



"Strive, Achieve, Succeed"

BELLEVILLE HIGH SCHOOL

100 PASSAIC AVENUE

BELLEVILLE, NEW JERSEY 07109

WEB-SITE: www.bellevilleschools.org



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June 22, 2018

Dear Parents/Guardians and Students:

As a result of the implementation of the New Jersey Student Learning Standards (NJSLs), academic standards have become more rigorous and we would like our students to be able to demonstrate and communicate an in-depth understanding of the topics taught in mathematics. Our goal is not only to have the students master a particular skill, but also to be able to apply these skills in real-life situations.

In the summer time, many necessary mathematical skills are lost due to the absence of daily exposure. The loss of skills may result in a lack of success and unnecessary frustration for students as they begin the new school year. The purpose of this math assignment is to set the stage for instruction for the 2018-2019 school year.

For this reason, a summer packet has been prepared for all current eighth, ninth, tenth, and eleventh graders entering the following classes in September:

1. Algebra 1
2. Geometry A and H
3. Algebra 2 A and H
4. Pre-calculus A and H
5. Statistics A and H

Students can access the summer packets for their scheduled course at the Belleville school district's website: www.bellevilleschools.org. Packets can be downloaded and printed out. Work can be done neatly in the packet, with answers clearly labeled. Students may also attach their work, if they choose to do the problems from the packet on separate sheets of paper. Problems must be numbered, all work must be included, and answers must be labeled. If you are unable to access an Internet connection, a limited number of copies will be available at the main office in Belleville High School. Students may also visit the Belleville Public Library to utilize their computers.

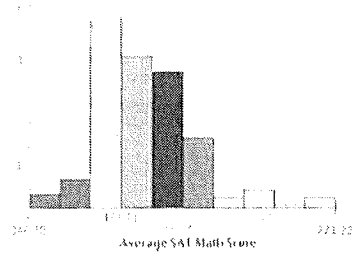
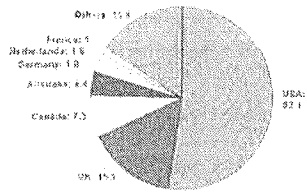
The summer assignment will be collected on Thursday, September 6, 2018 and assessed as a quiz grade based on the level of completion. The first week of instruction will be dedicated to covering prerequisite skills required for each course as found in the packet.

Each packet reviews the necessary foundational skills for the course and is accompanied by a study guide that includes both relevant notes and completed examples. Additional help could be found at www.khanacademy.org and <https://www.bellevillelearningacademy.com/>. Khan Academy is a free website for learning academic and real-world knowledge from tutorial videos. It is a great resource where you could find videos and examples from basic algebra through calculus. The Belleville Learning Academy provides student created content specific educational tutorials for peers.

Thank you very much for your support and cooperation. We look forward to working with you next year!

Sincerely,
The Belleville High School Mathematics Department

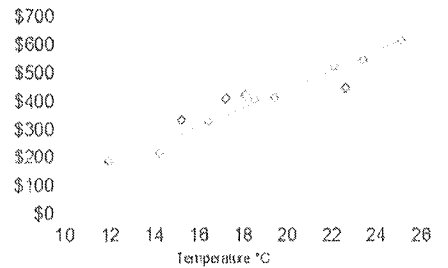
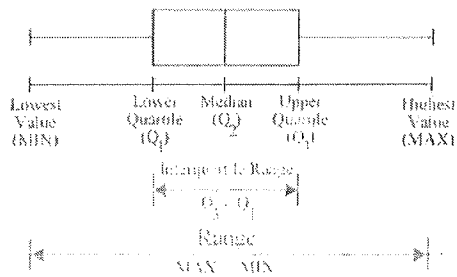
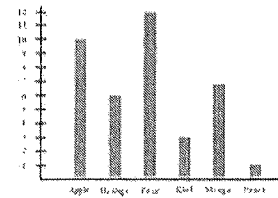
Name _____



Statistics

Summer Assignment

For students going into Statistics or Statistics Honors



The following assignment involves concepts and skills you need in order to be prepared for your Statistics class. This assignment will provide practice of these concepts. It is due on your return to school in September. If you have any questions about the problems in this packet please email me at annamaria.contella@belleville.k12.nj.us.

