

72/72 = 100

**University of North Georgia  
Quantitative Skills and Reasoning  
Exam #3 Spring 2019 – M. Goodroe**

Name: Key

**Directions:** Answer each question completely on the exam. Seventy-five percent of the total points for a question will be awarded to your explanation and twenty-five percent to the correct answer. Each question is worth four points.

1) The following statement is true:  $\emptyset \subseteq$  any set  $S$  - Why? Explain.

$A \subseteq B$

$C \not\subseteq D$

$\emptyset$

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$\therefore \emptyset \subseteq S$

By def.: All elements in  $A$  are in  $B$

: There is at least one element in  $C$  not in  $D$ .  
no element

2) Negate the following: Some students are prepared for the Final Exam.

Some

negate →

No students are prepared for the final exam.

3) Determine if the following argument is valid by constructing a truth table:

- $P$  If news on inflation is good, then stock prices will increase.
- $Q$  News on inflation is good.
- $C$  Therefore, stock prices will increase.

$P \rightarrow Q$

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$\therefore Q$

Valid

$P$	$Q$	$[P \rightarrow Q \wedge P]$	$\rightarrow$	$Q$
T	T	T	T	T
T	F	F	F	F
F	T	T	F	F
F	F	T	F	F

only valid line

4) Determine if the symbolic form of the argument below is valid:

	$p$	$q$	$\sim p$	$\sim q$	$[p \wedge q \rightarrow \sim p \wedge \sim q \rightarrow q]$	$\rightarrow p$
$p$	T	T	F	F	T	<span style="border: 1px solid black; padding: 2px;">F</span>
$q \rightarrow \sim p$	T	F	F	T	T	<span style="border: 1px solid black; padding: 2px;">F</span>
$\sim q \rightarrow q$	F	T	T	F	<span style="border: 1px solid black; padding: 2px;">F</span>	
<hr style="width: 100%; border: 0.5px solid black;"/>					<span style="border: 1px solid black; padding: 2px;">F</span>	
$\therefore p$	F	F	T	T	<span style="border: 1px solid black; padding: 2px;">F</span>	

Invalid

5) If the probability that a vaccine you received will protect you from getting the flu is 0.965, what is the probability you will get the flu?

$$1 - 0.965 = 0.035$$

$$= 3.5\%$$

6) If  $P(A \cup B) = 0.70$ ,  $P(A) = 0.40$ ,  $P(A \cap B) = 0.25$ , find  $P(B)$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$0.70 = 0.40 + P(B) - 0.25$$

$$= 0.15 + P(B)$$

$$0.55 = P(B)$$

7) You are rolling two "fair" dice, find  $P(F)$  and  $P(F | E)$ .

$E$  - An odd total is show on the dice.

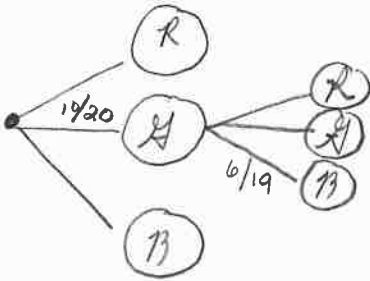
$F$  - The total is seven

$$P(F | E) = \frac{P(F \cap E)}{P(E)}$$

$$P(F) = \frac{6}{36} = \frac{1}{6}, \quad P(F \cap E) = \frac{6}{36} = \frac{1}{6}, \quad P(E) = \frac{18}{36} = \frac{1}{2}$$

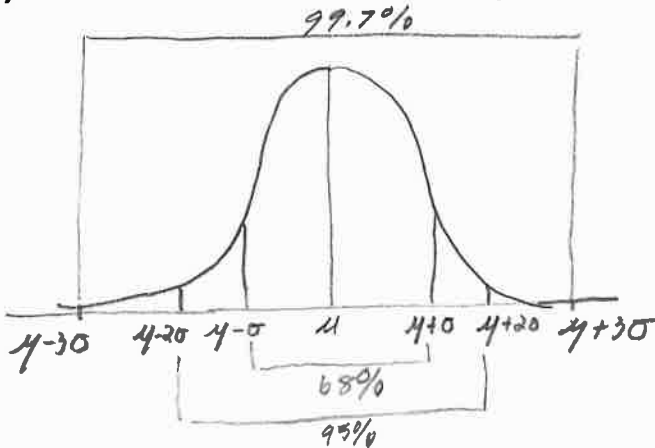
$$P(F | E) = \frac{\frac{1}{6}}{\frac{1}{2}} = \frac{1}{6} \cdot \frac{2}{1} = \frac{2}{6} = \frac{1}{3}$$

