

**Algebra 1** Course Final Exam TE

1. Write a verbal expression for the algebraic expression given below.

$$3x^2 - 2x$$

**three times  $x$  squared minus twice a number  $x$**

2. Evaluate the expression for the given variable.

$$\frac{(9-x)^2+4}{5} \text{ when } x = 3$$

$$= \frac{(9-3)^2+4}{5}$$

$$= \frac{6^2+4}{5}$$

$$= \frac{36+4}{5}$$

$$= \frac{40}{5}$$

$$= 8$$

3. Simplify the expression  $6 + 3[2x - 4(3x - 2)]$ .

$$= 6 + 3[2x - 12x + 8]$$

$$= 6 + 3[8 - 10x]$$

$$= 6 + 24 - 30x$$

$$= 30 - 30x$$

4. Find the solution of the equation given below.

$$7 + (-5x) = -33$$

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$$(-5x) = -33 - 7$$

$$-5x = -40$$

$$x = 8$$

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5. Find the solution of  $\frac{f}{2} = -162$ .

Multiply both sides by 2

$$\frac{f}{2} \times 2 = -162 \times 2 \rightarrow f = -324$$

6. Find the solution of  $18(x + 1) = -54$ .

Divide both sides by 18

$$\frac{18(x+1)}{18} = \frac{-54}{18} \rightarrow x + 1 = -3$$

$$x + 1 - 1 = -3 - 1 \rightarrow x = -4$$

7. Find the value of  $y$  for the value of  $x$  given.

$$3y - 9x = 24 \quad ; \quad x = 3$$

$$3y - 9(3) = 24$$

$$3y = 24 + 27 \rightarrow 3y = 51$$

$$y = 17$$

8. The sale price of a car is depreciated by 15% after one year. If the initial price of the car is 12,000\$, what is the price of the car after one year?

$$15\% \text{ of } 12000 = 0.15 \times 12000 = 1800$$

$$\text{Price of car after 1 year} = 12000 - 1800 = 10200\$$$

9. Graph the inequality  $a \leq -10$ .



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10. Write and solve the inequality.

The sum of a number  $x$  and  $-7$  is less than or equal to  $18$ .

$$x + (-7) \leq 18$$

$$x + (-7) + 7 \leq 18 + 7$$

$$x \leq 25$$

11. Solve the inequality  $-\frac{y}{7} \leq -7$ .

$$-\frac{y}{7}(-7) \geq -7(-7)$$

$$y \geq 49$$

12. Draw a Venn diagram to represent the union and intersection of these sets.

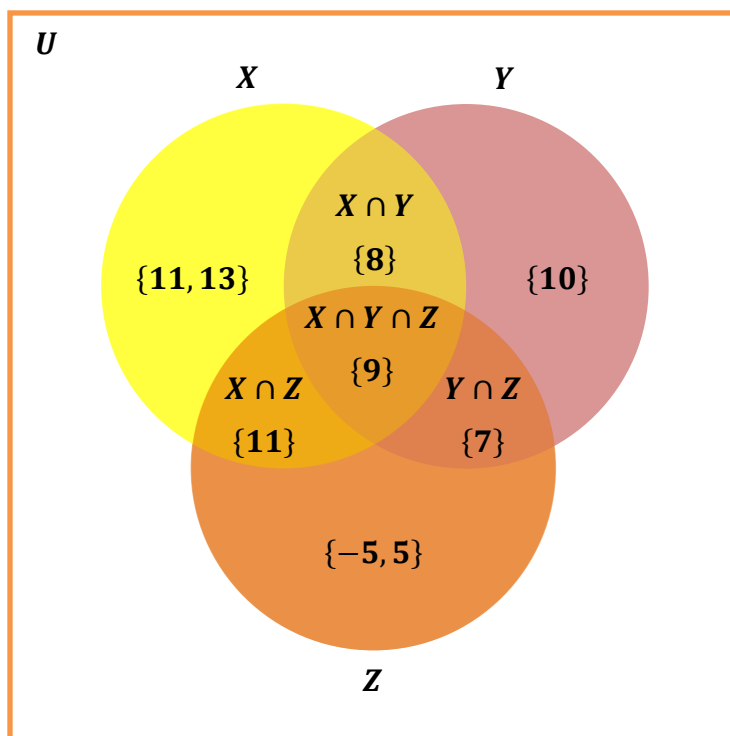
$X = \{8, 9, 11, 13\}$ ,  $Y = \{7, 8, 9, 10\}$  and  $Z = \{-5, 5, 7, 9, 11\}$ . Find  $X \cap Y \cap Z$ .

