

Fifteen percent of divers or snorkelers are victims of unprovoked shark attacks. Twenty diver certification cards are drawn at random. Use this information to answer the next **THREE** questions.

1. What is the probability that at least three but less than seven of the divers drawn would have been a victim of an unprovoked shark attack?
  - A. =BINOM.DIST(7, 20, .15, 1)-BINOM.DIST(3,.20,.15,1)
  - B. =BINOM.DIST(6, 20, .15, 1)-BINOM.DIST( 3, 20, .15, 1)
  - C. =BINOM.DIST(6,20,.15,1)-BINOM.DIST(2,20,.15,1)
  - D. =BINOM.DIST(7, 20, .15, 1)-BINOM.DIST(2,20,.15,1)
  
2. Of twenty divers, how many divers would one expect to be shark attack victims?
  - A. 10
  - B. 3
  - C. 1.5
  - D. 0.15
  
3. What is the probability that more than seven divers drawn would have been shark attack victims?
  - A. =BINOM.DIST(7,20,.15,1)
  - B. =BINOM.DIST(8,20,.15,1)
  - C. =1-BINOM.DIST(6,20,.15,1)
  - D. =1-BINOM.DIST(7,20,.15,1)
  
4. A random variable follows the Student's *t* distribution. The probability that it will be negative is
  - A. 0.
  - B. <0.50.
  - C. 0.50.
  - D. Depends on n.

A size of Twix candy bars is advertised as weighing 2.13 ounces. However, the weight of the candy bars is normally distributed with a mean of 2.20 ounces and a standard deviation of 0.4 ounces. Use this information to answer the next **FOUR** questions. Note: the questions continue onto the next page.

5. What is the minimum weight of the heaviest 75% of the Twix candy bars?
  - A. =NORM.INV(0.25,2.2,0.4)
  - B. =NORM.INV(0.75,2.2,0.4)
  - C. =NORM.INV(1-0.25,2.13,0.4)
  - D. =NORM.INV(1-0.75,2.13,0.4)
  
6. Of the 75% of Twix candy bars distributed symmetrically around the mean, what is the heaviest weight?
  - A. =2.13+NORM.SI.NV(0.875)\*0.4
  - B. =2.13 + NORM.S.INV(0.125)\*0.4
  - C. =NORM.INV(0.125,2.2,0.4)
  - D. =NORM.INV(0.875,2.2,0.4)

7. A store owner was calculating mean weights of 100 Twix candy bars. What is the probability that the mean weight of Twix candy bars in such samples is more than 2.30 ounces?
- A. =1-NORM.DIST(2.3,2.2,0.04,1)  
 B. =NORM.DIST(2.3,2.2,0.04,1)  
 C. =NORM.DIST(2.3,2.2,0.4,1)  
 D. =1-NORM.DIST(2.3,2.2,0.4,1)
8. What would be the mean weight of 100 Twix candy bars if the Z-score was 1.7?
- A. 2.13                      B. 2.20                      C. 2.27                      D. 2.88

The data in the table concern a group of 40 different animal species. They are the average gestation period (in days) and average longevity (in years). Use this table to answer the next **THREE** questions.

Longevity in years	Gestation in days				
	<100	100-200	200-300	300-400	400 or more
< 10	8	2	1	0	0
10-20	5	5	5	3	3
20 or more	0	1	5	1	1

9. Which is more likely, that an animal species will have an average gestation of less than 100 days or that an animal species will have an average longevity of 20 or more years?
- A. Average gestation of less than 100 days.  
 B. Average longevity of 20 or more years.  
 C. The likelihood is the same for both events.  
 D. Insufficient information to tell.
10. Given that an animal species is one of the shortest lived, what is the probability that its average gestation will be between 100 and 300 days?
- A. 0.08                      B. 0.18                      C. 0.25                      D. 0.27
11. If gestation and longevity are independent, what number of animal species would you expect to find in the shaded cell?
- A. 0.065                      B. 2.6                      C. 0                      D. 21.3

