

MATH Placement Practice Test

Math Part A and Math Part B

Overview

There are two parts to the math placement test. Students must earn an 80% or higher on Part A of the test to have the opportunity to continue on to Part B.

Each test takes approximately 60 to 90 minutes to complete. A four-function calculator will be provided for the test.

See the lists below of the content areas for each of the tests.

Part A/Test 1

- Whole Numbers
- Fractions and Mixed Numbers
- Decimals
- Ratios, Rates and Proportions
- Percents
- Measurement
- Geometry
- Concepts in Statistics
- Exponents and Polynomials
- Real Numbers
- Solving Equations and Inequalities

Part B/Test 2

- Solving Equations and Inequalities
- Graphing
- Systems of Equations and Inequalities
- Exponents and Polynomials
- Factoring
- Rational Expressions and Equations
- Radical Expressions and Equations and Quadratic Equations
- Functions

The following pages contain sample test questions and an answer key organized by Part A and Part B. During the practice test and real test experiences, students should use the Math Placement Test Formula Sheet. This will be provided at the testing center.

MATH PART A Practice Test Questions

Whole Numbers

1. You open up a shop in Hawaii and want to offer customers four days of extreme experiences. For the first 2 days the customer chooses one of the following water activities: snorkeling, fishing and water skiing. For the next 2 days, the customer chooses one of the more extreme activities: zip lining, sky diving, rock climbing, and cave exploring. How many of these extreme sports are possible?
 - a. 12
 - b. 7
 - c. 13
 - d. 4
2. Constance wants brand new carpet for her square-shaped bedroom. Her bedroom is 11 ft. by 11 ft. How much carpeting will she need to purchase to cover half of the floor?
 - a. 121 sq. ft.
 - b. 60.5 sq. ft.
 - c. 120 sq. ft.
 - d. 65 sq. ft.

Fractions

3. The Krispy Creme donut's "Hot Now - are ready" sign at three different Krispy Cremes, lights up when the donuts are ready at every 10 minutes, 15 minutes and 20 minutes, respectively. If the time is 9:00pm and donuts are ready at all three shops, when will the signs light up at the same time?
 - a. 30
 - b. 40
 - c. 50
 - d. 60
4. In figure 1, below, there are 3 out of 5 triangles shaded blue. In figure 2, below, there are 6 out of 10 triangles shaded blue. What is the totaled blue shaded triangles between figure 1 and 2. Keep your answer as an improper fraction.
 - a. $\frac{6}{5}$
 - b. $\frac{10}{12}$
 - c. $\frac{9}{15}$
 - d. $\frac{9}{10}$

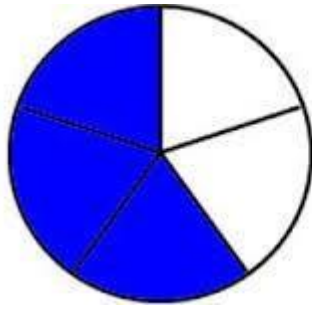


Figure 1

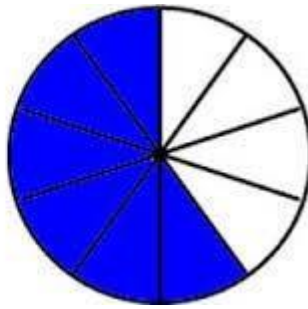


Figure 2

Decimals

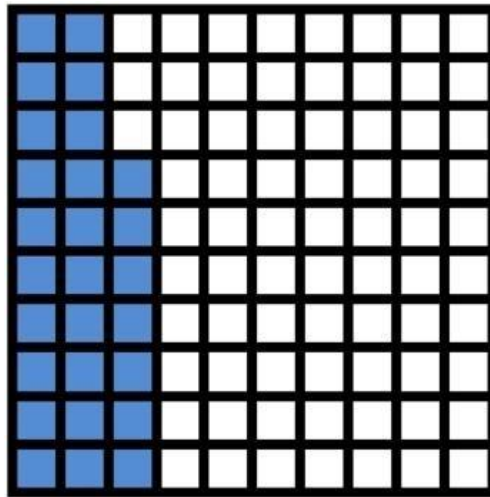


Figure 3

5. In figure 3, above, each square represents $\frac{1}{100}$ of an inch. As a decimal, which one of the following is true?
- Since each square represents $\frac{1}{100}$ of an inch, then the figure is representing 0.2 as an equivalent decimal.
 - Since each square represents $\frac{1}{100}$ of an inch, then the figure is representing 0.27 as an equivalent decimal.
 - Since each square represents $\frac{1}{100}$ of an inch, then the figure is representing 0.25 as an equivalent decimal.
 - Since each square represents $\frac{1}{100}$ of an inch, then the figure is representing 0.23 as an equivalent decimal.

Ratios, Rates, and Proportions

6. A lime sherbet punch can be made from 2 pints of lime sherbet and 4-liters of Ginger Ale. If I triple the Lime Sherbet, how many liters of Ginger Ale will be needed to make the punch?
- 10
 - 11
 - 12
 - 13
7. The following prices for pecans are all in proportion except,
- \$2 per oz. equals \$6 per 3 oz.
 - \$4 per 2 oz equals \$20 per 10 oz.
 - \$9 per 4.5 oz equals \$36 per 18 oz.
 - \$13 per 6 oz equals \$29 per 12 oz.

Percents

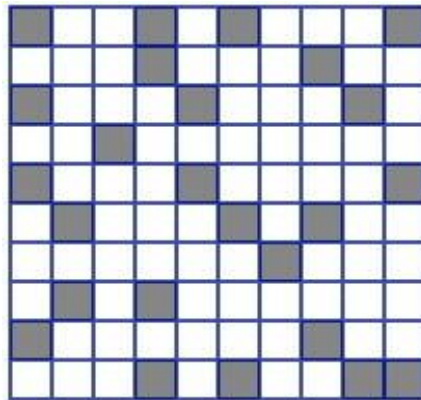


Figure 4

8. In the figure 4 above, what is the percentage of unshaded blocks?
- 60%
 - 65%
 - 70%
 - 75%
9. What is the discount price for a pair of shoes that cost \$ 75.00, if the discount is 25%?
- \$55.00
 - \$56.25
 - \$57.50
 - \$58.00

10. To find the original price, use the formula, Percent x Base = Amount.

What is the original cost of the sofa, if the percent off discount is 40% and the amount is \$165.00?

- a. \$412.50
- b. \$413.36
- c. \$414.45
- d. \$417.18

Measurements

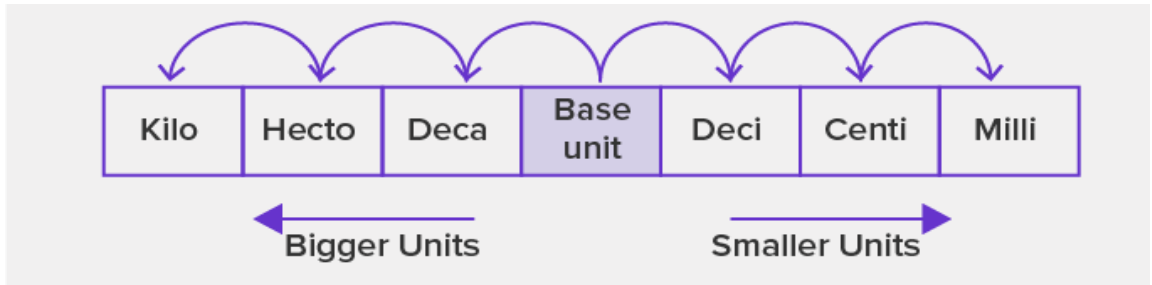


Figure 5

11. In figure 5 above, it is showing the metric system. If the base units are meters, convert 87,000 mm to Km.

- a. 0.87 Km
- b. 0.0087 Km
- c. 0.087 Km
- d. 0.00087 Km

12. Laurence purchased a 200 ml bottle of juice and purchased a second 3-liter bottle of juice. What is the difference in liters between the two juice bottle amounts?

- a. 2.08 L
- b. 2.008 L
- c. 2.8 L
- d. 28 L



Figure 6

13. The figure 6 above shows a digital scale and the weight of Ms. Roberson's grandson, Romiin, in Kilograms (Kg). The digital scale shows a Romiin's weight to be 56.8 Kg.
How many pounds (lbs) is Romiin? (Round to nearest whole number)

- a. 125 *lbs*
- b. 126 *lbs*
- c. 127 *lbs*
- d. 128 *lbs*

Geometry

14. The circumference of a circle is given by the formula, $C = \pi d$, where $\pi = 3.14$. The radius of the tire of a Lexus is 17 inches. Find the circumference of the tire. Round your final answer to the nearest whole number.

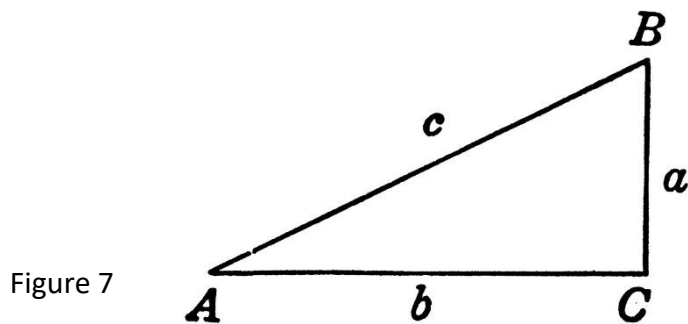
- a. 104 *inches*
- b. 105 *inches*
- c. 106 *inches*
- d. 107 *inches*

15. What is the positive root for $\sqrt{169}$?

- a. -13
- b. -12
- c. 13
- d. 12

16. Given the right triangle below, in figure 7, If side length $a = 3$ and side length $c = 5$, find b , the missing side length.

