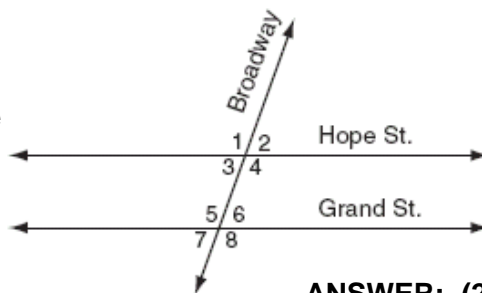


- 1) **The first image represents a line reflection.**

Image 2 can represent a rotation.
 Image 3 represents a translation.
 Image 4 represents a dilation.

ANSWER: (1)

- 2) You are presented with the diagram at the right. You are told that the measure of angle 1 is 110 and are asked for the measure of angle 7. Here's one way of determining the measure of the angle. $\angle 1$ and $\angle 5$ are corresponding angles and therefore congruent. This means that the measure of $\angle 5$ is 110 as well. $\angle 5$ and $\angle 7$ are supplementary and the sum of their measures 180 degrees. Since the measure of $\angle 5$ is 110, **this leaves 70 degrees for the measure of $\angle 7$.**



ANSWER: (2)

- 3) The $\sqrt{5}$ is a number between 2 and 3. On the given number line, point C represents such a number and is therefore the answer.

ANSWER: (3)

- 4) The ratio of the perimeter of two similar triangles will remain the same as the ratio of two of its corresponding sides. You are told that the base of one isosceles triangle is 5, and that the base of a similar isosceles triangle is 10. You now know that the perimeter of the larger triangle will be double the perimeter of the smaller triangle. You are told that the perimeter of the smaller triangle is 11. This makes the **perimeter of the larger triangle equal to twice 11, or 22.**

ANSWER: (3)

- 5) You are asked for the value of n: $3n - 8 = 32 - n$

$3n - 8 = 32 - n$	Add n to both sides.
$4n - 8 = 32$	Add 8 to both sides.
$4n = 40$	Divide both sides by 4.
$n = 10$	

ANSWER: (4)

- 6) A conjunction, two statements joined with an "and" , will be true only when each statement is true. The first step in this problem is to solve the following inequality:

$2x - 4 < 6$	Add 4 to both sides.
$2x < 10$	Divide both sides by 2.
$x < 5$	

You now have to find a value for x that satisfies both inequalities: $x \geq 4$ and $x < 5$
 Of the given choices, 4 is the only element that will make both inequalities true.

ANSWER: (4)

- 7) To simplify the given expression, you first have to drop the minus sign and change the sign of each term inside the second parenthesis.

$$\begin{aligned} &(2x^2 + 6x + 5) - (6x^2 + 3x + 5) \\ &2x^2 + 6x + 5 - 6x^2 - 3x - 5 \\ &- 4x^2 + 3x \end{aligned}$$

Change the signs as mentioned above.
Combine like terms.

ANSWER: (1)

- 8) You are presented with the equation:

$$\frac{x}{y} = \frac{1}{2} \quad \text{Cross multiply to obtain an equivalent equation of } y = 2x$$

This is considered an direct variation because as x increases, y increases proportionately.

ANSWER: (2)

- 9) The probability of tossing a tail on a fair coin is one-half. It makes no difference how many times the coin is tossed or how many times it lands on heads. The probability of each single toss remains 1/2.

ANSWER: (4)

- 10) You are presented with the formula $P = mgh$ and asked to solve for g .

$$\begin{aligned} P &= mgh && \text{Divide both sides by } mh. \\ \frac{P}{mh} &= g \end{aligned}$$

ANSWER: (4)

- 11) Given the three dimensions of the building, its volume can be calculated using the formula $V = lwh$. You are told that the length is 100, the width (depth) is 75, and its height is 30. At this point you can calculate the volume of the building by multiplying $100 \times 75 \times 30$. However, there is no need to do this. You are told that the owner wishes to increase the volume of the building by 10%, changing **only** the length of the building (keeping the other two dimensions unchanged). So in reality, all you have to do now is increase the length by 10% and the volume will automatically increase by 10%. Ten percent of 100 is 10, so if your **new length** will be $100 + 10$ or **110**, your volume will increase by 10%.