$$X \cap Y = \{8, 9\}$$

$$X \cap Z = \{9, 11\}$$

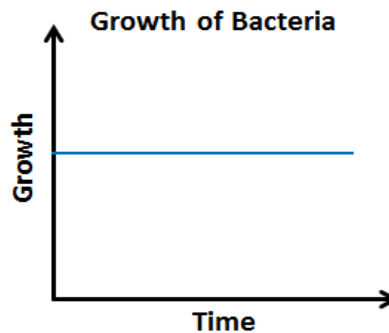
$$Y \cap Z = \{7, 9\}$$

$$X \cap Y \cap Z = \{9\}$$



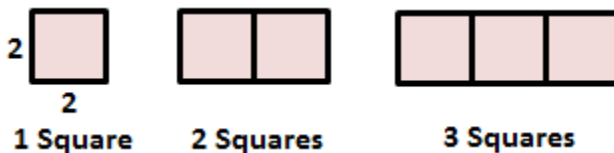
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13. What variables are represented in the graph? Also tell the relationship between the variables.



**Growth and Time, Growth of bacteria remains constant with the increase in time.**

14. For the diagram given below, find the relationship between the number of shapes and the perimeter of the figure they form. Then represent this relationship using words and an equation.



Using words: **The perimeter is 4 more than 4 times the number of squares.**

Using Equation:  **$P = 4n + 4$  ;  $P = \text{Perimeter}$ ,  $n = \text{number of squares}$**

15. The set of ordered pairs represents a function. Write a rule representing the function.

$(-1,2), (0,1), (1,2), (2,5), (3,10)$

Rule:  **$y = x^2 + 1$**

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16. Find the  $n^{\text{th}}$  term in the arithmetic sequence given.

9<sup>th</sup> term in -11, -1, 9, 19, ...

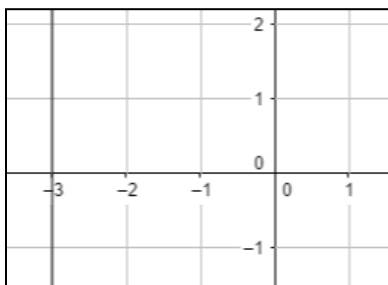
Common difference:  $-1 - (-11) = 10 = 9 - (-1)$

$$a_n = a_1 + (n - 1) \cdot d$$

$$a_9 = -11 + (9 - 1) \cdot 10$$

$$a_9 = -11 + 80 = 69$$

17. Find the slope of the line given below.



$$\text{Slope} = \frac{\text{rise}}{\text{run}}$$

$$\text{rise} = 1, \text{run} = 0$$

$$\text{Slope} = \frac{1}{0} = \text{undefined}$$

18. Assume that  $y$  varies directly with  $x$ . Write an equation relating  $x$  and  $y$ . Also find the value of  $y$  when  $x$  is 18.

$$y = 6 \text{ when } x = 18$$

$$k = \frac{y}{x} = \frac{6}{18} = \frac{1}{3}$$

$$y = \frac{1}{3}x$$

When  $x = 18$

$$y = \frac{1}{3}(18) = 6$$

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19. Write an equation of a line with the given slope  $m$  and y-intercept  $b$ .

$$m = -0.01, b = -100$$

$$y = mx + b$$

$$y = -0.01x - 100$$

20. Write an equation in slope-intercept form of the line that passes through the given point and is perpendicular to the graph of the given equation.

$$(2, 1); y = 2x + 1$$

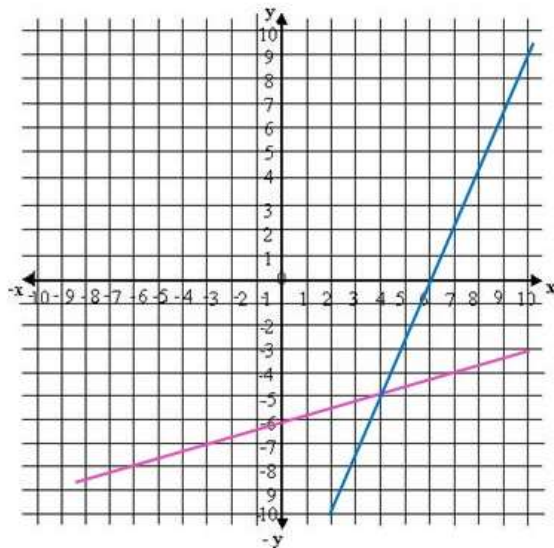
$$\text{Slope of the perpendicular line } m = -\frac{1}{2}$$

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

$$y - 1 = -\frac{1}{2}(x - 2)$$

$$y = -\frac{1}{2}x + 2$$

21. Identify from the graph the solution of the system and determine if it is an independent, Inconsistent or Dependent system.