- a. 1
- b. 2
- c. 4
- d. 6



17. For the figure 8 below, find the perimeter of the polygon.

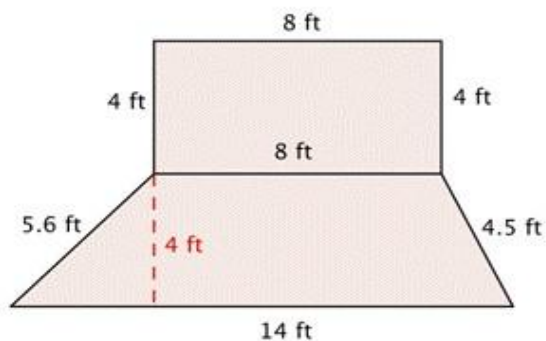
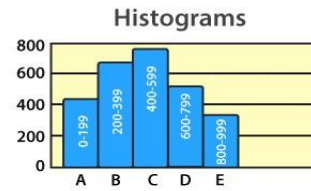
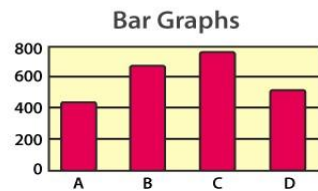


Figure 8

- a. 44.0 ft
- b. 42.3 ft
- c. 40.1 ft
- d. 4102 ft

Concepts in Statistics

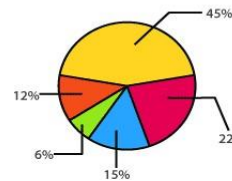
TYPES OF GRAPHICAL REPRESENTATION



Frequency Table

Rulers of France		
Reign (Years)	Tally	Frequency
1-15		18
16-30		11
31-45		6
46-60		4
61-75		1

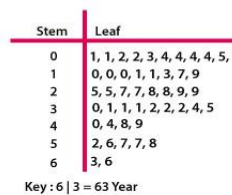
Circle Graph



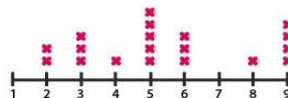
Line Graphs



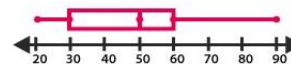
Stem and Leaf Plot



Line Plot



Box and Whisker Plot



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Figure 14

18. The figure 14 above shows types of graphical representations. Which graph records the number of observations in a set of data?
 - a. A Frequency Table
 - b. Line Plot
 - c. Box and Whisker Plot
 - d. Circle Graph
19. Find the mean of the set of 5 of NASCAR Motor speedways' miles: Talladega 2.660, Pocono 2.500, Atlanta, 1.540, Bristol .533 and Lowes (Charlotte) 1.500.
 - a. 1.074 mi.
 - b. 1.07445 mi.
 - c. 1.7466 mi.
 - d. 107046 mi.

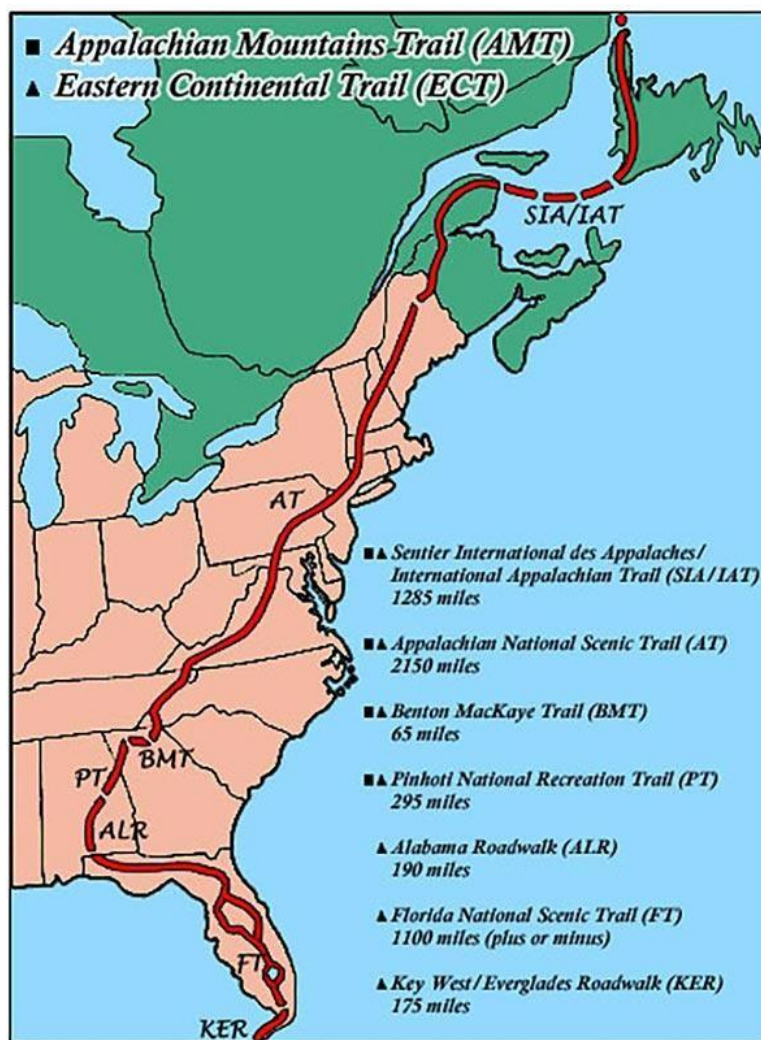


Figure 15

20. In figure 15, the map above of U.S. Top Hiking Trails, what is the mode of the trail's miles?

- a. 0
- b. 1
- c. 2
- d. 3

Exponents and Polynomials

21. Convert 0.00000073 into scientific notation.

- a. 7.3×10^{-5}
- b. 7.3×10^{-6}
- c. 7.3×10^{-7}
- d. 73×10^{-8}

22. The local dairy farm has 3.7×10^3 cows and each cow produces approximately 2.6×10^3 gallons of milk each year. How many gallons of milk are produced at this farm each year? Write your answer in standard form.

- a. 962,000
- b. 9,620,000
- c. 96,200,000
- d. 962

Real Numbers

23. Translate the written sentence into a mathematical expression, then simplify.

“8 times the quantity of 3 squared minus 6, divided by 4.”

- a. 6
- b. 7
- c. 8
- d. 9

24. Simplify. $\sqrt{36} + |-50| - (-70 + 35)$.

- a. 88
- b. 89
- c. 90
- d. 91

25. Translate and evaluate the expression, x divided by 4 plus 9, if $x = 4$.

- a. 11
- b. 10
- c. 9
- d. 8

26. Simplify the expression. $4^2 - 5^2$.

- a. -9
- b. 9
- c. 10
- d. -10

27. Simplify the expression. $\left(\frac{15}{6} - \frac{9}{6}\right) - \left(\frac{8}{9}\right)^0$

- a. 4
- b. 2
- c. 1
- d. 0

28. Write -6^3 in expanded notation and evaluate.

- a. 216
- b. 18
- c. -216
- d. -18

Solving Equations and Inequalities

29. Solve the equation for x , given $x + (-9) = 26$.

- a. $x = 31$
- b. $x = 32$
- c. $x = 34$
- d. $x = 35$

30. Solve the equation below for y , given $41 - y = 90$.

- a. $y = -49$
- b. $y = -48$
- c. $y = -47$
- d. $y = -46$

31. Solve the equation, $7x + 11 = -73$.

- a. 12
- b. 13
- c. -13
- d. -12

MATH Part A Answers and Explanations

Whole Numbers and Fractions

Question Number	Correct Answer	Explanation
1	a	This problem uses the basic principle of multiplication. The shop offers 3 different activities for 2 days to choose from and offers 4 more different activities for the next 2 days. Since the question wants to know how many extreme sports are possible, and since there are 3 on one experience and 4 on the others, then $3 \times 4 = 12$. There are 12 possible extreme activities to choose from.
2	b	This problem uses the formula for the area of a rectangle, $A = l \times w$. In this case, the shape of the room is a square. So, the formula is modified, and the area of a square is $A = s \times s$. To cover only half of the floor divide by 2. $A = 11 \times 11 = 121 / 2 = 60.5$ sq. ft.
3	d	Applying Least Common Multiples (<i>lmc</i>) will solve this problem. For example, at one Krispy Kremes, the sign will light up every 10, 20, 30, 40, 50, 60 minutes. At the next donut shop every 15, 30, 45, 60 minutes. Lastly, at the third shop every 20, 40, 60 minutes. So, when the sign "Hot Now - are ready" lights up at the same 9:00pm, it will be in every 60 minutes. The <i>lcm</i> for 10, 15, and 20 is 60.
4	a	We can write figures 1 and 2 as fractions, $\frac{3}{5}$ and $\frac{6}{10}$. In order to add these two fractions, the denominators must be the same. You will need to find the Greatest Common Denominator (GCD) between 5 and 10. Finding the multiples of 5, by counting by 5's: 5, 10, 15, and so on. Finding the multiples of 10, by counting by 10's: 10, 20, 30, and so on. Looking at the multiples of 5 and 10, 10 appears to be what both numbers have in common. Now we can use 10 to be the new denominator for each fraction. Since there is a new denominator, there should be a new numerator. The steps are as follows: $\frac{3}{5} + \frac{6}{10} = \frac{6}{10} + \frac{6}{10} = \frac{12}{10} = \frac{6}{5}$ To change $\frac{3}{5}$ to $\frac{6}{10}$, you will change 5 to the (gcd), 10, by multiplying the denominator and numerator by 2, since $5 \times 2 = 10$. Once the denominators are the same, adding the numerators, ONLY, gives the $\frac{12}{10}$. Now simplifying gives $\frac{6}{5}$. Notice that the numerator is larger than the denominator. Since this is an improper fraction, we can say that this is the total between both figures 1 and 2.