ANSWER: (3)

- 12) Two odd integers will be two apart just like two even integers. For example if your first odd integer is 7, the next consecutive odd integer will be $7 + 2$ or 9. Assuming that your first odd integer is represented by n , the next consecutive odd integer will therefore be represented by $n+2$. The product of these two integers will be the result obtained when they are multiplied. In our case the product will be **$n(n+2)$** .

ANSWER: (2)

- 13) ${}_3P_3$ denotes a permutation of 3 objects taken 3 at a time. That is the equivalent of ${}_3P_3$ factorial which is exactly what is meant by **3!** Done on a calculator, both will give you the answer obtained by calculating $3 \cdot 2 \cdot 1$ or 6.

ANSWER: (3)

- 14) The graph of $x^2 + y^2 = r^2$ will be a **circle** with a radius of "r" and whose center is the origin. **ANSWER: (1)**

- 15) To form the inverse of a conditional statement, simply negate each part of the statement. Using this rule, $p \rightarrow q$ would have as its inverse $\sim p \rightarrow \sim q$.
You are given the statement: If Bob gets hurt, then the team loses the game.
Negating each part results in the inverse:
If Bob does not get hurt, then the team does not lose the game. **ANSWER: (4)**

- 16) A fraction is undefined when its denominator equals 0. Let's evaluate each denominator when $w=3$.

(1) $w + 1$ will equal $3 + 1 = 4$

(2) $5w$ will equal $5(3) = 15$

(3) $w^2 - 3w$ will equal $3^2 - 3(3) = 9 - 9 = 0$

(4) $3w^2$ will equal $3(3)^2 = 3(9) = 27$

Choice 3 is your answer as that fraction's denominator will equal 0. **ANSWER: (3)**

- 17) Step number one requires you to determine the area of the circular garden. The formula for the area of a circle is $A = \pi r^2$. You are told that the garden has a diameter of 12 ft. Its radius will be one-half of that or 6. Its area will therefore be:

$$\pi(6)^2 = 36\pi$$

Each bag of topsoil will cover 3 square feet of the garden. Now all you have to do is divide 36π by 3 to determine how many bags will be required for this particular garden. Use the pi key on your calculator.

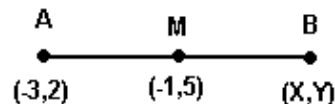
$$(36\pi) \div 3 = 37.69911184$$

You will need 38 bags of topsoil.

ANSWER: (2)

- 18) When presented with the coordinates of two endpoints of a line segment, it is quite simple to find the midpoint of that line segment. All that is required is that you add the two x-coordinates and divide by 2 to obtain the x-coordinate of the midpoint, and then to add the two y-coordinates and divide by 2 to obtain the y-coordinate of the midpoint. In this question you are given the coordinates of the midpoint and one endpoint, and are asked to find the coordinates of the other endpoint.

Let's find the x-coordinate first. -3 and X will have to equal -2 (double the x-coordinate of the midpoint). After we divide by 2, the -2 will equal -1, which is the x-coordinate of the midpoint. So again, -3 and what will equal -2? The answer is +1. The x-coordinate of B will be **1**. A quick check: $(-3+1)/2 = -1$. Now for the y-coordinate. 2 plus what will equal 10 (double the y-coordinate of the midpoint)? **8** is the answer. The coordinates of point B will therefore be **(1,8)**. **ANSWER: (1)**



- 19) You are presented with the following equation and asked to solve for x.

$$\frac{x}{2} + \frac{x}{6} = 2 \quad \text{Multiply each term by 6 -- the lowest common denominator.}$$

$$(6)\frac{x}{2} + (6)\frac{x}{6} = (6)2 \quad \text{Simplify}$$

$$3x + x = 12 \quad \text{Combine like terms.}$$

$$4x = 12 \quad \text{Divide both sides by 4.}$$

$$x = 3$$

ANSWER: (3)

- 20) $M + A = A + M$ is an example of the commutative property. Think of it as if the two elements are commuting--traveling around.

ANSWER: (1)

- 21) SQUARE: BOTH pairs of opposite sides ARE parallel.
 RHOMBUS: BOTH pairs of opposite sides ARE parallel.
 RECTANGLE: BOTH pairs of opposite sides ARE parallel.
 ISOSCELES TRAPAZOID: BOTH pairs of opposite sides ARE NOT parallel.
 PARALLELOGRAM: BOTH pairs of opposite sides ARE parallel

If one of the above figures are selected at random there is a probability of $\frac{4}{5}$ that both pairs of its opposite sides are parallel.