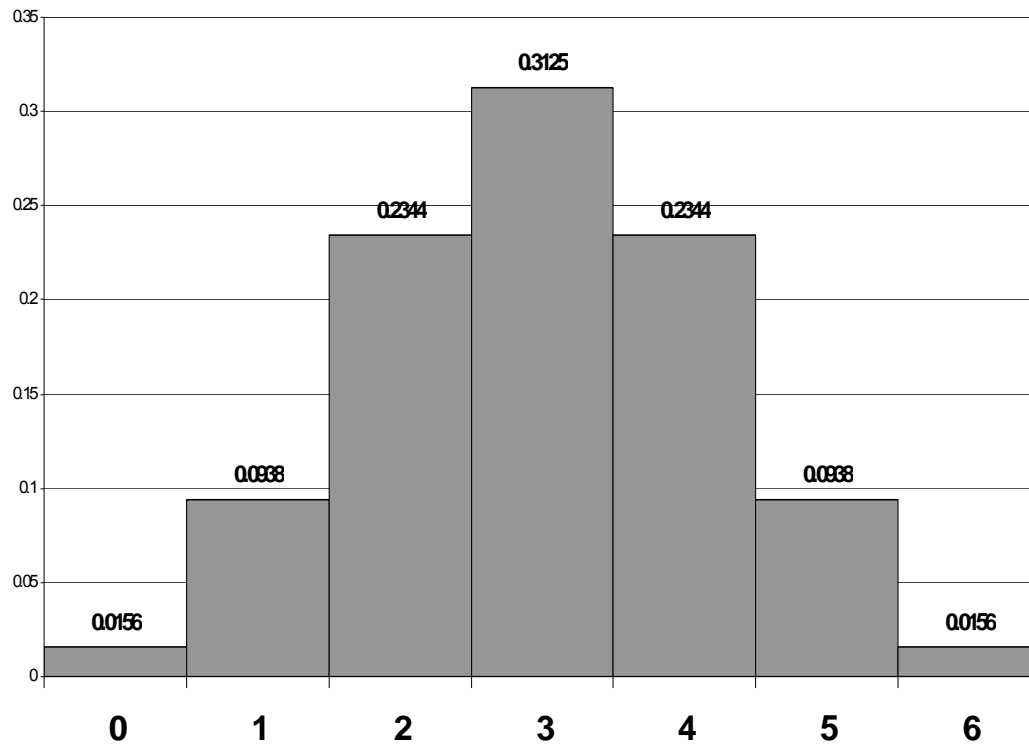
12. Kunlakarn has decided to invest in oil paintings as a hedge against inflation. She is particularly interested in paintings by Picasso or Constable. Below is a table of information about the value of paintings by these artists in differing states of the Fine Art Market.

**Values of one painting by Picasso or Constable  
in different states of the Fine Art Market.**

Probability of Fine Art Market State		Picasso	Constable
Depressed	0.25	300K	500K
Stable	0.45	400K	400K
Expanding	0.30	500K	700K

Kunlakarn wishes to purchase 2 paintings by one of the artists and 1 by the other. If she wishes to minimize the risk of her investment, which collection of paintings should she buy?

- A. Two Picassos and One Constable  
 B. One Picasso and Two Constables  
 C. There is no difference in the risk between the two collections.  
 D. Insufficient information to tell.
13. Which of the following is true in a binomial distribution?
- A. Each outcome is dependent on the previous outcome.  
 B. Each outcome is collectively exhaustive.  
 C. The outcome of a trial depends on the number of trials.  
 D. The likelihood that each trial is a success is constant.
14. Which of the following statements about the relationship between the Normal, the Standard Normal and the Student's  $t$  distributions is true?
- A. As  $n$  increases both the Student's  $t$  and the Normal approach the Standard Normal.  
 B. The Normal and the Student's  $t$  are both large families of distributions.  
 C. The Standard Normal is an approximation of the Normal.  
 D. The Standard Normal and the Normal are symmetric but the Student's  $t$  is right skewed.
15. You wish to calculate the probability that the  $t$ -score of a random variable distributed as a Student's  $t$  is smaller than  $-2$ . The degrees of freedom for the distribution is 7. Which command will give you the correct probability?
- A. =T.DIST(-2,7,1)  
 B. =2\*T.DIST(-2,7,2)  
 C. =T.DIST(-2,7,2)  
 D. =T.DIST(1,7,1)



