

Statistics

Final Trimester 3 (2016-2017) Review

round all answers to the nearest thousandth

\*Show all work for full credit

\*If the calculator is used to answer a question please write down what you typed in the calculator. Only do this if you are using the calculator to access distribution functions not arithmetic.

1) A fair coin has come up "heads" 10 times in a row. What is the probability that the coin will come up heads on the next flip? Explain.

$\frac{1}{2}$ , The "flips" are independent of each other. The fact that 10 heads appeared does not effect the 11th flip.

2) According to the National Telecommunication and Information Administration 56.5% of US households owned a computer in 2001. What is the probability that three randomly selected US households owned at least 1 computer in 2001?

$$1 - P(\text{no computer}) \quad , \quad q = 1 - 0.565 = 0.435$$
$$1 - (0.435)^3$$
$$= \boxed{0.92}$$

3) According to the National Telecommunication and Information Administration, 50.5% of US households had internet access in 2001. What is the probability that four randomly selected US households all had internet access in 2001?

$$(0.505)^4 = \boxed{0.07}$$

4) Which of the following can be described using the binomial model?

- a) the number of people we survey until we find someone who has taken statistics
- b) the number of people in a class of 25 who have taken statistics ~~✗~~
- c) the number of aces in a five-card poker hand
- d) the number of sodas students drink per day

5) Which of these can be described using the geometric model?

- a) the number of people we survey until we find someone who has taken statistics ~~✗~~
- b) the number of people in a class of 25 who have taken statistics
- c) the number of aces in a five-card poker hand
- d) the number of sodas students drink per day

6) Batco, a company that sells batteries, claims that 99.5% of their batteries are in working order. How many would you expect to buy, on average, to find one that does not work?

$$\frac{1}{0.005} = \boxed{200 \text{ batteries}}$$

7) According to a car magazine 18.8% of the luxury cars manufactured in 2003 were silver. A large car dealership typically sells 50 luxury cars a month.

a) What is the probability that the fifth car sold is the first silver one?

$$(0.812)^4 (0.188) = \boxed{0.08}$$

b) What is the mean and standard deviation of the number of silver cars sold in a month?

$$E(x) = np = 0.188(50) = 9.4 \text{ cars}$$

$$SD(x) = \sqrt{npq} = 2.76 \text{ cars}$$

8) Mr. Whipple has a ~~ten~~ ten-sided die labeled with the numbers 1, 2, 3, 4, 5, 6, ~~7, 8, 9,~~ and 10. He rolls the die 169 times and counts the number of one's he rolls and makes a proportion. For example, if he got 17 ones, his proportion would be 17/169 (this meaning 17 of his 169 rolls were ones).

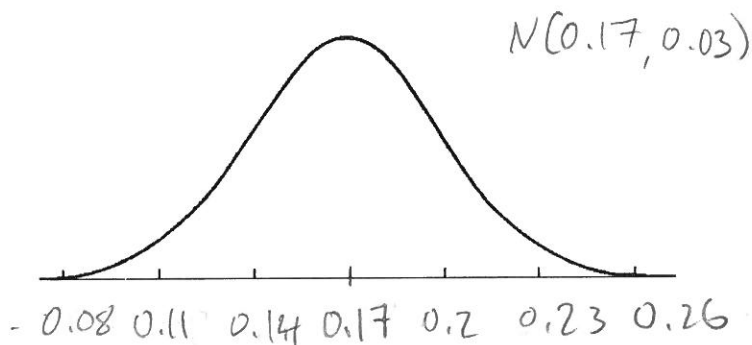
a) If Mr. Whipple asked his large class of students to repeat this same process and report their proportions and then he made a histogram from these proportions, where would his histogram be centered?

$$\frac{1}{6} \approx 0.1\bar{6} = \boxed{0.17}$$

b) What would the standard deviation of the histogram be?

$$SD(\hat{p}) = \sqrt{\frac{\hat{p}\hat{q}}{n}} = \sqrt{\frac{(0.17)(0.83)}{169}} = \boxed{0.03} \text{ or } 1.7$$

c) Draw a picture of the histogram



9) Repeat question 1 but this time the die is 225 times instead of 169.

