

*I've never been competitive with anybody but myself. Tracy Lauren Marrow*

1. How can you characterize a probability distribution?

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- A) \_\_\_\_\_
- B) \_\_\_\_\_
- C) \_\_\_\_\_

2. How do you measure spread/dispersion of a variable?

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- A) \_\_\_\_\_
- B) \_\_\_\_\_
- C) \_\_\_\_\_
- D) \_\_\_\_\_

3. How do you measure central tendency of a variable?

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- A) \_\_\_\_\_
- B) \_\_\_\_\_
- C) \_\_\_\_\_

4. Definitions/Concepts:

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- A) Sampling: \_\_\_\_\_
  - Simple Random Sampling: \_\_\_\_\_
  - Stratified Sampling: \_\_\_\_\_
  - Cluster Sampling: \_\_\_\_\_
  - Convenience Sampling: \_\_\_\_\_
  - Volunteering Sampling: \_\_\_\_\_
- B) Experiments: \_\_\_\_\_
  - Replication: \_\_\_\_\_
  - Blinding: \_\_\_\_\_
  - Randomization: \_\_\_\_\_
  - Confounding: \_\_\_\_\_
- C) Observational Study
  - Prospective: \_\_\_\_\_
  - Retrospective: \_\_\_\_\_
  - Cross-Sectional: \_\_\_\_\_
- D) Use if Statistics
  - Inferential Statistics: \_\_\_\_\_
  - Descriptive Statistics: \_\_\_\_\_
- E) Frequency: \_\_\_\_\_

5. Know when to use these graphics:

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- A) Histogram: \_\_\_\_\_
- B) Barplots: \_\_\_\_\_
- C) Scatter Plots: \_\_\_\_\_
- D) Boxplot: \_\_\_\_\_

6. Where are the outliers when the data looks:

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- A) Skew-Left: \_\_\_\_\_
- B) Skew-Right: \_\_\_\_\_
- C) Bell-Shaped: \_\_\_\_\_

7. How can you determine if there is an outlier:

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- A) \_\_\_\_\_
- B) \_\_\_\_\_

8. Determine if the following is a statistic or parameter.

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- A)  $s$  : \_\_\_\_\_
- B)  $\mu$  : \_\_\_\_\_
- C)  $\sigma^2$  : \_\_\_\_\_
- D)  $s^2$  : \_\_\_\_\_
- E)  $\bar{x}$  : \_\_\_\_\_
- F)  $\sigma$  : \_\_\_\_\_
- G)  $p$  : \_\_\_\_\_
- H)  $\hat{p}$  : \_\_\_\_\_
- I)  $q$  : \_\_\_\_\_

9. Check one category for each variable:

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| Variables                   | Nominal | Ordinal | Discrete | Continuous |
|-----------------------------|---------|---------|----------|------------|
| Height (feet and inches)    |         |         |          |            |
| # of Marbles in a container |         |         |          |            |
| Time (min and sec)          |         |         |          |            |
| Grades (A, A-,B+, etc.)     |         |         |          |            |
| Weight (pound and ounces)   |         |         |          |            |
| City Capitals               |         |         |          |            |
| Color of Eyes               |         |         |          |            |
| # of students in class      |         |         |          |            |

Use the following data to answer questions 10-18.

2, 3, 5, 2, 7, 9, 3, 2

10. How could I visualize this data?

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A) \_\_\_\_\_

11. What is minimum value?

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A) \_\_\_\_\_

12. What is maximum value?

0

A) \_\_\_\_\_

13. What is Q1?

0

A) \_\_\_\_\_

14. What is Q2?

0

A) \_\_\_\_\_

15. What is Q3?

0

A) \_\_\_\_\_

16. What is the IQR?

0

A) \_\_\_\_\_

17. What is the mean?

0

A) \_\_\_\_\_

18. Are there any outliers? What methods can you use? Which one is robust to outliers?

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19. What are the four assumptions of the binomial distribution?

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- A) \_\_\_\_\_
- B) \_\_\_\_\_
- C) \_\_\_\_\_
- D) \_\_\_\_\_

Remember to provide 4 decimal places.

20. Suppose events  $A$  and  $B$  are such that  $P(A) = 2/5$ ,  $P(B) = 2/5$ , and  $P(A \cup B) = 1/2$ . Find  $P(A \cap B)$ .

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21. Suppose events  $A$  and  $B$  are such that  $P(A) = 1/3$ ,  $P(A \cap B) = 1/4$ , and  $P(A \cup B) = 1/2$ . Find  $P(B)$ .

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22. Assume  $X$  follows binomial distribution with sample size,  $n = 40$ , and probability of success,  $p = 0.8$ . What is the probability that  $X$  equals 32,  $P(X = 32)$ . **Box YOUR answer.**

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23. Assume  $X$  follows a Poisson distribution. On average there are 4 accidents that occur on 101 a day, what is the probability that  $X$  equals 2,  $P(X = 2)$  tomorrow. **Box YOUR answer.**

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Use the following information to answer questions 24 and 28. A school has 65% women (W) and 35% are men (M). It is known that 25% of women smoke and 29% of men smoke. What is the probability that a random student is smoking (given) is a female? (i.e.,  $P(W|S)$ )

24. Create a table.

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25. Note the probability of smoking,  $P(S)$  and how we found it. **Box YOUR answer.**

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26. Here we can now find the  $P(W|S)$  **Box YOUR answer.**

0

27. What is the complement of not smoking? **Box YOUR answer.**

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28. What are the odds of smoking? **Box YOUR answer.**

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Use the following information to answer questions 29 and 44. The mean time to travel to SF from SC is 64.3 (minutes and seconds) and standard deviation is 7.4 (minutes and seconds).