16. With respect to the histogram above, what is the probability of success to 2 decimals for the binomial distribution it represents?
- A. 0.317      B. 0.47      C. 0.50      D. 0.14
17. Assume that the probability of success in the binomial above is 0.35. What is the expected value and the standard deviation of this binomial?
- A. 2.1 and 1.37 respectively  
 B. 0.35 and 0.19 respectively  
 C. 0.35 and 1.14 respectively  
 D. 2.1 and 1.17 respectively
18. The standard error of  $\bar{X}$  is equal to 15 when  $n=36$ . To the nearest whole number, what size sample is necessary to reduce the standard error to 5?
- A. 18      B. 108      C. 324      D. 467

19. What must be true of the population distribution in order to appropriately use the Student's  $t$  distribution to calculate probabilities and  $t$ -scores?
- A. It must be distributed as a Standard Normal.
  - B. It must be distributed normally for samples of less than 30.
  - C. It must have fewer than 30 observations in it and be symmetric.
  - D. Both B and C.
20. What are degrees of freedom?
- A. The number of observations in a sample that are random.
  - B. The number of samples in a population that are random.
  - C. The number of observations in a sample that do not vary.
  - D. The number of random samples in a sampling distribution.
21. Which of the following statements is consistent with the Central Limit Theorem?
- A. When  $\mu$  and  $\sigma$  are known, the population will be approximately normally distributed.
  - B. If a population has  $\mu$  and  $\sigma$ , a sample from that population will be normally distributed if the sample size is large enough.
  - C. When we know  $\sigma$ , the variation in the sample means will be equal to that of the population.
  - D. Means of samples for  $n=30$  from a Poisson distribution will be approximately normally distributed.
22. Why is the Central Limit Theorem so important to the statistics discipline?
- A. It allows us to make inferences about statistics when we know  $\mu$  and  $\sigma$ .
  - B. It allows us to estimate a population parameter when it is unknown.
  - C. It allows us to estimate a statistic when the population is unknown.
  - D. It allows us to make inferences about parameters when we know  $\mu$  and  $\sigma$ .
23. The sampling distribution simulation from the lab manual demonstrated
- A. as  $n$  increased, the mean of the sample means got closer to the standard deviation of the population.
  - B. for small samples, the mean of the sample means is biased.
  - C. as  $n$  increased, the sample mean is a consistent and efficient estimator.
  - D. for small samples, the standard deviation of the population is biased.

24. In a 1999 Gallup Poll, given the week before Halloween, 22% of adults contacted stated that they believed in witches. If you wished to calculate a 90% confidence interval for the proportion of adults who believe in witches, with a margin of error no larger than 3%, how many adults would you need to interview? A useful number is one of the following:
- |                                    |                                  |
|------------------------------------|----------------------------------|
| $=\text{NORM.S.INV}(0.90) = 1.28$  | $=\text{T.INV}(0.925,10) = 2.63$ |
| $=\text{NORM.S.INV}(0.95) = 1.64$  | $=\text{T.INV}(0.90,10) = 2.23$  |
| $=\text{NORM.S.INV}(0.05) = -1.64$ | $=\text{T.INV}(0.975,10) = 1.81$ |

A. 313                      B. 513                      C. 625                      D. 1329

A certain breed of rat is bred to be used for research about breast cancer. One characteristic that is important to researchers is the weight of the rat. A ninety-five percent confidence interval was calculated and it is [4.8 ounces, 5.6 ounces]. Use this information to answer the next **FOUR** questions.