**Solution (4,-5) , Independent System**

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22. Find the solution of the following system of equation by substitution and determine if it is an independent, inconsistent or dependent system.

$$x = 3y - 1$$

$$3x - y = 2$$

We choose the equation which contains the easiest variable to solve. In this case we select variable “x” from equation I and then substitute it in equation II to find the value of the other variable, like follows:

$$x = 3y - 1$$

Substituting in II:

$$3(3y - 1) - y = 2$$

Applying distributive property:  $9y - 3 - y = 2 \rightarrow 8y = 5 \rightarrow y = 5/8$

Now, we calculate the value of variable “x” by substituting the result of y into the equation  $x = 3y - 1$

$$x = 3\left(\frac{5}{8}\right) - 1 = \frac{7}{8}$$

**Solution (7/8, 5/8). Independent System**

23. Find the solution of the following systems by elimination and determine if it is an independent, inconsistent or dependent system.

$$2x + 4y = -6$$

$$x = 1 - 2y$$

We interchange the “x” or “y” coefficients from equation I and equation II to eliminate one of the variables. In this case, we are going to interchange the “x” coefficients of both equations, like follows:

$$\begin{cases} 1(2x + 4y = -6) \\ -2(x + 2y = 1) \end{cases}$$

As both coefficients have the same sign, we have to assign a negative sign to one of the coefficients so they can eliminate each other

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Applying distributive property:

$$\begin{cases} 2x + 4y = -6 \\ -2x - 4y = -2 \end{cases}$$

The result would be:

$$0 = -8$$

**No Solution. Inconsistent System**

24. Express the following interval as a set.

$$(2, 10)$$

**All x such that x is greater than 2 and less than 10**

$$\{x | x \in R, 2 < x < 10\}$$

25. Simplify:

$$2ab^{-1}c = \frac{2ac}{b}$$

26. Simplify:

$$4a^3 \cdot 2a^{-1} = 8a^2$$

27. Simplify:

$$\sqrt[6]{x^2} = \sqrt[3]{\sqrt{x^2}} = \sqrt[3]{x}$$

28. Find the sum of the first 6 terms of a sequence with the first element of 6 and a common ratio of  $\frac{3}{2}$ .

Solution:

$$S = \frac{a(1 - r^n)}{1 - r}$$

$$S = \frac{6(1 - (1.5)^6)}{1 - 1.5} = \frac{62.34}{0.5} = 124.6875$$

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29. Simplify  $\{-4x - [5x - 2 - (3x + 3) - 6] + 10\} + 2$ .

$$= \{-4x - [5x - 2 - 3x - 3 - 6] + 10\} + 2$$

$$= \{-4x - [2x - 11] + 10\} + 2$$

$$= \{-4x - 2x + 11 + 10\} + 2$$

$$= \{-6x + 21\} + 2$$

$$= -6x + 21 + 2$$

$$= -6x + 23$$

30. Factor the following polynomial.

$$30vuz - 60u^2z - 100uz$$

$$(10 \times 3)vuz - (10 \times 6)u^2z - (10 \times 10)uz$$

GCF:  $10uz$

Answer:  $10uz(3v - 6u - 10)$

31. Simplify  $(x + 4)(2x + 2)$ .

$$2x^2 + 2x + 8x + 8$$

$$2x^2 + 10x + 8$$

32. Factorize  $x^2 - 2nx + 2ax - 4an$  by grouping.

$$(x^2 - 2nx) + (2ax - 4an)$$

$$x(x - 2n) + 2a(x - 2n)$$

$$(x + 2a)(x - 2n)$$

33. Identify the domain and range of the function  $y = 10x^2 + 0.5$ .

Domain: set of all real numbers

Range:  $y \geq 0.5$

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34. Graph the function using the vertex and axis of symmetry.

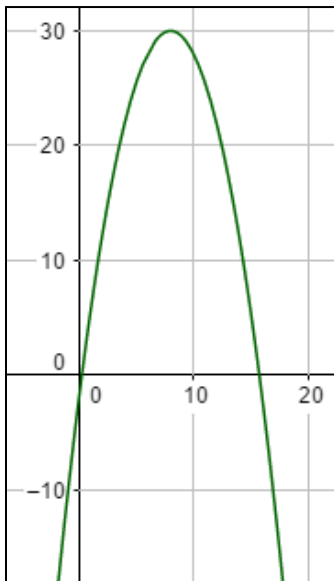
$$f(x) = -\frac{1}{2}x^2 + 8x - 2$$

Axis of symmetry:

$$x = -\frac{b}{2a} \rightarrow -\frac{8}{2(-\frac{1}{2})} = \mathbf{8}$$

Vertex:

$$f(8) = -\frac{1}{2}(8)^2 + 8(8) - 2 = 30 = \mathbf{(8, 30)}$$

35. Solve the equation  $(8t + 4)(3t + 6) = 0$ 

By zero-product property:

$$8t + 4 = 0 \quad \text{or} \quad 3t + 6 = 0$$

$$8t = -4 \quad ; \quad 3t = -6$$

$$t = -\frac{1}{2} \quad ; \quad t = -2$$

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36. Solve the quadratic equation using the quadratic formula.