8) Assume that you are drawing two balls without replacement from a box containing four red balls, ten green balls, and six blue balls: What is the probability you will draw a green ball followed by a blue ball? (Hint: probability tree)



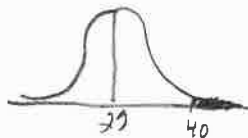
$$\begin{aligned}
 P(A \cap B) &= P(A) \cdot P(B|A) \\
 &= \frac{10}{20} \cdot \frac{6}{19} \\
 &= 1 \cdot \frac{3}{19} \\
 &= \frac{3}{19} \\
 &\approx 0.1578947 \\
 &\approx 15.8\%
 \end{aligned}$$

9) What is the 68-95-99.7 Rule? (Hint: draw a diagram)



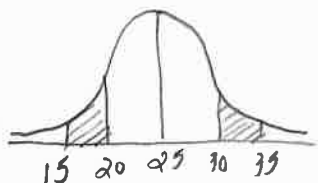
Assume that  $\mu = 25$  and  $\sigma = 5$

10) What is the probability above 40?



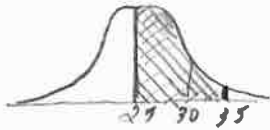
$$\begin{aligned}
 1 - 99.7 &= \frac{0.003}{2} = 0.0015 \\
 &= 0.15\%
 \end{aligned}$$

11) What is the probability between 15 and 20?



$$\begin{aligned}
 0.95 - 0.68 &= \frac{0.27}{2} = 0.135 \\
 &= 13.5\%
 \end{aligned}$$

- 12) What is the probability between 25 and 35?



$$0.95 \div 2 = 47.5\%$$

$$.9772 - 0.5 = 47.72\%$$

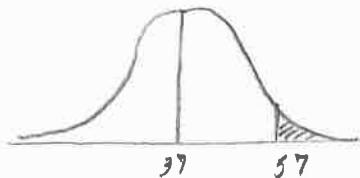
- 13) Comcast has analyzed the amount of time its customers are online per session. The analysis indicates that the distribution of online times has a mean of thirty-seven minutes and a standard deviation of eleven minutes. They, also, have concluded that the data is normally distributed. Find the probability that a randomly selected customer is online for fifty-seven minutes or greater.

$$\mu = 37, \sigma = 11$$

$$z = \frac{57 - 37}{11} = \frac{20}{11} = 1.82$$

$$\downarrow$$

$$0.9656$$



$$1 - 0.9656 = 0.0344$$

$$= 3.44\%$$

- 14) Solve the following equation for the specified variable:

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

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

$$\sigma z = x - \mu$$

$$\mu = x - \sigma z$$

- 15) Given the point  $(-2, 5)$  and  $m = \frac{3}{4}$ , find a point above and below the given point.

$$(-2+4, 5+3) = (2, 8)$$

$$(-2-4, 5-3)$$

$$= (-6, 2)$$

- 16) If the demand for elementary school teachers in 2014 was 96 thousand and is projected to be 105 thousand in 2020, what would be the expected demand in 2030? Assume the trend is linear.

$$(2014, 96) \quad \neq \quad (2020, 105)$$

$$(0, 96) \quad \neq \quad (6, 105)$$

$$m = \frac{105 - 96}{6 - 0} = \frac{9}{6} = \frac{3}{2} = 1.5$$

$$\text{Demand} = 1.5t + 96$$

$$= 1.5(16) + 96$$

$$= 24 + 96$$

$$= 120 \text{ Thousand}$$

- 17) Calculate the *Correlation Coefficient* from the given table below, determine if there is at least a 95% confidence that there is significant linear correlation between the variables, and write the predictor equation:

X	4	6	5	5
Y	5	8	3	6

$r = 0.588$  As 0.59 is less than 0.95, no there is not at least a 95% confidence

$$y = 1.5x - 2$$

- 18) Given  $y = x^2 - 4x - 5$  answer the following:
- a. Is the equation's graph opening up or down?

up

- b. What is the vertex of the graph?

$$x = -\frac{b}{2a} = -\frac{-4}{2(1)} = \frac{4}{2} = 2$$

$$y = (2)^2 - 4(2) - 5 = 4 - 8 - 5 = -4 - 5 = -9 \quad (2, -9)$$

- c. What are the solutions of the equation?

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-5)}}{2(1)} \quad (5, 0) \text{ and } (-1, 0)$$

$$= \frac{4 \pm \sqrt{16 + 20}}{2}$$

$$= \frac{4 \pm \sqrt{36}}{2}$$

$$= \frac{4 \pm 6}{2}$$

$$\textcircled{1} x = \frac{10}{2} = 5$$

$$\textcircled{2} x = \frac{-2}{2} = -1$$