Decimals

Question Number	Correct Answer	Explanation
5	b	Since each square is $1/100$. Counting squares that are blue, there are 27. So, we can write this as a fraction, $27/100$. $27/100$ can be written as 27 hundredths. Then writing as an equivalent decimal, 0.27.
6	c	There are two ratios, 2 pints :4 liters and 6 pints (2 x 3, tripled the amount of sherbet): L liters. Using proportions, and setting the two ratios equal to each other, it follows, $\frac{2}{4} = \frac{6}{L}$ By cross multiplying, $2 \cdot L = 4 \cdot 6$. Multiplying both sides gives, $2L = 24$. Solving for L, by dividing both sides by 2, gives, $L = 12$. So, it will take 12 liters of Ginger Ale for 6 pints of Lime Sherbet.
7	d	To see if two ratios are in proportion, first make sure we are working with the same units, dollars to ounces. Then we set the two ratios equal to each other. Take the cross products of the numerator to denominator which must equal. This shows proportions. The multiple-choice answers that are in proportion are a, b, and c. d is not in proportion because, $13 \times 12 = 6 \times 29$ does not equal the same number. Therefore, the prices are not in proportion to each other.

Percent

Question Number	Correct Answer	Explanation
8	d	By simply counting the unshaded blocks, there are 75 out of 100 blocks, unshaded. This represents 75% unshaded blocks.
9	b	To find the discount price, you first multiply the discount rate x the original price. So, multiply, $75.00(.25) = \$18.75$, remember to change your percent to a decimal by dividing by 100. Therefore, by subtracting \$18.75 from the original price of \$75.00, equals the discount price of \$56.25.
10	a	Following the formula, $0.40 s = 165.00$, where s is the unknown original price. Solving for s, by dividing by 0.40 on both sides, gives the original price to be \$412.50.

Measurements

Question Number	Correct Answer	Explanation
11	c	Start counting from the decimal in the smaller unit, 87,000 mm and move 6 spaces to the left until you get to Km. Now move the decimal, in the number 87,000, 6 places to the left also. Since this is a whole number, the decimal is behind the last zero in 87.000 mm. The conversion is equal to 0.087Km.
12	c	The two bottles must be in the same metric units. Convert 200ml to liters. Using the figure 5 above, this gives 0.2 L. Therefore, to find the difference, subtract, 0.2 from 3 and get, 2.8 L.
13	a	Converting 56.8 Kg to pounds by multiplying by 2.2, (1 kg = 2.2 pounds), therefore, Romiin weighs 124.96 pounds. Rounding to the nearest whole number, the answer is 125 lbs.

Geometry

Question Number	Correct Answer	Explanation
14	d	The diameter of the tire is 2 times the radius , so 17 times 2 is 34 inches. Using the formula $C = \pi d$ and using $\pi = 3.14$, then $C = 3.14 (34) = 106.76$. Rounding 106.76 to the nearest whole number, which is 6. The number behind 6 is 7, therefore, round 6 up to 7, the rounded number is 107. So, the circumference of the Lexus tire is 107 inches.
15	c	Taking the square root of $\sqrt{169} = \pm 13$. So, the positive root is +13.
16	c	To find the missing side, b, use the Pythagorean theorem formula, $a^2 + b^2 = c^2$. Replace a and c in the formula, with its respective given values. Therefore, $3^2 + b^2 = 5^2$. Simplify, $9 + b^2 = 25$. Next, subtract 9 from both sides, $b^2 = 25 - 9$ to get $b^2 = 16$, take the square root of both sides, to get $b = 4$.
17	c	To find the perimeter of the polygon, add all sides around the outside of the shape. So, $P = 4ft + 8ft + 4ft + 4.5ft + 14ft + 5.6ft = 40.1 ft$.

Concepts in Statistics

Question Number	Correct Answer	Explanation
18	a	A frequency table is the answer. It shows the number of times each data occurs by tally marks.
19	c	Adding all the values and divide by 5 is 1.7466. This is the mean.
20	a	There is no re-occurrence of numbers (miles).

Exponents and Polynomials

Question Number	Correct Answer	Explanation
21	c	Scientific notation is written in the form of $a \times 10^n$ where a is a number greater than or equal to 1 and less than 10, and n is an integer that indicates the power of ten by which a is multiplied. The decimal place must be moved to the right 7 places to get the a to be between 1 and 10. This makes $a = 7.3$ and since the decimal was moved to the right, the power is the negative integer of how many places you moved the decimal. This makes $n = -7$.
22	b	Multiply the two given values together $(3.7 \times 10^3)(2.6 \times 10^3)$. Multiply $(3.7)(2.6) = 9.62$, then add your powers together $3 + 3 = 6$. This will give you 9.62×10^6 . Now, convert to standard form by moving the decimal place in 9.62 to the right 6 times and placing zeros as place holders as you move. $9.62 \times 10^6 = 9,620,000$.

Real Numbers

Question Number	Correct Answer	Explanation
23	a	Translated as a mathematical expression, denoted as, $8(3^2 - 6) \div 4$. Following PEMDAS, $8(9 - 6) \div 4$, $= 8(3) \div 4$, $= 24 \div 4$ $= 6$.

24	d	Following PEMDAS, and look for representation of parentheses, working from left to right, $\sqrt{36} + -50 - (-35)$ take the square root of 36, then take the absolute value of -50 . Continuing PEMDAS, left to right you add then subtract -35 . $= 6 + 50 + 35$ $= 56 + 35$ $= 91$
25	b	Choosing b is the correct answer. Translated, we have, $\frac{x}{4} + 9$. Since $x = 4$, substitute into the translated expression to get $\frac{4}{4} + 9 = 1 + 9 = 10$.
26	a	By following orders of operations, and working from left to right, take the square of 4, by multiplying 4 times 4, and the same for 5 squared. Then subtract the two from each other, as follows: $16 - 25 = -9$.
27	d	Following orders of operations and working in parentheses first, subtracting the fractions gives, $\frac{15-9}{6} = \frac{6}{6} = 1$. Now raising $\frac{8}{9}$ to the zero power is 1. So, $1 - 1 = 0$.
28	c	The expanded form of -6^3 is written as $-(6 \cdot 6 \cdot 6) = -[216] = -216$. The expanded notation of -6^3 is not $(-6)(-6)(-6) = -216$. That would be the expanded notation for $(-6)^3$. Although the answer is the same, the number is a positive 6 and not a negative 6.

Solving Equations and Inequalities

Question Number	Correct Answer	Explanation
29	d	Using the Addition property of Equality to solve for x , add 9 (opposite of -9) to both sides. This is a one-step equation, so the solution for $x = 35$.
30	a	Using the Addition property of Equality to solve for y , subtract 41 (opposite of -41) from both sides. This gives, $41 - 41 - y = 90 - 41$. Simplify both sides to get $-y = 49$. Now divide both sides by -1 . The solution for $y = -49$.
31	d	Using the Addition property and multiplication property of Equality, this a two-step equation. So, $7x + 11 = -73$, $7x + 11 - 11 = -73 - 11$, $7x = -84$, and $x = -12$.

MATH PART B Practice Test Questions

Solving Equations and Inequalities

1. Solve the equation below for x , given $x + (-9) = 26$.
 - a. $x = 31$
 - b. $x = 32$
 - c. $x = 34$
 - d. $x = 35$

2. Solve the equation below for y , given $41 - y = 90$.
 - a. $y = -49$
 - b. $y = -48$
 - c. $y = -47$
 - d. $y = -46$

3. Solve: $7x + 11 = -73$.
 - a. $x = 12$
 - b. $x = 13$
 - c. $x = -13$
 - d. $x = -12$

4. Solve: $3y - 2 = 6 - 4y$.
 - a. $y = 7/8$
 - b. $y = 56$
 - c. $y = 8/7$
 - d. $y = 8$

5. Which equation shows the equivalence of a solution that would be all real numbers?
 - a. $x = 1$
 - b. $x = -1$
 - c. $0 = 0$
 - d. $2 = 3$

6. Which equation matches the information, *Henry's appetite is twice as big as Guy's*?
 - a. $2(G) = H$
 - b. $G \times H = 2$
 - c. $H(2) = G$
 - d. $2 + G = H$

7. In question #6 above, if Guy can eat 2 full racks of baby back ribs, how many full racks of baby backs can Henry eat?
- 3
 - 4
 - 5
 - 6
8. The diagram below, in figure 9, shows 4 graphs of inequalities.
- Which graph shows $-1 < x \leq 3$?

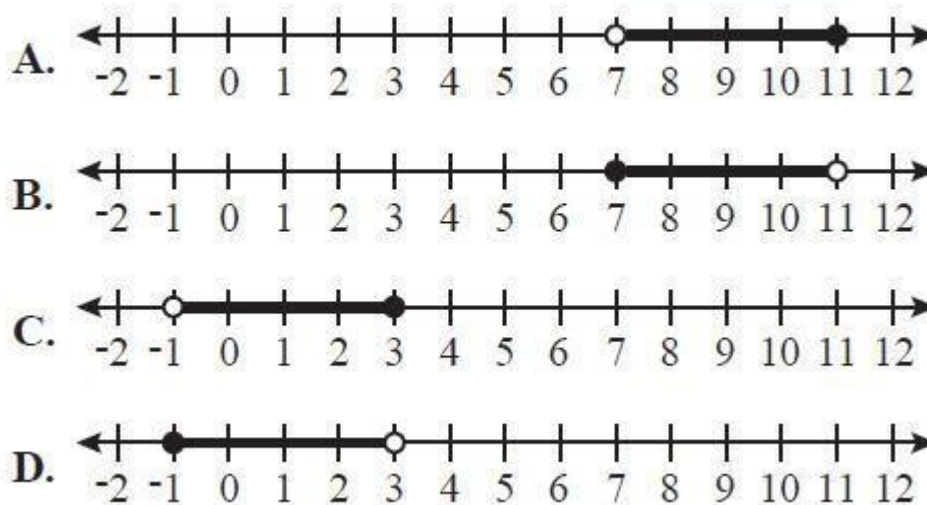


Figure 9

9. An iguana has to keep its temperature between 75 degrees and 95 degrees (Fahrenheit). Write this as an inequality.
- $\{x|x > 75\}$ and $\{x|x < 95\}$
 - $\{x|x < 95\}$
 - $\{x|x > 75\}$
 - $\{x|x > 95\}$ and $\{x|x < 75\}$
10. Solve for h given the inequality $h - 28 > 28$. Solving the inequality, the graph will be _____ circle? (Fill in the blank)
- Closed
 - Open
 - Out
 - In

Graphing

11. The coordinate plane allows us to plot points. These points are represented by ordered pairs, (x, y) . x is called the domain and y is called the range. Given the following ordered pairs,

$(1, 2), (4, 6), (8, 10), (12, 14)$.