ANSWER: (2)

- 22) The sum of the measures of the angles of a triangle will equal 180 degrees. You are given 3 angle with the following measures: $2x$, $3x-15$, and $7x+15$. Set up your equation:

$$2x + (3x - 15) + (7x + 15) = 180 \quad \text{Combine like terms.}$$

$$12x = 180 \quad \text{Divide both sides by 12.}$$

$$x = 15$$

Now substitute 15 for x in the given angle measures.

$$2x = 2(15) = \mathbf{30}$$

$$3x - 15 = 3(15) - 15 = 45 - 15 = \mathbf{30}$$

$$7x + 15 = 7(15) + 15 = 105 + 15 = \mathbf{120}$$

A triangle with angles that measure 30, 30, and 120 is **isosceles** since it has two congruent angles.

ANSWER: (1)

- 23) You are asked for the value of $3^0 + 3^{-2}$. You can get your answer by simply inputting the numbers into your calculator, and then changing the decimal answer to a fraction. Or you can work it out as follows. Any number to the 0 power equals 1. Therefore, $3^0 = 1$. Any number raised to a negative power is the equivalent of 1 over that number to the positive power. $3^{-2} = \frac{1}{3^2} = \frac{1}{9}$

$$\text{Therefore } 3^0 + 3^{-2} = 1 + \frac{1}{9} \text{ or } 1\frac{1}{9}$$

ANSWER: (3)

- 24) You are asked to divide $(50x^3 - 60x^2 + 10x)$ by $10x$. To get your answer, divide each term by $10x$.

$$\begin{aligned} 50x^3 \div 10x &= 5x^2 \\ - 60x^2 \div 10x &= - 6x \\ 10x \div 10x &= 1 \end{aligned}$$

The final answer is $5x^2 - 6x + 1$

ANSWER: (1)

- 25) In a dilation, the coordinates of the given point are multiplied by a constant. In this case the constant is 3, and the image obtained is (6,15). What was the original point? The original point will be (6/3,15/3) or **(2,5)**. When this point (2,5) is dilated by 3, its image will be (2•3,5•3) or (6,15).

ANSWER: (1)

- 26) Mario's fare came to \$44.25. Included in this price is \$2.25 which is the charge for the first mile. This means that excluding the first mile he was charged \$44.25 - \$2.25 or \$42.00. You are told that for each additional mile he was charged \$3.50. So it is now easy to determine how many additional miles were included. Divide \$42 by \$3.50. Your answer is 12. So the total number of miles he traveled was that 1st mile plus the additional 12 miles, for a **total of 13 miles**.

ANSWER: (4)

- 27) What is the solution set of the following equation? $x^2 - 5x = 0$

$$\begin{array}{ll} x^2 - 5x = 0 & \text{Factor out an x.} \\ x(x - 5) = 0 & \text{Set each factor equal to 0.} \\ x = 0 \quad x - 5 = 0 & \text{Solve for x.} \\ \mathbf{x=0} \quad \mathbf{x = 5} & \end{array}$$

ANSWER: (2)

- 28) Simplify $(6x^3y^6)^2$.

When a power is raised to a power the exponents are actually multiplied.

Each factor in the parenthesis will be raised to the second power.

$$6^2 = 36 \quad (x^3)^2 = x^6 \quad (y^6)^2 = y^{12}$$

ANSWER: (1)

- 29) How many teams consisting of 4 students can be formed from a group of 18 students. The answer will be the result of ${}_{18}C_4$. You can use your calculator to obtain the answer of **3060**.

Here is another way to get your answer: ${}_{18}C_4 = \frac{{}_{18}P_4}{4!} = \frac{18(17)(16)(15)}{4(3)(2)(1)} = 3060$

One final point to clarify is when do we use P for permutation, and when to use C for combination. Permutation is used when order makes a difference. In our case here, order makes no difference. Players A B C D on a team would be the same as D B C A.

ANSWER: (3)

- 30) The inverse of an element is the element that results in the identity under a certain operation. When looking for the multiplicative inverse, then, you first have to know that the multiplicative identity is 1. The multiplicative inverse will therefore be the element that will equal 1 upon multiplying. You are asked for the multiplicative inverse of $-\frac{1}{3}$. Think... $-\frac{1}{3}$ times what will equal 1. The answer is **-3**. **ANSWER: (4)**
(Another more common name for the multiplicative inverse is reciprocal).