REVIEW ALGEBRA

- Complete each problem & Show all work.
- Use the space provided to carry out the work (attach additional pages if necessary).
- Print pages 1-3, 5-6,9-12(Pages 4,7,& 8 contain notes and do not necessarily need to be printed out)

1. Here is a formula that is used often in Statistics:

$$z = \frac{x - \mu}{\sigma}$$

(Greek letters such as μ and σ are used in many statistics calculations)

- a. If $\mu = 24$, $x = 20$, and $\sigma = 3$, what is z ? Show your work.
- b. If $z = -3.35$, $x = 60$, and $\sigma = 4$, what is μ ? Show your work.
- c. If $z = 1.96$, $\mu = 18.4$ and $\sigma = 3.2$, what is x ? Show your work.
- d. If $z = -2.05$, $x = 8.3$, $\mu = 10.4$, what is σ ? Show your work.

Give the slope and y-intercept of each line for problems 2 and 3.

2. $y = -3x + 21$

3. $7x - 9y = 18$

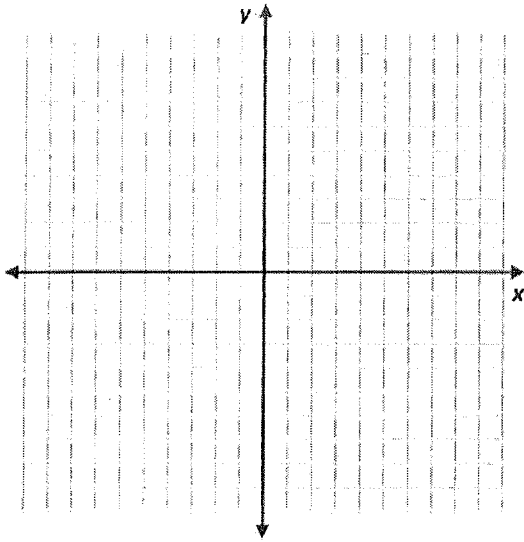
4. Write the equation of the line with a slope of $-\frac{2}{3}$ that passes through the point (5,24).

5. Write the equation of the line with a slope of .0235 and a y-intercept of 3.52.

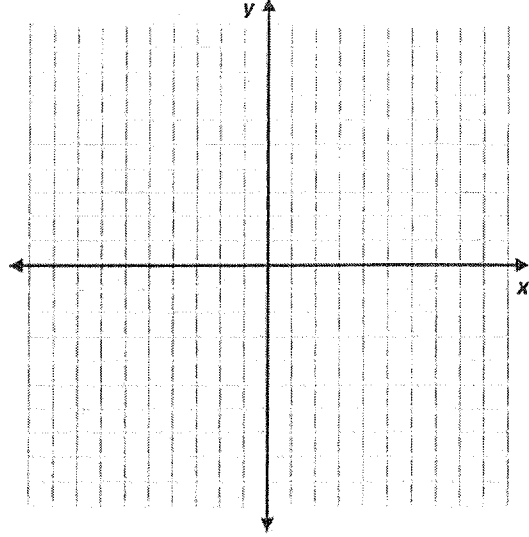
6. The following equation can be used to predict the average height of boys anywhere between birth and 15 years old: $y = 2.79x + 25.64$, where x is the age (in years) and y is the height (in inches).

- a. What does the slope represent in this problem? Interpret it in context.
- b. What does the y-intercept represent in this problem? Interpret it in context.

7. Graph $y = \frac{1}{3}x + 5$

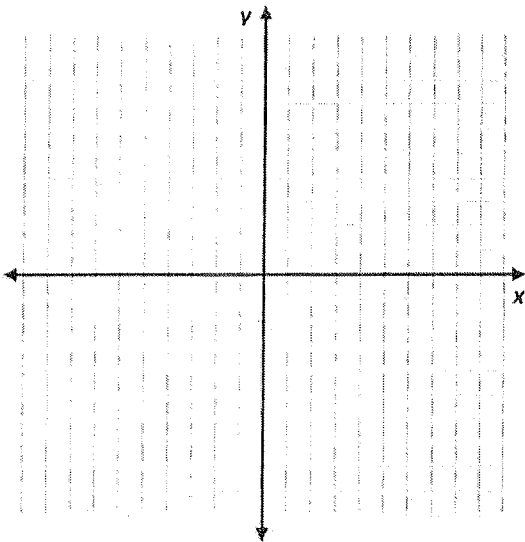


8. Graph $y = 7 + 3x$

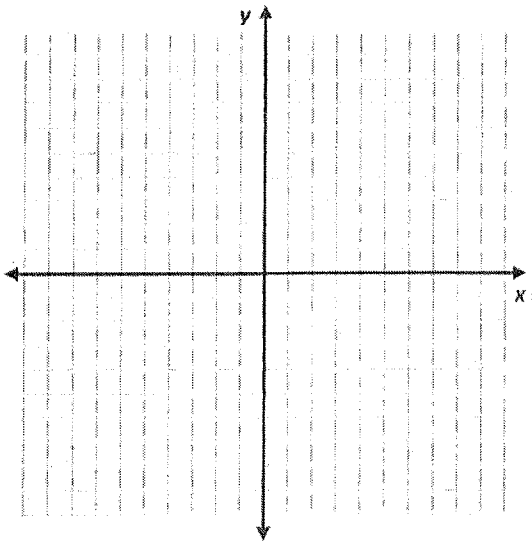


In Statistics, we don't use $y = mx + b$, instead we use the standard form of $y = a + bx$, where a is the y -intercept and b is the slope.