25. What is the mean weight of the rat sample?

A. 4.8 ounces  
 B. 5.2 ounces  
 C. 5.6 ounces  
 D. It could be anything.

26. What is the margin of error of the confidence interval?

A. 0.40                      B. 0.80                      C. 1.60                      D. 2.60

27. Assume that the margin of error of the confidence interval is 1 ounce. If the population standard deviation of rat weights is 2 ounces, what size sample was used to calculate this interval? A useful number is one of the following:

$=\text{NORM.S.INV}(0.95) = 1.64$	$=\text{T.INV}(0.925,10) = 2.63$
$=\text{NORM.S.INV}(0.025) = -1.96$	$=\text{T.INV}(0.90,10) = 2.23$
$=\text{NORM.S.INV}(0.975) = 1.96$	$=\text{T.INV}(0.975,10) = 1.81$

A. 11                      B. 16                      C. 160                      D. 646

28. Which of the following interpretations of this interval is correct?

A. Ninety-five percent of all rats of this breed weigh between 4.8 and 5.6 ounces.  
 B. Ninety-five percent of the rats in the sample weigh between 4.8 and 5.6 ounces.  
 C. The mean of the sample of rat weights is between 4.8 and 5.6 ounces with 95% confidence.  
 D. The mean weight of this rat breed is between 4.8 and 5.6 ounces with 95% confidence.

A 99% confidence interval for female cat weights was calculated to be 8.9 pounds  $\pm$  0.59 pounds. The number of female cats in the sample was 50. Use this information to answer the next **TWO** questions.

29. In order to decrease the width of this interval, ceteris paribus, what must happen to the probability of committing an error?
- A. Need the level of confidence to tell.
  - B. It must stay the same.
  - C. It must decrease.
  - D. It must increase.
30. Suppose it was discovered that the population standard deviation of female cat weights was 2 pounds, rather than 1.6 pounds. How would this affect the width of the interval?
- A. It would become narrower.
  - B. It would become wider.
  - C. It would not change.
  - D. Depends on the sample size.
31. Confidence intervals for proportions
- A. get wider as alpha increases.
  - B. get wider as the sample size increases.
  - C. get narrower as the level of confidence increases.
  - D. get narrower as the proportion moves away from 0.50.
32. The ages of E370 students follow a right skewed distribution with a mean of 23 years and a standard deviation of 3 years. If we randomly sampled 25 students, which of the following statements is **INCORRECT**?
- A. The shape of the sampling distribution of the mean is approximately normal.
  - B. The mean of the sampling distribution is 23 years.
  - C. The standard deviation of the sampling distribution is 0.6 years.
  - D. This information is not sufficient to make inferences about the population.

33. The following is partial Excel Descriptive Statistics output. The data are longevity for 40 animal species. Calculate a 95% confidence interval for the mean longevity of animal species.

<i>Longevity</i>	
Mean	13.15
Sample Variance	52.49
Skewness	1.28
Maximum	40
Sum	526
Count	40
A useful number is one of the following:	
=NORM.S.INV(0.95)	1.64
=NORM.S.INV(0.975)	1.96
=T.INV(0.975,39)	2.02
=T.INV(0.90,39)	1.68

- A. [11.23 , 15.07]  
 B. [12.00 , 14.30]  
 C. [10.84 , 15.46]  
 D. [10.90 , 15.40]

E370--Fall, 2002-03						
Exam Three, Version B (Blue) Answers						
1 C	6 D	11 C	16 B	21 A	26 A	31 C
2 B	7 A	12 B	17 D	22 A	27 B	32 B
3 D	8 C	13 D	18 C	23 D	28 C	33 D
4 C	9 D	14 B	19 D	24 B	29 C	
5 A	10 D	15 A	20 B	25 B	30 C	