- 31) Kimberly has 3 pairs of pants: black, red, and tan. Let's use b, r, and t to represent them. She has 4 shirts: pink, white, yellow, green. Let's use p, w, y, and g to represent them. Here is a sample space of all possible outfits she can wear consisting of one pair of pants and one shirt.

b, p	r, p	t, p
b, w	r, w	t, w
b, y	r, y	t, y
b, g	r, g	t, g

She can wear a total of 12 different outfits.

- 32) 11 grams out of the 14 are fat. Change 11/14 to a decimal and then to a percent. 11 divided by 14 is **.7857**. Move the decimal point two places to the right to change to a percent and your answer is **78.57**. Rounded to the nearest tenth that would be **78.6%**.
- 33) Let X= number of pizzas Omar bought in April
 then $2x+3$ = number of pizzas he bought in May (3 more than twice the number in April).
 You are also told that the number of pizzas bought in May total 15.

Set up your equation:

$2x + 3 = 15$	Subtract 3 from both sides.
$2x = 12$	Divide both sides by 2.
$x = 6$	

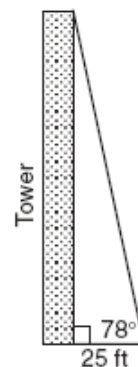
The question asks how many pizzas were bought in April. That quantity was represented by x. Since x = 6, that is your answer.

- 34) You are given the formula for converting Fahrenheit to Celsius and asked what is the Fahrenheit equivalent of 10° Celsius. In the formula, substitute 10 for C.

$C = \frac{5}{9} (F-32)$	Substitute 10 for C.
$10 = \frac{5}{9} (F-32)$	Multiply both sides by 9 to canceling the denominator 9.
$90 = 5(F-32)$	Simplify using the distributive property.
$90 = 5F - 160$	Add 160 to both sides.
$250 = 5F$	Divide both sides by 5.
50 = F	

10° Celsius is the equivalent of 50° Fahrenheit.

- 35) You are presented with the diagram at the right and asked to calculate the height of the tower to the nearest tenth of a foot. The tower is **opposite** the given angle of 78° , and the side of 25 ft. is **adjacent** to the angle of 78° . The trigonometric ratio that uses opposite and adjacent is tangent. The tangent ratio equals opposite over adjacent. Set up your ratio. Let x = height of the tower.



$$\tan 78^\circ = \frac{x}{25}$$

Multiply both sides by 25.

$$25 (\tan 78^\circ) = x$$

Use your calculator to multiply $\sin 78$ by 25.

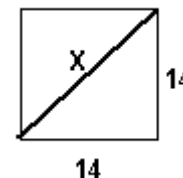
$$117.615752 = x$$

Round to nearest tenth.

$$x = 117.6$$

The height of the tower is 117.6 feet.

- 36) You are told that the perimeter of a square is 56 feet. As shown at the right each side of the square will therefore equal 14 feet. $56 \text{ divide by } 4 = 14$. You are asked to determine the length of the diagonal in simplest radical form. One way of doing this is using the Pythagorean Theorem.



$$c^2 = a^2 + b^2$$

Substitute the given values. a and b are the legs.

$$X^2 = 14^2 + 14^2$$

Simplify.

$$X^2 = 196 + 196$$

Combine

$$X^2 = 392$$

Find square root of both sides.

$$X = \sqrt{392}$$

Now simplify $\sqrt{392}$

$$\sqrt{392} = \sqrt{196} \sqrt{2} = 14\sqrt{2}$$

The length of the diagonal is $14\sqrt{2}$.

- 37) The new laser machine cost \$500,000. The institute charges \$2,000 for each surgery. However, they have to pay the inventor \$550 each time they use the machine. **This means that they are left with \$2,000 - \$550 or \$1450 after each surgery.** The question is now, how many \$1450's do they need to reach the 500,000 that the machine cost them? **500,000 divided by 1450 = 344.8275.** That is the break even point. **At the 345th operation they will have paid off the cost of the machine and finally begin realizing a profit.**

#38 begins on the next page.

- 38) You are presented with 2 inequalities and asked to graph them on one set of axes.
 $y > x - 4$ This is in the form of $y=mx+b$ so you know that the y-intercept will be -4, and the inequality will have a slope of 1. Let's however do it using a table of values. The other inequality is $y + x \geq 2$. Subtract x from both sides and it becomes the inequality that we will use: $y \geq -x + 2$. This inequality will have a slope of -1 and a y-intercept of 2. Below you will see a table for this inequality as well.