9. Graph the line $y = 5 + \frac{1}{4}x$



10. Graph the line $y = 3 - \frac{x}{5}$



MEASURES OF CENTER: mean, median, and mode are called measures of center or central tendency. They tell us what the center or typical value of a data set is.

Mean = arithmetic average. Find the mean by adding up all the numbers data values and dividing by how many data values there are.

Median = the middle value. Find the median by listing the data set in order from smallest to largest and locating the middle value. If the data set has an odd number of data points, there will be one exact number in the middle. If the data set has an even number of data points, you need to take the average of the two middle values.

Mode = the number that shows up most often. A data set may have no mode (none of the values are repeated), one mode, two modes, or several modes.

MEASURES OF SPREAD:

Range = maximum — minimum. The range is the difference between the largest number in the data set (maximum) and the smallest number (minimum).

Interquartile Range (IQR) = $Q3 - Q1$. The IQR is the range of the middle 50% of your data.

The five number summary for the data set include the minimum data value(min), maximum data value(max), Q_1 , Median(Q_2), and Q_3 .

Look at the data set below. It shows the number of shots made from 50 free throws for 18 players.

12 32 42 50 39 38 27 34 42 35 48 36 13 15 23 16 25 43

What's the first thing we need to do? Sort it from lowest to highest! We've found the median — its between the 9th and 10th value. Below, we've marked the median with a line to divide the data set into the lower half and the upper half. How many data values are in each half? The same number!

Median
= 34.5

12 13 15 16 23 25 27 32 34 | 35 36 38 39 42 42 43 48 50

Lower Data Set Upper Data Set

Find the median of the lower data set → 23. This is called the lower quartile, or Q_1 .

Find the median of the upper data set → 42. This is called the upper quartile, or Q_3 .

Now, we have everything (the five number summary) we need to make a box and whisker plot. Always use a scale to draw the box and whisker plot.

Number of shots made from 50 attempts

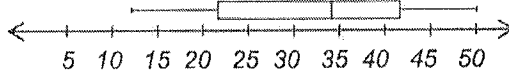
Min = 12

Q_1 = 23

Median = 34.5

Q_3 = 42

Max = 50



1. A real estate agent has sold seven homes priced at \$104,900, \$119,900, \$134,900, \$142,000, \$179,900, \$199,900, \$750,000.
- Find the mean selling price.
 - Find the median selling price.
 - Find the mode of the selling prices.
 - How does the selling price of \$750,000 affect the mean selling price?
 - How does this explain why the most commonly used measure of central tendency for housing prices is the median rather than the mean or the mode?

2. A survey was conducted by Mrs. Johnson in her math class. She asked, "How many hours did you spend on homework this past week?" The responses are below:

13	4	10	8	9
0	2	5	15	12
9	16	11	8	4
3	8	10	6	8
11	6	7	11	9

Find the lowest value, highest value, Q_1 , median, and Q_3 . Draw a box and whisker plot for this set of data.

3. Twenty high school students took the Math 2 examination and received the following scores: 70, 60, 75, 68, 85, 86, 78, 72, 82, 88, 88, 73, 74, 79, 86, 82, 90, 92, 93, 73. Create a **histogram** for this data. Use the frequency table below. Helpful video <https://www.youtube.com/watch?v=fbckNjLK7mw>

Grade Range	Frequency
60-64	
65-69	
70-74	
75-79	
80-84	
85-89	
90-94	

Statistics is the science of collecting , organizing, analyzing, summarizing, and drawing conclusions from data.

A variable is a characteristic or attribute that can assume different values.

Data are the values that variables can assume.

Quantitative variables are the numerical values that can be ordered. Age, weight, body temperature are examples of quantitative variables.

Categorical or Qualitative variables are variables that can be placed in distinct categories. Gender, favorite ice cream flavor, county you live in, are examples of categorical variables.

Use the definitions above as well as the apstatsguy summer video number two :

https://www.youtube.com/watch?feature=player_detailpage&v=j_Y_0eh-FCQ

To help you determine answers to the following:

Determine if the variables listed below are quantitative or categorical.