What are the numbers in the set of x domain?

- a. $\{2, 6, 10, 14\}$
- b. $\{1, 4, 8, 12\}$
- c. $\{1, 6, 8, 14\}$
- d. $\{2, 4, 6, 8\}$

12. Sponge Bob is drawn below in figure 10 on the coordinate plane. What quadrant is his red tie in?

- a. I
- b. II
- c. III
- d. IV

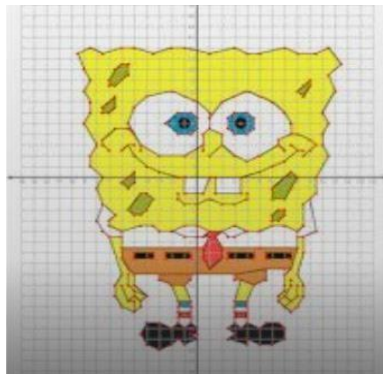


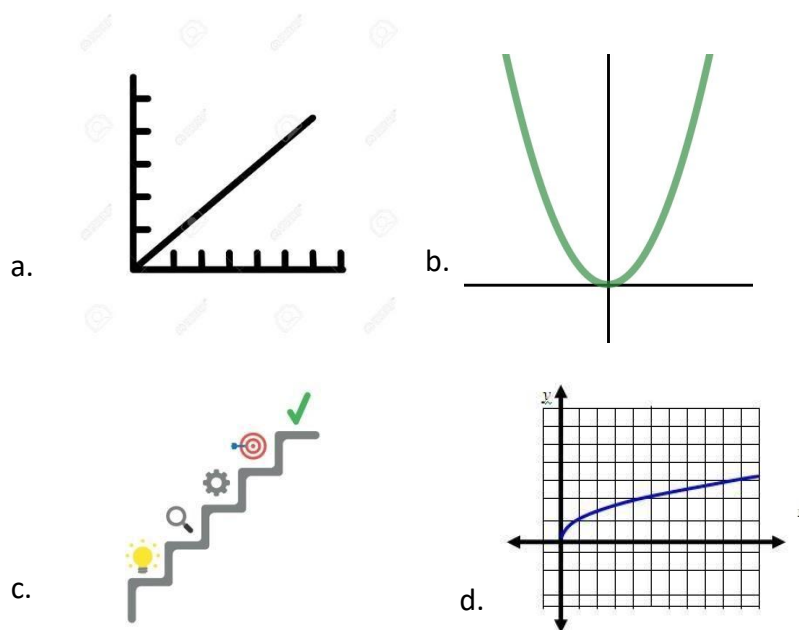
Figure 10

13. What quadrant will you find the ordered pair $(-8, 10)$? Use the table of ordered pairs below.

Given (x, y)	X	Y	Quadrant
$(-1, -6)$	-1	-6	III
$(4, 9)$	4	9	
$(-8, 10)$	-8	10	?
$(13, -5)$	13	-5	IV

- a. I
- b. II
- c. III
- d. IV

14. Which of the graphs below represents a linear equation?



15. In Figure 11 below, the slope of a line is defined as the ratio, rise: run. What would be the slope for a line with a ratio 3: 6?

- a. Slope is $\frac{3}{6}$. b. Slope is $\frac{1}{2}$. c. Slope is $\frac{6}{3}$. d. Slope is $\frac{2}{1}$

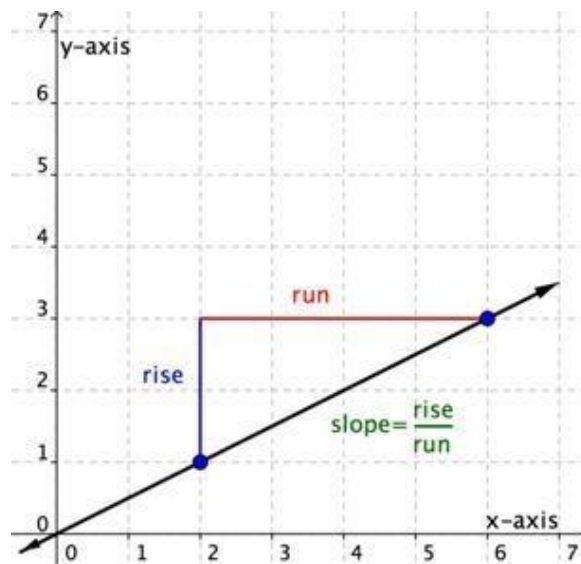


Figure 11

16. In Figure 12 below, which statement is correct?

- a. Line b is a transversal line to a and d.
- b. Lines a is a transversal line to b and c.
- c. Line a is perpendicular to line b.
- d. Line a is parallel to line b.

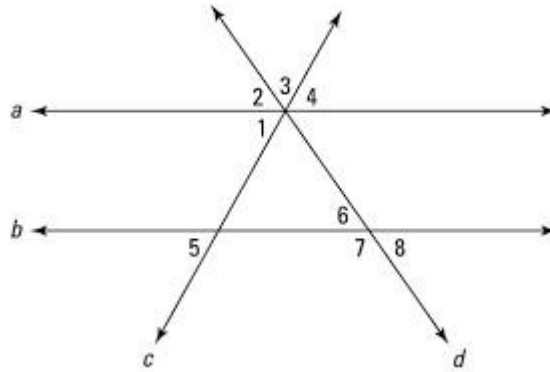


Figure 12

17. The formula, Slope-Intercept, is written, $y = mx + b$, is used to identify the slope and y-intercept of a line. Which variable in the formula represents the slope?

- a. y
- b. b
- c. x
- d. m

18. Determine whether the lines, $y = 7x - 9$ and $y = 7x + 5$ are parallel, perpendicular, or equal?

- a. The lines are not parallel.
- b. The lines are equal (same line).
- c. The lines are parallel.
- d. The lines are perpendicular.

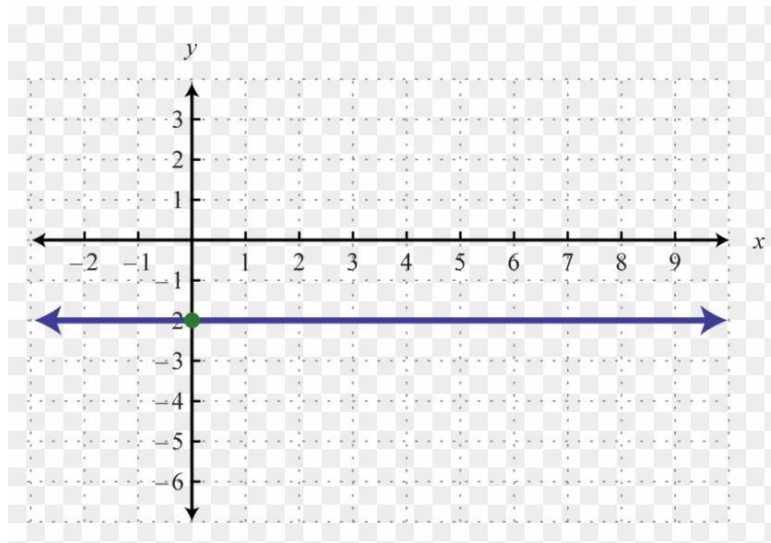


Figure 13

19. In the Figure 13 above, what is the slope of the line that passes through the point $(0, -2)$ and $(4, -2)$ on the graph?
- $m = 6$
 - $m = 4$
 - $m = 2$
 - $m = 0$

Systems of Equations and Inequalities

20. Solve the system of equations by substitution. $\begin{cases} y - 2x = 3 \\ 3x - y = 5 \end{cases}$
- $(1.6, -0.2)$
 - $(5, 13)$
 - $(0.4, 3.8)$
 - $(8, 19)$
21. Luca and William are playing a video game, and they have scored a total of 20,000 points. Luca scored 1,000 more points than William. If you let L = the number of points that Luca scored, and W = the number of points that William scored, then the problem can be represented by the system: $\begin{cases} L + W = 20,000 \\ L = W + 1,000 \end{cases}$

Graph the system. How many points did each score?

- William = 8,000 and Luca = 12,000
- William = 9,500 and Luca = 10,500
- William = 1,000 and Luca = 19,000
- William = 10,500 and Luca = 9,500

Exponents and Polynomials

22. Evaluate the expression $-(3x^{-3})$, where $x = 2$.

- a. $1/8$
- b. $-3/8$
- c. $-5/8$
- d. $7/8$

23. Given the polynomial expression $6x^4 + 5x + 1$, an example of a constant would be:

- a. 5
- b. 1
- c. 6
- d. 4

24. Add. $(-7x^7 + 5x^4 - 4x - 8) + (11x^7 - 10x^5 + 2x^4 + 4x - 9)$.

- a. $4x^7 - 10x^5 + 7x^4 - 17$
- b. $4x^7 - 10x^5 + 7x^4 + 17$
- c. $4x^7 + 10x^5 + 3x^4 - 17$
- d. $-7x^7 - 10x^5 + 7x^4 - 17$

25. Consider a polygon, whose side lengths are described by $(x + 3)$, $(x + 7)$, $2x$, $8x$, $(-6x - 8)$, *respectively*. Find the perimeter.