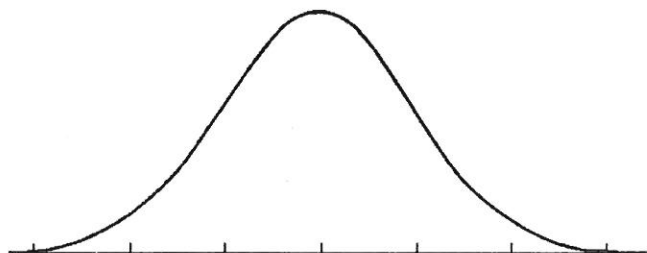
a) If Mr. Whipple asked his large class of students to repeat this same process and report their proportions and then he made histogram from these values, where would his histogram be centered?

sum as before  $\approx 0.16 \approx 0.17$   
 $\uparrow$

b) What would the standard deviation of the histogram be?

$$SD(\hat{p}) = \sqrt{\frac{(0.17)(0.83)}{225}} = 0.025$$

c) Draw a picture of the histogram



10) What happens to the standard deviation of this model as the number of times the die is rolled increases?

The standard deviation becomes smaller.

11) A study reports the 57% of people have blue eyes.

a) What is the probability that in a class of 24 students 13 or more have blue eyes?

$\hat{p} = \frac{13}{24} = 0.542$ 
 $N(0.57, 0.10)$ 
 $p = 0.57$ 
 $SD(\hat{p}) = \sqrt{\frac{(0.57)(0.43)}{24}} = 0.101$

0.542 0.57

0.609

b) What is the probability that 13 or less have blue eyes?

0.391

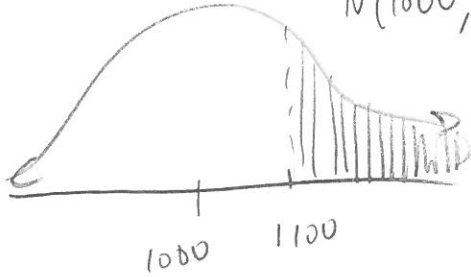
c) Would you be surprised if only 10 of the students have blue eyes?

$\frac{10}{24} = 0.416$ , no this is only 1.524 standard deviations from the mean.

12) The new SAT reports an average score of 1000 with a standard deviation of 100. What is the probability that in a group of 10 people the average score is better than 1100?

$$\mu = 1000, \quad SD(\bar{y}) = \frac{\sigma}{\sqrt{n}} = \frac{100}{\sqrt{10}} = 31.623$$

$$N(1000, 31.623)$$



normcdf

low: 1100

high: ∞

μ: 1000

σ: 31.623

$$7.828 \times 10^{-4}$$

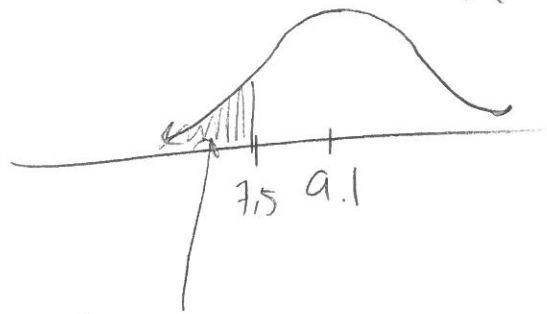
$$\boxed{0.0007828}$$

13) Mr. Whipple was once employed as a loon biologist. One day he was asked to collect a sample of 10 loons from Squam Lake and record their weights. He found that the average weight of the 9 loons was 7.5 lbs. If previous studies have shown that the average weight for loons is 9.1 lbs with a standard deviation of 1 lb, should Mr. Whipple be concerned about the loons living in Squam Lake?

$$\mu = 9.1, \quad \sigma = 1$$

$$SD(\bar{y}) = \frac{1}{\sqrt{9}} = \frac{1}{3}$$

$$N(9.1, 0.33)$$



$$7.94 \times 10^{-7}$$

$$\boxed{0.000000794}$$