- 1. Favorite author*
- 2. Number of people living in a household*
- 3. Eye color*
- 4. Temperature of a cup of coffee*
- 5. Yearly salary*
- 6. Gender*
- 7. Time it takes to get to school*
- 8. Height*
- 9. Amount of water you drink per day*
- 10. Jellybean flavors*
- 11. Zip code*
- 12. pizza toppings*
- 13. number of shoes owned*

COUNTING PROBLEMS, PERMUTATIONS AND COMBINATIONS

<https://www.khanacademy.org/math/probability/probability-and-combinatorics-topic>

<http://www.regentsprep.org/Regents/math/ALGEBRA/APR1/indexAPR1.htm>

<http://www.regentsprep.org/Regents/math/ALGEBRA/APR2/indexAPR2.htm>

<http://www.regentsprep.org/Regents/math/ALGEBRA/APR4/indexAPR4.htm>

or other recommended sites and the information blow can be used to review **COUNTING PROBLEMS, PERMUTATIONS AND COMBINATIONS**

COUNTING PROBLEMS:

$$n \text{ factorial} = n! = (n)(n-1)(n-2)(n-3)\dots(1)$$

$$7! = 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 5040$$

The coach of a softball team needs to put the 9 players on the team into a batting order.

This means: players have to be assigned places from 1st through 9th.

How many different batting orders are possible?

Reasoning: There are 9 choices for who will bat 1st, then 8 choices for who will bat 2nd, then 7 choices for who will bat 3rd, and so on.

Answer: $9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 362,880$ possible batting orders.

You want to press one key on a piano and pluck one string on a ukele at the same time. How many different ways can you do this?

Step 1: Determine how many choices you have for each:

A piano has 88 keys and a ukele has 4 strings

Step 2: Use the counting principal: number of keys you can choose x number of strings you can choose

answer: $88 \times 4 = 352$ total possible ways

Joey has four pairs of pants and six shirts. How many outfits does he have in all?

answer: $4 \times 6 = 24$

How many ways can the letters of the word "CAT" be arranged? $3! = 6$ ways

How many ways can the letters of the word "BOOT" be arranged? $\frac{4!}{2!}$ (4 letters in the word) = 12 ways
(2 O's)

How many ways can the letters of the word "STATISTICS" be arranged? $\frac{10!}{3!3!2!}$ (4 letters in the word) = 50400 ways
(3 S's, 3 T's, 2 I's)

PERMUTATIONS: When different orderings of the same items are counted separately, we have a permutation problem:

$${}_n P_r = \frac{n!}{(n-r)!}$$

There are 12 horses ($n = 12$) in a race in which a first, second, and third prize will be awarded. The first prize is \$20,000, the second prize is \$8,000, and the third prize is \$2,000 ($r = 3$). Assuming that there are no ties, how many different outcomes are possible.

$${}_{12}P_3 = \frac{12!}{9!} = 1320$$

A club has 20 members ($n = 20$). In how many different ways can they choose a slate of four officers ($r = 4$): president, vice-president, secretary, and treasurer?

$${}_{20}P_4 = 116,280$$

COMBINATIONS: The fundamental counting principle, as demonstrated above, is used any time the order of the outcomes is important. When selecting objects from a group where order is **NOT** important, we use the formula for COMBINATIONS:

$${}_n C_r = \frac{n!}{r!(n-r)!}$$

From the debate team with a membership of 10 ($n = 10$) we are to select three members to participate in the competition next week ($r = 3$). In how many ways can this task be accomplished? Since selecting Sue, then Mary, then Ted would give the same results as Mary, then Ted, then Sue (the competition team would still be the same) we use the combination formula:

ANSWER:

$${}_{12}C_3 = 116,280$$

A charitable organization is holding a raffle in which three ($r = 3$) lucky winners will each receive a wide-screen television worth \$1,500. If 300 tickets ($n = 300$) were sold, in how many substantially different ways can the three winners be selected? **It's a combination because the prizes are the same, so order that the winners are chosen is not important**

ANSWER:

$${}_{300}C_3 = 4,455,100$$

Solve:

1. $\frac{25!}{20!}$

2. $\frac{12!}{(12-7)!}$

3. ${}_8P_4 =$

4. ${}_5P_1 =$

5. ${}_7C_4 =$

6. ${}_4C_4 =$

7. Four seniors will speak at graduation. If 30 students audition to speak, how many different groups of 4 speakers can be selected?
8. Mike has nine baseball trophies to arrange on the shelf. How many different ways can they be arranged?
9. A club consisting of eight people must choose a president, vice-president, and a secretary. How many different arrangements are possible?
10. In how many ways can 12 people wait in line if Pete is last in line?(only take into account the other 11)
11. A teacher decides to give six different prizes to 6 of the 30 students in the class. In how many ways can the students be selected?
12. How many different 12-member juries be chosen from a pool of 25 people?
13. A man has 8 pairs of pants, 12 shirts, 15 ties, and 6 sport coats. If he wears one of each, how many different outfits can he wear?