- a. $5x + 1$
- b. $3x - 8$
- c. $2x + 6$
- d. $6x + 2$

$$-8x^4 + 5x^2 + 4x - 7$$



Figure 16

26. In figure 16 above, the square has a side length described by a polynomial expression $-8x^4 + 5x^2 + 4x - 7$. How many terms are this polynomial?

- a. 1
- b. 2
- c. 3
- d. 4

Factoring

27. Completely factor the following polynomial by first factoring out the GCF and then factoring the resulting trinomial: $x^5 - 7x^4 + 12x^3$.
- a. $6x^4$
 - b. $x^5(x + 3)(x - 4)$
 - c. $x^3(x^2 - 7x + 12)$
 - d. $x^3(x - 4)(x - 3)$
28. Factor completely. $18y^2 - y - 4$
- a. $(3y + 4)(6y - 1)$
 - b. $(2y - 2)(9y - 2)$
 - c. $(2y - 1)(9y + 4)$
 - d. $(2y - 4)(9y + 1)$
29. Factor completely. $9x^2 - 49$
- a. $(3x - 7)(3x - 7)$
 - b. $(9x - 1)(40x + 1)$
 - c. $(3x + 7)(3x + 7)$
 - d. $(3x + 7)(3x - 7)$
30. Find the factor that $5y^2 + 33y - 14$ and $10y^2 - 9y + 2$ have in common.
- a. $2y - 1$
 - b. $5y - 12$
 - c. $5y - 2$
 - d. $y + 7$
31. Solve for x : $x^2 + 17x + 50 = -20$
- a. $x = 10$ or $x = 7$
 - b. $x = 88$
 - c. $x = -10$ or $x = 7$
 - d. $x = -10$ or $x = -7$
32. A rectangular sheet of paper has an area of 85 in^2 . If the length of the paper is $1\frac{1}{2} \text{ in}$ more than the width, what are the dimensions of the sheet of paper?
- a. Width = $8\frac{1}{2} \text{ in}$ and Length = 10 in
 - b. Width = 8 in and Length = $10\frac{1}{2} \text{ in}$
 - c. Width = 5 in and Length = 17 in
 - d. Width = $15\frac{1}{2} \text{ in}$ and Length = 17 in

Rational Expressions and Equations

33. Divide and simplify. $\frac{x^2-3x-28}{x-11} \div \frac{x^2+x-56}{x-11}$

a. $\frac{-2x-86}{x-11}$

b. $\frac{-1}{(x-11)^2}$

c. $\frac{x+4}{x+8}$

d. $\frac{1}{2}$

34. Simplify and express the result in simplest form. $\frac{8y}{3x} - \frac{6y^2}{x^2} + \frac{10y^3}{3}$

a. $\frac{2xy(4x-3y+5xy)}{3}$

b. $\frac{2y(4x-9y+5x^2y^2)}{3x^2}$

c. $\frac{12y^2}{5x}$

d. $2\frac{2}{3} \cdot \frac{y}{x} - 6 \cdot \frac{y^2}{x^2} + 3\frac{1}{3} \cdot y^3$

35. Solve for x . $\frac{2-x}{10} = \frac{x}{5}$

a. $x = -1$

b. $x = \frac{2}{3}$

c. $x = \frac{1}{2}$

d. $x = 0$

36. The time it takes to travel a particular distance varies inversely as the speed traveled. If it takes a person 15 hours to travel from point A to point B at a speed of 60 miles per hour, how long will it take to travel from point A to point B at 75 miles per hour?

a. 12 hours

b. 30 hours

c. 10 hours

d. 18.75 hours

Radical Expressions and Equations and Quadratic Formula

37. The formula for the volume of a sphere is $V = \frac{4}{3}\pi r^3$, where V is the volume and r is the radius of the sphere. Solve the formula for r .

a. $r = \frac{V}{4\pi}$

b. $r = \frac{4\pi}{V}$

c. $r = \sqrt[3]{\frac{V - \frac{4}{3}}{\pi}}$

d. $r = \sqrt[3]{\frac{3V}{4\pi}}$

38. John and his little brother Kevin have a job that requires them to rake and bag leaves at a large house in their neighborhood. Suppose it takes John 2 hours to do the job alone and Kevin 3 hours to do the job alone. At these rates, how long will it take both boys to complete the job together?

- a. 5 hours
- b. 1.25 hours
- c. 1 hour
- d. 1.2 hours

39. Simplify: $\sqrt{x^4 y^6 z^9}$, $z \geq 0$

- a. $x^2 y^3 z^4 \sqrt{z}$
- b. $(2x)(3y)(4\frac{1}{2}z)$
- c. $x^2 |y^3| z^4 \sqrt{z}$
- d. $x^8 y^{12} z^{18}$

40. Simplify: $\sqrt{3b}(5\sqrt{3b} - \sqrt{12b^7})$, $b \geq 0$

- a. $15b - 6b^4$
- b. $3b^3 \sqrt{3b}$
- c. $6b - 15b^2$
- d. $3b^2 - \sqrt{3b}$

41. Simplify: $\sqrt[3]{54b^8c^9}$

a. $3b^2c^3\sqrt[3]{2b^2}$

b. $3b^4c^4\sqrt{6c}$

c. $162b^{24}c^{27}$

d. $18b^2c^3\sqrt[3]{b^2}$

42. Rationalize the denominator and simplify the result. $\frac{6+\sqrt{10}}{\sqrt{5}}$

a. $\frac{11\sqrt{5}}{25}$

b. $\frac{11\sqrt{10}}{5}$

c. $6 + \sqrt{2}$

d. $\frac{6\sqrt{5}+5\sqrt{2}}{5}$

43. Solve for x : $-4\sqrt{11+x} + 15 = 3$

a. $x = \sqrt{13}$

b. $x = -2$

c. $x = 2$

d. $x = -13$

44. Solve for x using the Quadratic Formula: $5x^2 - 2 = 12x$

a. $6 + \sqrt{46}$ or $6 - \sqrt{46}$

b. $\frac{6}{5} + \frac{\sqrt{46}}{5}$ or $\frac{6}{5} - \frac{\sqrt{46}}{5}$

c. $\frac{2}{5}$ or $-\frac{2}{5}$

d. $\frac{5}{12}$ or $-\frac{5}{12}$

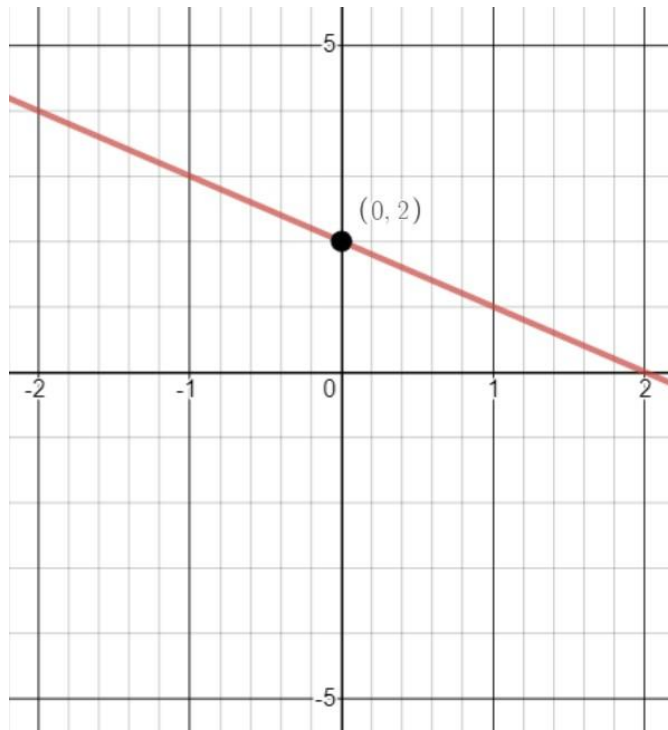
45. Use the discriminant to determine the number and type of solutions to the following quadratic equation. $7x^2 - 3x + 1 = 0$
- a. One real solution
 - b. Two real solutions
 - c. No solutions
 - d. Two complex solutions

Functions

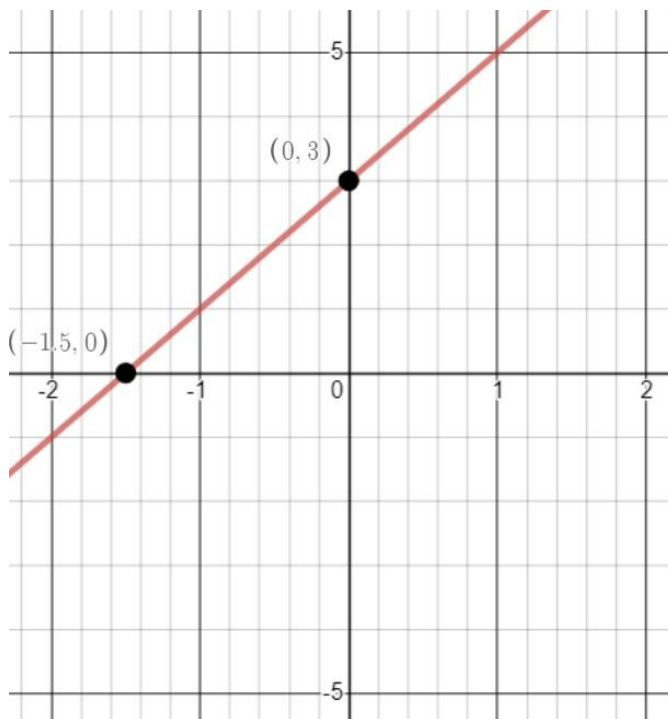
46. What is the domain and range of the following function? $\{(5, -8), (9, 2), (15, 2), (19, -8), (7, 0)\}$
- a. Domain: $\{-8, 0, 2\}$
Range: $\{5, 7, 9, 15, 19\}$
 - b. Domain: $\{5, 7, 9, 15, 19\}$
Range: $\{-8, 0, 2\}$
 - c. Domain: $\{5, 7, 9, 15, 19\}$
Range: $\{-9, -8, 0, 2, 2\}$
 - d. Domain: $\{5, 7, 9, 11, 13\}$
Range: $\{-8, -4, -2, 0, 2\}$
47. What is the domain and range of the function $f(x) = \sqrt{x}$
- a. Domain: $x > 0$
Range: $f(x) > 0$
 - b. Domain: $x > 0$
Range: All real numbers
 - c. Domain: $x \geq 0$
Range: $f(x) \geq 0$
 - d. Domain: All real numbers
Range: All real numbers

