Math 21 Online – Final Review

- For sample size problems, just state the appropriate sample size.
- For confidence interval problems, express your answer in a sentence.
- For hypothesis tests, use the standard 5-step procedure.
    1. Ho & H1
    2. alpha
    3. test
    4. test statistic & p-value
    5. Decision about Ho and conclusion

1) A news agency is planning a poll. The agency wants to determine what proportion of American citizens supported NATO involvement in Kosovo. If the agency wants to be 95% sure that the sample proportion differs from the true population proportion by no more than 4%, how large of a sample is necessary?

2) A high school counselor wants to estimate the mean SAT combined score for high school students. He has been told that the standard deviation for all such scores is approximately 230 points. How large of a sample is required in order to be 99% sure that his sample mean is off by no more than 10 points from the true mean SAT combined score.

3) A sample of 350 Americans were asked if they had ever seen a UFO, and 14 said that they had. Construct an 84% confidence interval for the proportion of all Americans who have seen a UFO.

4) Here are the ages of a random sample of 10 men who first married in 1998.

28	25	18	18	19	34	21	25	24	24

Construct a 95% confidence interval for the mean age at which men get married.

5) A random sample of 23 symphony musicians was asked how many hours they practiced their instrument per week. The survey produced a mean practice time of 6.2 hours with a standard deviation of 2.36 hours per week. At the 0.05 level of significance, test the claim that the mean time that symphony musicians practice per week is greater than 5 hours per week.

6) A sample of 340 Americans were asked whether they thought that UFO's are real, and 146 said that they thought that UFO's are real. At the 0.05 level of significance, test the claim that less than half of all Americans think that UFO's are real.

7) Does amount of education play a role in the healthiness of an individual? A random sample of individuals were asked to rate their health. Here are the results, broken down by level of education.

	Excellent	Good	Poor
Less Than High School	72	202	62
High School Grads	465	877	108
College Grads	439	561	25

Test the claim that health is independent of level of education at the 0.05 level of significance.

8) The Harris Poll conducted a survey in which they asked, "How many tattoos do you currently have on your body?"

- Of the 1205 males surveyed, 181 responded that they had at least one tattoo.
- Of the 1097 females surveyed, 143 responded that they had at least one tattoo.

Test the claim that the proportion of males that have at least one tattoo is different than the proportion of females that have at least one tattoo, at the 0.05 level of significance.

9) Do people walk faster in the airport when they are departing (getting on a plane) or when they are arriving (getting off a plane)? A researcher measured the walking speed of travelers in two airports.

- 35 departing passengers had a mean walking speed of 260 feet/minute, with a standard deviation of 53 feet/minute.
- 35 arriving passengers had a mean walking speed of 269 feet/minute, with a standard deviation of 34 feet/minute.

Test the claim that the mean walking speed for departing passengers is different than the mean walking speed for arriving passengers at the 0.05 level of significance.

10) According to the manufacturer of M&Ms, 13% of the plain M&Ms in a bag should be brown, 14% yellow, 13% red, 24% blue, 20% orange, and 16% green. A student randomly selected a bag of plain M&Ms. He counted the number of M&Ms that were each color and obtained the results shown in the table.

Color	Brown	Yellow	Red	Blue	Orange	Green
Frequency	61	64	54	61	96	64

Test the claim that plain M&Ms follow the distribution stated by M&M/Mars at the 0.05 level of significance.

11) A researcher plans soybeans in three types of plots: Liberty, No till, and Chisel plowed. The data represent the number of pods on a random sample of soybean plants for the three plot types.

Plot Type	Pods								
Liberty	32	31	36	35	41	34	39	37	38
No till	34	30	31	27	40	33	37	42	39
Chisel plowed	34	37	24	23	32	33	27	34	30

At the 0.05 level of significance, test the claim that the mean number of pods is the same for all 3 plot types.

12) To test the belief that sons are taller than their fathers, a student randomly selects 13 fathers who have adult male children. She records the height of both the father and son in inches and obtains the following data. Test the claim that sons are taller than their fathers at the 0.05 level of significance.

Family	1	2	3	4	5	6	7	8	9	10	11	12	13
Father	70.3	67.1	70.9	66.8	72.8	70.4	71.8	70.1	69.9	70.8	70.2	70.4	72.4
Son	74.1	69.2	66.9	69.2	68.9	70.2	70.4	69.3	75.8	72.3	69.2	68.6	73.9

Part 2 – For the following hypothesis tests, the test statistic and P-value have already been calculated for you using StatCrunch. Write up the hypothesis tests using the 5-step procedure.

1) 500 people were asked their income level and political affiliation.

	Republican	Democrat	Independent
$50,000 or lower	30	110	100
Above $50,000	120	50	90

At the 0.05 level of significance, test the claim that political affiliation is independent of income level.
(Test Statistic: 76.35, p-value < 0.0001)

2) A company is studying the absence patterns of its workers. A sample of 362 absences showed the following results:

Day	Mon	Tue	Wed	Thu	Fri
Absences	87	62	71	68	74

At the 0.05 level of significance, test the claim that the proportion of absences is the same for each day of the week.
(Test Statistic: 4.77, p-value: 0.3119)

3) A manufacturer is considering two methods for assembling chairs, and uses each method to assemble 25 different chairs. Method A produced a mean assembly time of 6.5 minutes, with a standard deviation of 1.30 minutes. Method B produced a mean assembly time of 6.2 minutes with a standard deviation of 1.36 minutes. Test the claim that the two methods have the same mean assembly time at the 0.01 level of significance.
(Test Statistic: 0.80, p-value: 0.4292)

4) A sample of 607 Americans reveals that 137 of them smoke cigarettes. Use this sample information to test the claim that more than 20% of all Americans smoke, at the 0.05 level of significance.
(Test Statistic: 1.58, p-value: 0.0567)

5) A new company claims that the average monthly long distance bill is less than $20. A sample of 36 of their customers produced a mean monthly bill of $19.18. If the population standard deviation is $3.87, test the company's claim at the 0.01 level of significance.
(Test Statistic: -1.27, p-value: 0.1018)

6) In a study conducted at LAX, 81 of 300 persons who had just gotten off a plane and 32 of 200 persons who were about to get on a plane admitted that they were afraid of flying. At the 0.05 level, test the claim that the two population proportions are not equal.
(Test Statistic: 2.88, p-value: 0.004)

7) To compare two kinds of baseball bats, 18 players were asked to swing 20 times with each kind of bat at balls pitched by a machine. Here are the numbers of home runs that they hit.

Aluminum Bat	6	9	4	7	10	5	9	3	5	6	12	8	5	4	9	10	7	11
Wooden Bat	8	5	4	6	8	6	7	4	4	6	9	9	5	6	6	8	7	7

At the 0.05 level, test the claim that more home runs are hit with an aluminum bat than with a wooden bat.
(Test Statistic: 1.84, p-value: 0.0413)

8) A farmer tried 4 different fertilizers to determine which was the most effective. He applied each fertilizer to 5 different tomato plants, and measured the yield of each plant. Here are the results, in pounds.

Fert. A	Fert. B	Fert. C	Fert. D
57	49	53	39
51	55	56	45
50	54	46	42
52	48	48	37
56	50	55	40

Test the claim, at the 0.05 level of significance, that each fertilizer produces the same mean yield.
(Test Statistic: 13.85, p-value: 0.0001)