14. Suppose that there are 3 roads connecting Town A to Town B, 4 roads connecting Town B to Town C, and 2 roads connecting Town C to Town D. Here is a picture representing the situation.



How many different ways are there to travel from Town A to Town D? (Assume that the trip goes through each of the towns just once.)

15. *Make up your own problem where the answer would be found using ${}_{12}C_5$.*
16. *Make up your own problem where the answer would be found using ${}_{12}P_5$.*
17. *How many different ways can the letters in the word "FIRST" be rearranged? "LETTER" be rearranged? "MISSISSIPPI" be arranged?*
18. *There are 10 true-false questions on a quiz. How many different possible ways can someone answer all 10 questions?*
19. *How many 3-digit numbers with place value can be made from the digits 0, 1, 2, 3, and 4 if repetition is not allowed?*
20. *How many different outcomes are possible when two coins are tossed?*
21. *How many different outcomes are possible when two dice are rolled?*
22. *Suppose a license plate consists of five different letters. How many five letter license plates are possible?*

PROBABILITY

<https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-probability-statistics>

<http://www.regentsprep.org/Regents/math/ALGEBRA/APR5/indexAPR5.htm>

<http://www.regentsprep.org/Regents/math/ALGEBRA/APR6/indexAPR6.htm>

<http://www.regentsprep.org/Regents/math/ALGEBRA/APR3/indexAPR3.htm>

or other recommended sites to help you solve the following problems.

1. A bowl contains 12 slips of paper, each with a different name of a month on it. Find the theoretical probability that a slip selected at random from the bowl has the name on the month that ends with "ber."
2. For a fair die, find the probability of not rolling a 3.
3. For a fair die, find the probability of rolling a number divisible by 3.
4. A manufacturer decides to inspect 2,500 skateboards. There are 2,450 skateboards that have no defects. Find the probability that a skateboard selected at random has no defects.
5. A baseball player has a batting average of .300.
 - a. What is the probability that the player had a hit each time he comes to bat?
 - b. What is the probability that the player misses the next time he comes to bat?
6. Mrs. Summer, a counselor, meets groups students at random to speak to them about their school concerns. If one group contains 15 boys and 17 girls, find the probability that the first person called is:
 - a) a boy
 - b) a girl
 - c) a student
 - d) the counselor

7. If a traffic light is green for 120 seconds, red for 50 seconds and yellow for 10 seconds, what is the probability that the light will be green or yellow?
8. Allison has a 45% chance of making a free throw, what is the probability that she will miss the free throw?
9. A number is selected from the set of integers 1 through 10 inclusive. What is the probability that the number is a multiple of 2 or 3.
10. What is the probability of picking two queens out of a deck of cards one at a time?(there are 52 cards in a deck of cards and 4 queens)
11. A bag contains 4 red blocks, 5 green blocks, and 7 blue blocks. One block is taken from the bag and then replaced. Another block is taken from the drawer. What is the probability that the first block is red and the second block is blue?
12. A bag contains 4 red blocks, 5 green blocks, and 7 blue blocks. One block is taken from the bag and then **NOT** replaced. Another block is taken from the drawer. What is the probability that the first block is red and the second block is blue?
13. A jar has 2 yellow marbles, 3 red marbles, 5 green marbles, and 2 blue marbles.
- A. What is the probability of picking 3 red marbles in a row if you replace your marble after each pick?
- | | |
|-------------------|------------------|
| a. $\frac{1}{12}$ | c. $\frac{1}{4}$ |
| b. $\frac{1}{64}$ | d. $\frac{1}{9}$ |
- B. What is the probability of picking a yellow marble, then a blue marble, then another yellow marble if you DO NOT replace your marble after each pick?
- | | |
|--------------------|--------------------|
| a. $\frac{1}{288}$ | c. $\frac{1}{432}$ |
| b. $\frac{1}{220}$ | d. $\frac{1}{330}$ |
14. In a school of 1500 students, 380 are seniors, 160 students take math, and 30 students are seniors and are also taking math. What is the probability that a randomly chosen student who is a senior, is taking math?