48. Graph: $f(x) = -2x + 3$

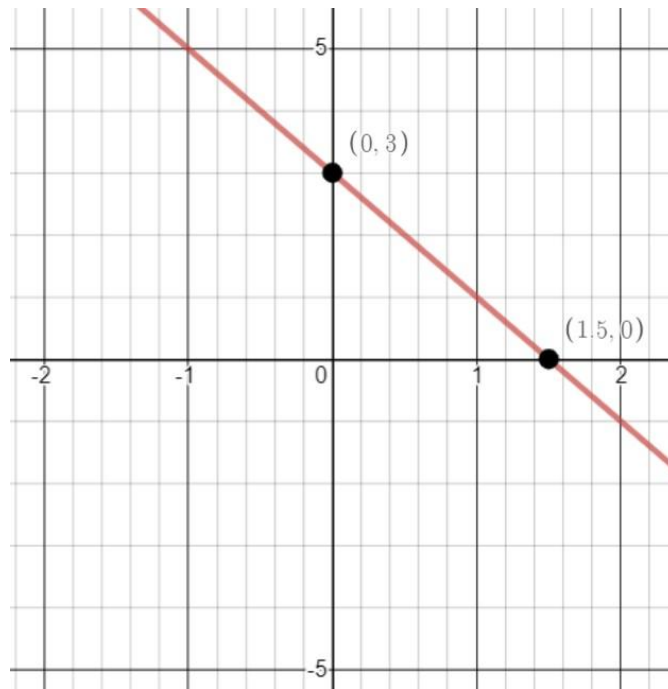
a.



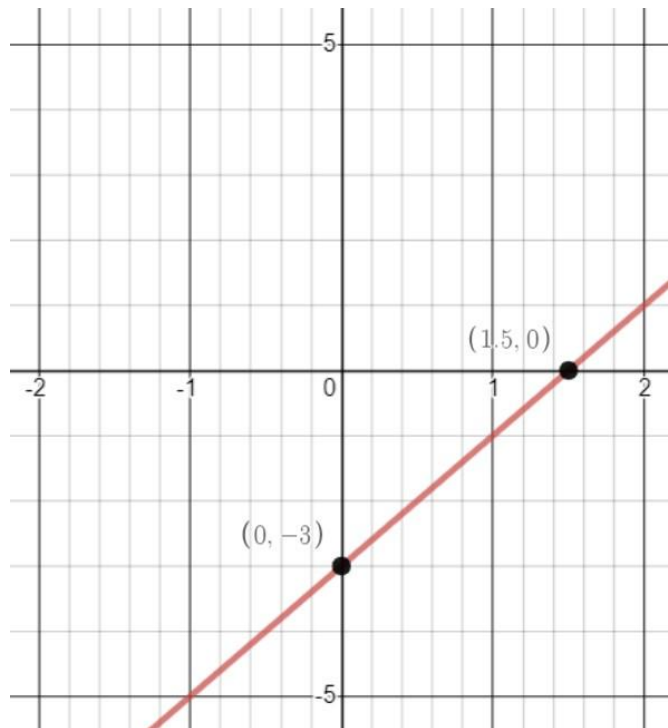
b.



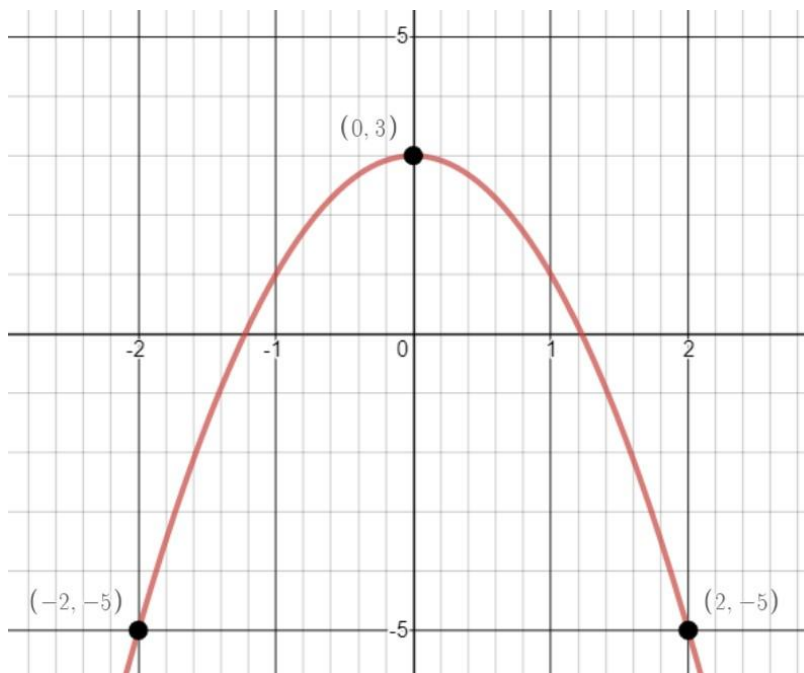
c.



d.



49. Which of the functions below is represented by the following graph?



- a. $f(x) = 5x^2 + 3$
- b. $f(x) = -2x^2 + 3$
- c. $f(x) = -5x^2 + 3$
- d. $f(x) = 2x^2 + 3$

50. Which function below has a graph that passes through all four of these given points:
 $\{(0, 1), (-1, 0), (-2, -1), (7, 2)\}$

- a. $f(x) = (x + 1)^2$
- b. $f(x) = x + 1$
- c. $f(x) = \sqrt[3]{x + 1}$
- d. $f(x) = -\frac{1}{2}x + 1$

51. Given that $f(x) = 10x - 3$, find $f(x - 3)$.

a. $f(x - 3) = 10x - 33$

b. $f(x - 3) = -33$

c. $f(x - 3) = 10x - 6$

d. $f(x - 3) = 11x - 6$

MATH Part B Answers and Explanations

Solving Equations and Inequalities

Question Number	Correct Answer	Explanation
1	d	Using the Addition property of Equality to solve for x , add 9(opposite of -9) to both sides. This is a one- step equation, so the solution for $x = 35$.
2	a	Using the Addition property of Equality to solve for y , subtract 41(opposite of -41) from both sides. This gives, $41 - 41 - y = 90 - 41, -y = 49$, divide both sides by -1 . The solution for $y = -49$.
3	d	Using the Addition property and multiplication property of Equality, this a two-step equation. So, $7x + 11 = -73, 7x + 11 - 11 = -73 - 11, 7x = -84, x = -12$.
4	c	Applying the addition rule, add $-4y$ to both sides and add 2 to both sides. This gives $7y = 8$, dividing by 7 both sides, gives the solution, $y = 8/7$
5	c	To be all real number the solution shows the left side of the equal sign is equal to the right side of the equal sign. $0 = 0$ shows this fact.
6	a	Translating into an equation, reading from left to right, Let h be Henry and G be Guy. Then the word is means equal too and the word twice means to multiply Guy's appetite by 2. $H = 2 \times G$.
7	b	Since $G = 2$, then $2(2) = 4$.
8	c	The graphs show that x has two solutions, $\{x x > -1\}$ and $\{x x \leq 3\}$. An open circle is represented by the inequalities $<$ and $>$. A closed circle is represented by the inequalities $\leq$ and $\geq$.
9	a	This means that the temperature cannot go below 75 and above 95 but it can be any temperature between. Representing the temperature as random variable x , the solution is $\{x x > 75\}$ and $\{x x < 95\}$. Both are open circle because the two end points are not included as an allowed temperature.
10	b	Isolate the variable by adding 28 to both sides. $h > 56$. The graph of the inequality will be open since the inequality means " h is greater than 56".

Graphing

Question Number	Correct Answer	Explanation
11	b	The numbers are 1, 4, 8, <i>and</i> 12. These are all the x-coordinates, which represents the domain of x .
12	d	Sponge Bob's red tie is in quadrant IV. The quadrants are counted counterclockwise beginning with the top right quadrant being quadrant I.
13	b	Since the x-coordinate is negative and the y-coordinate is positive, then the point $(-8, 10)$ is in Quadrant II.
14	a	There are a series of points on a straight line.
15	b	The slope is $\frac{1}{2}$, since $\frac{3}{6} = \frac{1}{2}$.
16	d	Lines a and b are parallel, as they have the same distance continuously between them. They never meet or intersect each other. Transversal line intersects a system of lines.
17	d	The lower-case m represents the slope of a line in the formula and is located in front of the x . The variable x <i>and</i> y represent the constants, and the variable b represents the y intercept.
18	C	The lines are parallel because they have the same slope and different y -intercepts.
19	d	The line is a horizontal line, where $y = -2$, therefore the slope is zero.