29. What is the probability that a random drive up to SF will be between 60.3 and 62.1 (minutes and seconds)? **Box YOUR answer.**

0

30. This means:

0

A) \_\_\_\_\_

31. What is the probability that a random drive up to SF will be greater than 59.3 (minutes and seconds)? **Box YOUR answer.**

0

32. This means:

0

A) \_\_\_\_\_

33. What is the probability that a random drive up to SF will be less than 75.6 (minutes and seconds)? **Box YOUR answer.**

0

34. This means:

0

A) \_\_\_\_\_

35. One time you went to SF real fast and you were among the 5<sup>th</sup> percentile. How long did it take you? **Box YOUR answer.**

0

36. This means that:

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A) \_\_\_\_\_

37. One time you went to SF real slow and you were among the 95<sup>th</sup> percentile. How long did it take you?  
**Box YOUR answer.**

0

38. This means that:

0

A) \_\_\_\_\_

39. What is the probability that a random sample of 20 of you and your friends time sample's mean time to SF is below 65.3 (minutes and seconds)? **Box YOUR answer.**

0

40. This means that:

0

A) \_\_\_\_\_

41. What is the probability that a random sample of 20 of you and your friends time sample's mean time to SF is greater than 65.3 (minutes and seconds)? **Box YOUR answer.**

0

42. This means that:

0

A) \_\_\_\_\_

43. What is the probability that a random sample of 36 of you and your friends time sample's mean time to SF is between 62.3 and 65.3 (minutes and seconds)? **Box YOUR answer.**

0

44. This means that:

0

A) \_\_\_\_\_

45. Name the Discrete Distributions and when you would use them:

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- 1.
- 2.
- 3.
- 4.

Memorize and Understand why each one is important.

Name the Continuous Distributions and when you would use them:

- 1.
- 2.
- 3.
- 4.

Memorize and Understand why each one is important.

46. Find p-value (or p-value range) and Critical Values from each of the tables:

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- Normal Distribution
- t Distribution
- Chi-Square Distribution
- F Distribution<sup>1</sup>

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<sup>1</sup>need to use it in other classes

47. Pieces of a confidence interval based on a  $1 - \alpha$  Confidence Interval:

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1. *PE*:
2. *SE*:
3. *CV*:
4. *ME*:
5. *LB*:
6. *UB*:
7. Interpretation:

Memorize and Understand Process.

|                              | Point Estimate | Standard Error | Critical Value |
|------------------------------|----------------|----------------|----------------|
| Sample Mean                  |                |                |                |
| Sample Proportion            |                |                |                |
| Two Independent Samples      |                |                |                |
| Two Dependent Paired Samples |                |                |                |
| Two Proportions Samples      |                |                |                |
| Regression (Slope)           |                |                |                |

Do past homework for practice.

48. State the four steps of Hypothesis Testing:

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1.
  - 
  - 
  -
- 2.
- 3.
- 4.

Memorize and Understand Process.

49. Types of Hypothesis Tests: Do past homework for practice.

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|                               | Type of Variable | Hypotheses | CV Distribution | Test Statistic |
|-------------------------------|------------------|------------|-----------------|----------------|
| Sample Mean                   |                  |            |                 |                |
| Sample Proportion             |                  |            |                 |                |
| Two Independent Samples       |                  |            |                 |                |
| Two Dependent Paired Samples  |                  |            |                 |                |
| Two Sample Standard Deviation |                  |            |                 |                |
| Two Proportions Samples       |                  |            |                 |                |
| Correlation                   |                  |            |                 |                |
| Regression                    |                  |            |                 |                |
| Goodness of Fit               |                  |            |                 |                |
| Test of Independence          |                  |            |                 |                |
| Analysis of Variance          |                  |            |                 |                |

## 50. Correlation

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- Definition
- Type of variables
- Weak, Medium, Strong
- Fact 1: Linear Relationship between  $x$  and  $y$
- Fact 2: Visualize Relationship using a Scatterplot
- Fact 3:  $r$  is between  $-1$  and  $1$
- Fact 4: Changes the sale for  $x$  and  $y$  does not affect  $r$
- Fact 5:  $r$  measures strength of a linear association
- Fact 6:  $r^2$  is the proportion of variance explained by the model

There is more information about correlation that you are responsible for in the class notes. Homework problems should be done for practice.

## 51. Regression

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- Equation of Linear Regression (population)
- Equation of Linear Regression (sample)
- Interpretation of slope
- How to find slope and y-intercept
- Define Residual
- Fact 1: Residuals need to be close to 0
- Fact 2: A good model, no patten in residual plot and all close to zero
- Define Coefficient of Determination  $R^2$
- Prediction Intervals
- Multiple Regression
- Define Adjusted  $R^2$  and its uses
- Assumptions of Regression
- Interpretation

There is more information about regression that you are responsible for in the class notes. Homework problems should be done for practice.

## 52. Contingency Tables

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- Requirements of Multinomial Distribution
- A Contingency Table uses what Type of variable
- Define Expected
- Test of Independence
- Test of Goodness of Fit

There is more information about Contingency Tables that you are responsible for in the class notes. Homework problems should be done for practice.

## 53. Analysis of Variance (ANOVA)

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1. Sums of Squares
2. Mean Squares
3. Test Statistic
4. ANOVA Table

There is more information about Analysis of Variance (ANOVA) that you are responsible for in the class notes. Homework problems should be done for practice.