$$x^2 = 3x + 2$$

$$x^2 - 3x - 2 = 0$$

Here  $a = 1, b = -3, c = -2$

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-2)}}{2(1)}$$

$$x = \frac{+3 \pm \sqrt{9+8}}{2(1)}$$

$$x = \frac{+3 \pm \sqrt{17}}{2} \quad x = \frac{+3 + \sqrt{17}}{2} \quad ; \quad x = \frac{+3 - \sqrt{17}}{2}$$

37. Andy walked 10 miles north and 5 miles west. How far is he from his starting point?

$$x^2 = 10^2 + 5^2$$

$$x^2 = 100 + 25$$

$$x^2 = 125$$

$$x = \sqrt{125} = \mathbf{11.18 \text{ miles}}$$

38. Simplify the following expression.

$$(\sqrt[5]{-243})^2$$

$$= \sqrt[5]{(-3)^{5 \cdot 2}}$$

$$= \sqrt[5]{(-3)^{10}}$$

$$= (-3)^2 = \mathbf{9}$$

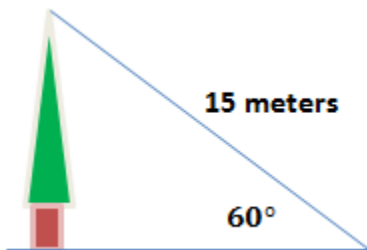
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39. Simplify  $\sqrt{ab}(\sqrt{ab^2} - \sqrt{ab})$ .

$$= \sqrt{a^2b^3} - \sqrt{a^2b^2}$$

$$= ab\sqrt{b} - ab$$

40. A damaged tree is supported by a guy wire 15 meters long. The wire makes an angle of  $60^\circ$  with the ground. Calculate the height at which the guy wire is attached to the tree.



$$\sin 60^\circ = \frac{h}{15 \text{ meters}}$$

$$h = 15 \text{ meters} \times \sin 60^\circ$$

$$h = 15 \text{ meters} \times 0.86$$

$$h = 12.89 \text{ meters}$$

41. Simplify the following.

$$\frac{x^2 + 3x - 4}{x^2 - 16}$$

$$= \frac{(x-1)(x+4)}{(x-4)(x+4)} = \frac{x-1}{x-4}$$

42. Simplify:

$$\frac{3d+6}{d} \times \frac{d}{3d}$$

$$= \frac{3(d+2)}{d} \times \frac{d}{3d} = \frac{d+2}{d}$$

**Algebra 1** Course Final Exam TE**43. Simplify:**

$$\frac{5g-20}{10g} \div \frac{7g-28}{14g^2}$$

$$= \frac{5g-20}{10g} \times \frac{14g^2}{7g-28} = \frac{5(g-4)}{5(2g)} \times \frac{7g(2g)}{7(g-4)} = g$$

**44. Simplify:**

$$\frac{3s+7}{s^2-9} - \frac{s+5}{s^2-9}$$

$$= \frac{3s+7-s-5}{s^2-9} = \frac{2s+2}{s^2-9}$$

**45. Solve for the variable  $a$ .**

$$\frac{a}{12} - \frac{a}{6} = 1$$

$$12\left(\frac{a}{12}\right) - 12\left(\frac{a}{6}\right) = 12$$

$$a - 2a = 12$$

$$-a = 12$$

$$a = -12$$

**46. The time required for two pipes to drain a pool is 10 hours. How long will it take for 5 pipes to drain the same pool?**

Pipes	Time
2	10
5	?

$$10 = \frac{k}{2} \quad k = 20$$

$$t = \frac{20}{5} = 4 \text{ hours}$$

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47. Find the y- intercept of  $f(x) = \frac{4x-2}{x+2}$ .

$$f(0) = \frac{4(0)-2}{(0)+2} = -1$$

48. The following are scores of 13 students in Algebra quiz: 3, 20, 18, 17, 6, 14, 11, 11, 15, 27, 23, 25, and 28. Find the Median and the Mode.

3, 6, 11, 11, 14, 15, 17, 18, 20, 23, 25, 27, 28

**The median is 17**

3, 6, 11, 11, 14, 15, 17, 18, 20, 23, 25, 27, 28

**The mode is 11**

49. A Super market wants to conduct a survey about costumer service; the number of visitor of the super market per week is about 1000 visitor. Find the sample of the population at 5% margin of error.

$$n = \frac{1000}{1+1000(0.05)^2} = \mathbf{285.7 \text{ or } 286}$$

50. There are 10 males and 8 females. How many 5-member committees can be formed if a committee is composed of all male members?

$$n = 10, r = 5$$

$${}_{10}C_5 = \frac{10!}{(10-5)!5!} = \mathbf{25 \text{ committees}}$$