Systems of Equations and Inequalities

Question Number	Correct Answer	Explanation
20	d	Rewrite equation $y - 2x = 3$ to be $y = 2x + 3$, then substitute $2x + 3$ into the second equation of $3x - y = 5$. This will be $3x - (2x + 3) = 5$, distribute the negative into the parenthesis to get $3x - 2x - 3 = 5$. Combine like terms on the left to get $x - 3 = 5$, and $x = 8$. Now substitute $x = 8$ into either equation and solve for y. So, $y - 2x = 3$ will be $y - 2(8) = 3$, solving for y to get $y = 19$.
21	B	Solving similarly to question 20. Substitute $W + 1000$ in for L in the first equation to get $W + 1000 + W = 2000$. So, $2W + 1000 = 20000$, $2W = 19000$, $W = 9500$. Substitute W into the first equation to get $L + 9500 = 20000$, solving for L to get $L = 10500$.

Exponents and Polynomials

Question Number	Correct Answer	Explanation
22	b	The negative exponent is the exponential rule to apply here. By taking the reciprocal of the x^{-3} , will make the exponent positive. Therefore, the expression becomes, $-\left(\frac{3}{x^3}\right)$, where $x = 2$, replacing x with 2 and evaluating gives, $-\left(3\left(\frac{1}{2^3}\right)\right) = -3\left(\frac{1}{8}\right) = -\frac{3}{8}$. By cubing 2 in the denominator and multiplying a whole number with a fraction gives the solution $-3/8$.
23	b	The constant in this polynomial expression is 1. Since it is the term without a variable. The other numbers in front of variables are called coefficients.
24	a	By removing the parentheses, grouping liked terms, adding and using laws of integers, equals, $4x^7 - 10x^5 + 7x^4 - 17$ as the solution.
25	d	By adding all sides of the rectangle, you can find the perimeter and add all liked terms. Therefore, the Perimeter is $6x + 2$.
26	d	The polynomial expression has 4 terms. A polynomial is an algebraic expression that consists of monomials. In this polynomial, there are 4 monomials, therefore it has 4 terms.

Factoring

Question Number	Correct Answer	Explanation
27	d	The GCF for $x^5 - 7x^4 + 12x^3$ is x^3. When this is factored out of $x^5 - 7x^4 + 12x^3$ it gives $x^3(x^2 - 7x + 12)$. However, the resulting trinomial in parentheses, $x^2 - 7x + 12$, is factorable. The trinomial factors into two binomials, $(x - 4)(x - 3)$. So, the completely factored result is $x^3(x - 4)(x - 3)$.
28	c	If you factor this trinomial using the grouping method: $18y^2 - y - 4$ 1. Multiply the leading coefficient 18 and the constant -4 to get -72. 2. We need two numbers that multiply to -72 but add to get the middle coefficient -1. Those numbers are -9 and 8. 3. Rewrite the middle expression $-y$ to be $-9y + 8y$. This gives you $18y^2 - 9y + 8y - 4$. 4. Group terms: $(18y^2 - 9y) + (8y - 4)$. 5. Factor out the GCF from each group in step 4 to get: $9y(2y - 1) + 4(2y - 1)$. 6. Factor out the common binomial of $2y - 1$ and put the "leftovers" together to get a final answer of: $(2y - 1)(9y + 4)$
29	d	$9x^2 - 49$ is a binomial that is classified as the difference of two perfect squares. This type of polynomial is always factorable. If you factor this trinomial using the grouping method: $9x^2 - 0x - 49$ 1. Multiply the leading coefficient 9 and the constant -49 to get -441. 2. We need two numbers that multiply to -441 but add to get the middle coefficient 0. Those numbers are -21 and 21. 3. Rewrite the middle expression $0x$ to be $-21x + 21x$. This gives you $9x^2 - 21x + 21x - 441$. 4. Group terms: $(9x^2 - 21x) + (21x - 441)$. 5. Factor out the GCF from each group in step 4 to get: $3x(3x - 7) + 7(3x - 7)$. Factor out the common binomial of $3x - 7$ and put the "leftovers" together to get a final answer of: $(3x - 7)(3x + 7)$
30	c	For this problem, both $5y^2 + 33y - 14$ and $10y^2 - 9y + 2$ need to be completely factored. Here are their factorizations: $5y^2 + 33y - 14 = (5y - 2)(y + 7)$ $10y^2 - 9y + 2 = (5y - 2)(2y - 1)$ The factor that both polynomials have in common is $5y - 2$.

31	d	The given equation, $x^2 + 17x + 50 = -20$, is a quadratic equation. One method to solve a quadratic equation is by writing it in standard form ($ax^2 + bx + c = 0$) and then attempting to factor the trinomial on the left of the equal sign. Then set the factors equal to zero and solve. For the given equation, standard form is $x^2 + 17x + 70 = 0$. Note that 20 was added to both sides of the original equation. The trinomial to the left of the equals sign does indeed factor. So, in factored form, the equation becomes $(x + 10)(x + 7) = 0$ Setting both factors equal to zero and solving for x, you will get $x = -10$ or $x = -7$. You can see that these two solutions are correct by substituting them back into $x^2 + 17x + 50 = -20$.
32	a	The equation that describes the information given in the problem is Area of a rectangle is length times width. Since the length is 1.5 inches more than the width or $l = w + 1.5$. Substituting into the area formula we get $w(w + 1.5) = 85$, where w represent the width of the sheet of paper. This is a quadratic equation that in standard form ($ax^2 + bx + c = 0$) becomes $w^2 + 1.5w - 85 = 0$. Factoring the left side, two numbers that multiply to equal -85 but add to equal 1.5 are -8.5 and 10. $(w - 8.5)(w + 10) = 0$ Therefore $w = 8.5$ or -10. Since a measurement can't be negative, use $w = 8.5$. Then substitute that value into $l = w + 1.5$ to get $l = 10$.

Rational Expressions and Equations

Question Number	Correct Answer	Explanation
33	c	To divide, keep first fraction same, change divide to multiply, and flip the second fraction. Then factor every term completely. Cancel like terms from numerator to denominator. $\frac{x^2-3x-28}{x-11} \div \frac{x^2+x-56}{x-11} = \frac{x^2-3x-28}{x-11} \cdot \frac{x-11}{x^2+x-56} = \frac{(x-7)(x+4)}{x-11} \cdot \frac{x-11}{(x-7)(x+8)}$ Cancelling the terms $x - 7$ and the terms $x - 11$. Multiplying straight across gives the final answer of $\frac{(x+4)}{x+8}$.

34	b	To simplify $\frac{8y}{3x} - \frac{6y^2}{x^2} + \frac{10y^3}{3}$, the fractions need to be written with a common denominator. For this rational expression, the least common denominator (LCD) is $3x^2$. Writing each fraction in terms of the $3x^2$, gives $\frac{8y}{3x} \cdot \frac{x}{x} - \frac{6y^2}{x^2} \cdot \frac{3}{3} + \frac{10y^3}{3} \cdot \frac{x^2}{x^2} = \frac{8xy}{3x^2} - \frac{18y^2}{3x^2} + \frac{10x^2y^3}{3x^2} = \frac{8xy - 18y^2 + 10x^2y^3}{3x^2}$ Factor the GCF in the numerator and simplify if possible, to get $\frac{2y(4x - 9y + 5x^2y^2)}{3x^2}$
35	b	One way to solve the rational equation is by eliminating the fractions by multiplying each term by the LCD (for this example the LCD would be 10). $\frac{2-x}{10} = \frac{x}{5}, \text{ multiplying by 10 would give } \frac{2-x}{10} \cdot 10 = \frac{x}{5} \cdot 10 \text{ to get } 2 - x = 2x.$ Solve the equation by adding x to both sides $2 = 3x, x = \frac{2}{3}$. Another method for this example would be to cross multiply and solve. $\frac{2-x}{10} = \frac{x}{5} \text{ cross multiplying to get } 5(2 - x) = 10x. \text{ Then simplify and solve:}$ $10 - 5x = 10x, 10 = 15x, x = \frac{10}{15} = \frac{2}{3}.$
36	a	Since the problem deals with inverse variation, it can be modeled with the standard form of the equation $y = \frac{k}{x}$ or more specifically for this example $t = \frac{k}{v}$, where t is the time, v is the speed, and k is the proportionality constant. Substituting $t = 15$ and $v = 60$ into the equation and then solving for k, this gives $15 = \frac{k}{60}$, multiply both sides by 60 to get $k = 900$. So, now the general form of the inverse variation equation is $t = \frac{900}{v}$. To find how long it will take to travel from point A to point B at 75 miles per hour, just substitute 75 for v in the general equation to get $t = \frac{900}{75}$, and $t = 12$.

Radical Expressions and Equations and Quadratic Formula

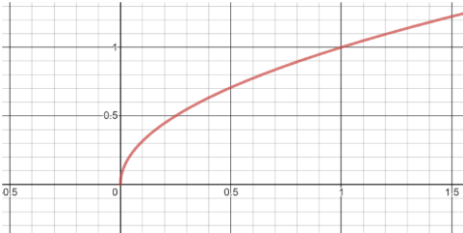
Question Number	Correct Answer	Explanation
37	d	The solution for this problem requires using algebraic steps to solve the volume formula, $V = \frac{4}{3}\pi r^3$, for a sphere in terms of r.

