side is 200 feet longer than the shortest side. Find the length of all three sides.
- 600 ft., 700 ft., 800 ft.
  - 600 ft., 600 ft., 600 ft.
  - 100 ft., 200 ft., 300 ft.
  - 500 ft., 600 ft., 700 ft.

34. The sum of the squares of two consecutive integers is 41. Find the integers.
- a. 4, 5 or  $-4, -5$
  - b. 4, 5
  - c. 4,  $-5$
  - d.  $-4, -5$
35. The length of a rectangle is 10 inches more than its width. If 5 inches are taken from the length and added to the width, the figure becomes a square with an area of 196 square inches. What are the dimensions of the original figure?
- a. 4 in. by 14 in.
  - b. 9 in. by 14 in.
  - c. 9 in. by 19 in.
  - d. 14 in. by 14 in.

**Find the probability.**

36. A bag contains 9 red marbles, 2 blue marbles, and 5 green marbles. What is the probability of choosing a blue marble?
- a.  $\frac{5}{16}$
  - b.  $\frac{1}{8}$
  - c.  $\frac{9}{16}$
  - d.  $\frac{2}{11}$
37. A bag contains 7 red marbles, 4 blue marbles, and 1 green marble. What is the probability of choosing a marble that is not blue?
- a.  $\frac{3}{2}$
  - b.  $\frac{2}{3}$
  - c. 8
  - d.  $\frac{1}{3}$
38. A 6-sided die is rolled. What is the probability of rolling a number less than 6?
- a.  $\frac{5}{7}$
  - b. 1
  - c.  $\frac{1}{6}$
  - d.  $\frac{5}{6}$

39. A card is drawn randomly from a standard 52-card deck. You win \$10 if the card is a spade or an ace. What is the probability that you will win the game?
- a.  $\frac{1}{13}$
  - b.  $\frac{13}{52}$
  - c.  $\frac{17}{52}$
  - d.  $\frac{4}{13}$
40. A coin is tossed three times. What is the probability that it lands on tails exactly one time?
- a. 0.125
  - b. 0.375
  - c. 0.33
  - d. 0.25

## Further Supplemental Practice for TSIA MATHEMATICS Test

### Directions for questions 41-50

Show all of your work. Clearly identify your answer.

#### Solve the equation.

41.  $\frac{24}{x-2} + \frac{24}{x+2} = 5$

42.  $(4x - 2)^2 - 4(4x - 2) + 3 = 0$

43.  $x - \sqrt{3x - 2} = 4$

#### Solve the inequality.

44.  $\frac{2x+1}{3} < \frac{x-1}{2} + \frac{1}{6}$

#### Solve the equation by the zero-factor property.

45.  $15x^2 + 26x + 8 = 0$

#### Solve by completing the square.

46.  $2x^2 + 7x + 3 = 0$

#### Solve the equation by using the quadratic formula.

47.  $3x^2 + 12x + 2 = 0$

#### Solve the problem.

48. A piece of machinery is capable of producing rectangular sheets of metal such that the length is three times the width. Furthermore, equal-sized squares measuring 5 in. on a side can be cut from the corners so that the resulting pieces of metal can be shaped into an open box by folding up the flaps. If specifications call for the volume of the box to be 1435 in.<sup>3</sup>, what should the dimensions of the original piece of metal be?
49. A 5% solution of a drug is to be mixed with some 15% solution and some 10% solution to get 20 ml of 8% solution. The amount of 5% solution used must be 2 ml more than the sum of the other two solutions. How many milliliters of each solution should be used?
50. Sam receives the following scores on his English tests: 63, 84, and 96. What average score does he need on the last two tests in order to maintain an 85 average?

## TSI SAMPLE MATHEMATICS QUESTIONS 1-40 ANSWER KEY

1. C
2. B
3. D
4. D
5. D
6. B
7. A
8. A
9. D
10. B
11. C
12. C
13. C
14. A
15. A
16. B
17. D
18. D
19. B
20. C
21. A
22. A
23. B
24. D
25. C
26. C
27. D
28. A
29. B
30. B
31. C
32. A
33. D
34. A
35. C
36. B
37. B
38. D
39. D
40. B