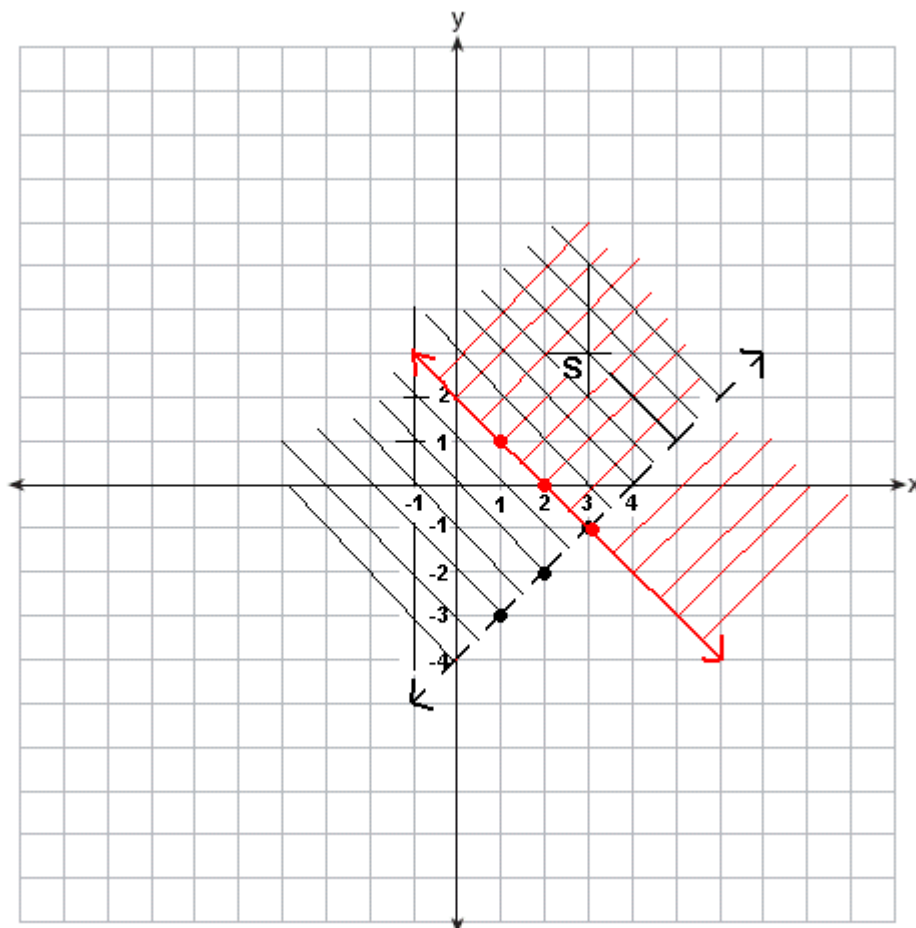
$y > x - 4$

x	x - 4	y
1	1 - 4	-3
2	2 - 4	-2
3	3 - 4	-1

$y \geq -x + 2$

x	-x + 2	y
1	-1 + 2	1
2	-2 + 2	0
3	-3 + 2	-1

The first inequality will graph as a dashed line since it is not equal, just greater. The second inequality will graph as a solid line because it is also equal. To make it easier to see, the second inequality is in red. Also note that both inequalities require shading. They are both greater than. To shade a greater than inequality you must shade either up and to the right or up towards the left. A less than inequality is shaded downwards. The solution set of a set of inequalities will always be the section that is checked. That area is labeled with an S below.



- 39) At the right is the table with the completed cumulative frequency column. The cumulative frequency column at the right is showing is the following information.
 6 students weigh between 91-100.
 9 students weigh between 91-110.
 9 students weigh between 91-120.
 12 students weigh between 91-130.
 12 students weigh between 91-140.
 14 students weigh between 91-150.
 16 students weigh between 91-160.

Interval	Frequency	Cumulative Frequency
91-100	6	6
101-110	3	9
111-120	0	9
121-130	3	12
131-140	0	12
141-150	2	14
151-160	2	16

When constructing the cumulative frequency histogram use the intervals the way I have them listed above to the left.

**STUDENT WEIGHTS
 CUMULATIVE FREQUENCY HISTOGRAM**