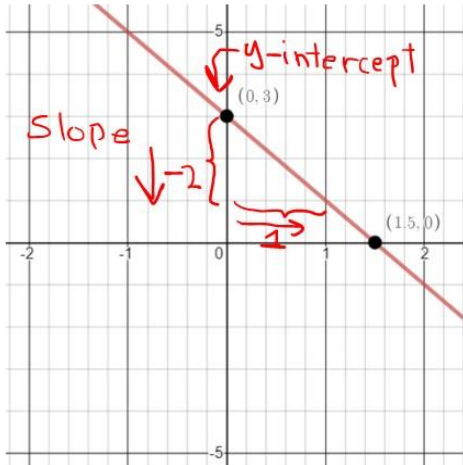
		First multiply both sides by reciprocal of $\frac{4}{3}$ which is $\frac{3}{4}$ to get $\frac{3}{4}V = \pi r^3$ or better would be $\frac{3V}{4} = \pi r^3$. Now, divide by π to get $\frac{3V}{4\pi} = r^3$. Next, cube root both sides to get $\sqrt[3]{\frac{3V}{4\pi}} = r$.
38	d	There's more than one way to think about finding a solution to this problem, but here's one approach: Summarizing the information given in the problem, it takes John 2 hours to do the job alone, and it takes Kevin 3 hours to do the job alone. This means that John could do 3 jobs in 6 hours, and Kevin could do 2 jobs in 6 hours. In other words, together they could do 5 jobs in 6 hours. Using this rate to calculate the number of hours per job, you get $\frac{6 \text{ hours}}{5 \text{ jobs}} = 1.2 \text{ hours per job.}$
39	c	Simplifying the radical expression, $\sqrt{x^4 y^6 z^9}$, $z \geq 0$, requires writing the radicand (part under the radical) in terms of perfect squares since the radical is a square root. Here is the radical simplified with perfect squares: $\sqrt{x^4 y^6 z^9} = \sqrt{(x^2)^2 (y^3)^2 (z^4)^2 z} = x^2 y^3 z^4 \sqrt{z}.$ This appears to be the solution, but it isn't. You were told at the beginning of the problem that $z \geq 0$, but you were not told anything about the variables x and y. In fact, they could be negative numbers. If y, in particular, is negative then the above solution is incorrect. So, since we don't know whether y is negative or positive, the correct solution is $x^2 y^3 z^4 \sqrt{z}$. Check the YouTube video below for a detailed explanation of why absolute value bars are necessary for the result. https://www.youtube.com/watch?v=dqek7EkXcYo
40	a	For this problem, since $b \geq 0$, the final result will not require any absolute value bars, as was the case in problem #39. To simplify this problem $\sqrt{3b} (5\sqrt{3b} - \sqrt{12b^7})$, distribute and continue simplifying. $\sqrt{3b} \cdot 5\sqrt{3b} - \sqrt{3b} \cdot \sqrt{12b^7} = 5\sqrt{9b^2} - \sqrt{36b^8} = 5 \cdot 3b - 6b^4 = 15b - 6b^4$
41	a	To simplify the given radical expression, $\sqrt[3]{54b^8c^9}$, the radicand (expression under the radical symbol) needs to be expressed in terms of perfect cubes, since the radical is a cube root:

		$\sqrt[3]{54b^8c^9} = \sqrt[3]{3^3 \cdot 2 \cdot (b^2)^3 \cdot b^2 \cdot (c^3)^3}$ and the factors in red are perfect cubes, and once the cube root of these is extracted, the result will be the expression inside the parentheses. So, simplifying further, you have $3b^2c^3 \sqrt[3]{2b^2}$ Note that since the original radical is a cube root (index is odd), there won't be a need for absolute value bars in the final answer. In short, when the index of a radical is odd (cube roots, 5th roots, etc.), or the variables in the radicand are all positive, absolute value bars won't be necessary in the final result.
42	d	To rationalize the denominator in $\frac{6+\sqrt{10}}{\sqrt{5}}$ means to get rid of the $\sqrt{5}$ in the denominator. To do this, multiply the numerator and denominator by $\sqrt{5}$. Distribute in the numerator and simplify. $\frac{6+\sqrt{10}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{6\sqrt{5}+\sqrt{50}}{\sqrt{25}} = \frac{6\sqrt{5} + 5\sqrt{2}}{5}.$
43	b	To solve for x, isolate the radical expression so that it is alone on one side of the equation: $-4\sqrt{11+x} + 15 = 3$ Subtract 15 from both sides of the equation to get $-4\sqrt{11+x} + 15 - 15 = 3 - 15.$ Simplify to get $-4\sqrt{11+x} = -12.$ Divide both sides by -4 to get $\sqrt{11+x} = 3.$ Square both sides to get rid of the square root: $(\sqrt{11+x})^2 = 3^2, \text{ which simplifies to } 11+x = 9.$ Subtract 11 from both sides to get $x = -2$.
44	b	Using the quadratic formula $\frac{-b \pm \sqrt{b^2-4ac}}{2a}$ to solve for x in $5x^2 - 2 = 12x$. First, put the given problem in standard form of $5x^2 - 12x - 2 = 0$, where now $a = 5$, $b = -12$, and $c = -2$. Substitute these values into the quadratic formula and simplify. $\frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-(-12) \pm \sqrt{(-12)^2-4(5)(-2)}}{2(5)} = \frac{12 \pm \sqrt{144+40}}{10} = \frac{12 \pm \sqrt{184}}{10} = \frac{12 \pm 2\sqrt{46}}{10}.$ Now, divide each term by the GCF of 2 to get $\frac{6 \pm \sqrt{46}}{5}$. This answer can be separated into two roots of $\frac{6 + \sqrt{46}}{5}, \frac{6 - \sqrt{46}}{5}$. Separating further to get $\frac{6}{5} + \frac{\sqrt{46}}{5}$ or $\frac{6}{5} - \frac{\sqrt{46}}{5}$.

45	d	To determine the number and type of solutions for $7x^2 - 3x + 1 = 0$, the discriminant will be used. The discriminant is the expression under the radical in the quadratic formula ($b^2 - 4ac$). • When $b^2 - 4ac = 0$, the given quadratic equation will have ONE real solution. • When $b^2 - 4ac > 0$, the given quadratic equation will have TWO real solutions. • When $b^2 - 4ac < 0$, the given quadratic equation will have NO real solutions but has TWO complex (or imaginary) solutions. For the given quadratic equation, $7x^2 - 3x + 1 = 0$, the $a = 7$, $b = -3$, and $c = 1$. Substitute these values into the discriminant of $b^2 - 4ac$. $b^2 - 4ac = (-3)^2 - 4(7)(1)$ and simplify to get $9 - 28 = -19$. Since the discriminant is -19, then this quadratic equation would have TWO complex solutions.
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Functions

Question Number	Correct Answer	Explanation
46	b	In the function, $\{(5, -8), (9, 2), (15, 2), (19, -8), (7, 0)\}$, the domain is the set of all x-values and the range is the set of all y-values in each ordered pair in the set. For example, in the ordered pair $(5, -8)$, the 5 would be the domain and -8 would be the range. When listing the domain and range, the integers are typically placed in ascending order without repeating an integer. Considering the given function, the domain would be $\{5, 7, 9, 15, 19\}$ and the range would be $\{-8, 0, 2\}$.
47	c	The domain and range for $f(x) = \sqrt{x}$ can most easily be determined by observing its graph, which looks like the graph below:  The domain of the function is the set of all x-values, which from looking at the graph, are the numbers bigger than or equal to zero to the right of the y-axis. The y-values are the numbers bigger than or equal to zero above the x-axis. Symbolically, this is written as Domain: $x \geq 0$ and Range: $f(x) \geq 0$. However, the domain can be found algebraically by setting the radicand ≥ 0. So, the domain is $x \geq 0$.

48	c	To graph $f(x) = -2x + 3$, note that the equation is given in slope-intercept form $y = mx + b$ (see provided formula sheet). In this form, m represents the slope and b is the y-intercept at $(0, b)$. For the given equation, the slope is -2 and the y-intercept is 3. You should expect the graph to cross the y-axis at the point $(0, 3)$ and have a negative slope (or a line that falls when proceeding from left to right on the graph). Also, the slope can be thought of in terms of the rise over the run. Since the slope is -2, that makes the $m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y\text{-values}}{\text{change in } x\text{-values}} = \frac{-2}{1}$ See the image below: 
49	b	The graph given is in the shape of a parabola (think of a bowl shape) and has a vertex at the point $(0, 3)$. Note that this point is also the y-intercept. Due to the graph being a parabola, this means that it was formed from a quadratic equation, which has general form of $f(x) = ax^2 + bx + c$. In this form, the vertex is found by $(-\frac{b}{2a}, f(\frac{-b}{2a}))$. Also, when the leading coefficient, a, is negative the parabola turns downward, which is the case for the graph in this problem. This makes only the answer choices of b and c possible solutions for the given function because they are the only two choices that have a leading coefficient that is negative. Finally, note that the function passes through the points $(-2, -5)$ and $(2, -5)$ in the given graph. These two points would need to satisfy the equation describing the graph. The only equation where this is true is answer choice b.
50	c	To find which function passes through all 4 points, you could take each function and substitute each x-value into the function and show that the corresponding y-value is obtained. In short, you would be using a process of elimination. Here's what this process looks like for $f(x) = \sqrt[3]{x+1}$:

		Recall the given points were $(0,1)$, $(-1,0)$, $(-2,-1)$, and $(7,2)$. Substitute these given points into the function $f(x) = \sqrt[3]{x+1}$. Remember, all 4 points must work or yield a true statement when you substitute and simplify. For $(0,1)$, $f(0) = \sqrt[3]{0+1} = \sqrt[3]{1} = 1$ true For $(-1,0)$, $f(-1) = \sqrt[3]{-1+1} = \sqrt[3]{0} = 0$ true For $(-2,-1)$, $f(-2) = \sqrt[3]{-2+1} = \sqrt[3]{-1} = -1$ true For $(7,2)$, $f(7) = \sqrt[3]{7+1} = \sqrt[3]{8} = 2$ true
51	a	Given the $f(x) = 10x - 3$, find $f(x - 3)$. The solution is obtained by substituting $x - 3$ in for the x value in the given function $f(x) = 10x - 3$. Then $f(x - 3) = 10(x - 3) - 3$. Distributing you get: $f(x - 3) = 10x - 30 - 3$. Simplifying you get: $f(x - 3) = 10x - 33$.