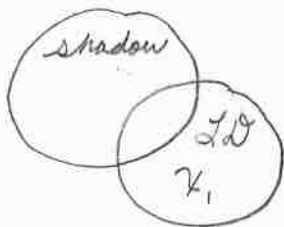


University of North Georgia
Quantitative Skills and Reasoning
Exam #2 Fall 2019 – M. Goodroe

Name: Key

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

- 1) Negate the following quantified statement: "Some little dogs are not scared of their own shadow."



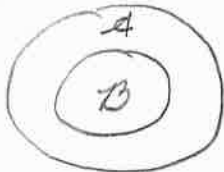
All little dogs are scared of their shadow.

or
No little dogs are not scared of their shadow.

- 2) Let A and B be sets with cardinal numbers $n(A) = a$ and $n(B) = b$. If $B \subseteq A$, then is $n(B) = n(A) - n(A - B)$ True or False? Support your position. Hint: try specific cardinal numbers for the sets and calculate the result. Let $n(A) = 5$ and $n(B) = 2$

$$\begin{aligned} n(B) &= n(A) - n(A - B) \\ 2 &= 5 - (5 - 2) \\ &= 5 - 3 \\ 2 &= 2 \checkmark \end{aligned}$$

$B \subseteq A$



- 3) Is $(S \cap T)' \equiv S' \cup T'$? You must prove your position for credit.

Let $U = \{1, 2, 3, 4\}$
 $S = \{1, 3, 4\}$
 $T = \{2, 3\}$

$$\begin{aligned} (\{1, 3, 4\} \cap \{2, 3\})' &\equiv \{1, 3, 4\}' \cup \{2, 3\}' \\ (\{1, 3, 4\} \cap \{1, 4\})' &\equiv \{2\} \cup \{2, 3\}' \\ (\{1, 4\})' &\equiv \{2, 3\} \end{aligned}$$

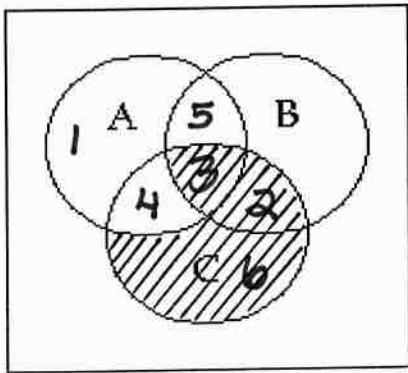
$$\{2, 3\}$$

4) Determine if the following statements are logically equivalent: $\sim(\sim p \vee \sim q)$; $(p \vee q)$

p	q	$\sim p$	$\sim q$	$(\sim p \vee \sim q)$	$\sim(\sim p \vee \sim q)$	$(p \vee q)$
T	T	F	F	F	T	T
T	F	F	T	T	F	T
F	T	T	F	T	F	T
F	F	T	T	T	F	F

$\sim(\sim p \vee \sim q) \neq (p \vee q)$

5) Describe the shaded region using set theory notation and standard set notation, i.e. $\{a, b, c\}$. Use the following sets: $U = \{1, 2, \dots, 6\}$; $A = \{1, 3, 4, 5\}$; $B = \{2, 3, 5\}$; $C = \{2, 3, 4, 6\}$



need $\{2, 3, 6\}$

$$A' = \{2, 6\}$$

$$A' \cup B = \{2, 6\} \cup \{2, 3, 5\} = \{2, 3, 5, 6\}$$

$$(A' \cup B) \cap C = \{2, 3, 5, 6\} \cap \{2, 3, 4, 6\} = \{2, 3, 6\}$$

$$A' \cup (B \cap C)$$

$$C - (A \cap B)$$

$$(C - A) \cup (A \cap B \cap C)$$

6) Find the Standard Deviation (s) and the coefficient of Variation (CV) of the following by showing all calculations: 6, 8, 21, 4, 19, 7

\bar{x}	10.834
s	7.25
CV	66.92

$$n = 6$$

$$\bar{x} = \frac{\sum x}{n} = \frac{65}{6} = 10.834$$

$(x - \bar{x})$	$(x - \bar{x})^2$
$6 - \bar{x} = -4.834$	23.37
$8 - \bar{x} = -2.834$	8.03
$21 - \bar{x} = 10.166$	103.35
$4 - \bar{x} = -6.834$	46.70
$19 - \bar{x} = 8.166$	66.68
$7 - \bar{x} = -3.834$	14.67
	$\Sigma = 262.8$

$$s^2 = \frac{\sum (x - \bar{x})^2}{n - 1} = \frac{262.8}{5} = 52.5595$$

$$s = \sqrt{52.5595} = 7.25$$

$$CV = \frac{s}{\bar{x}} \cdot 100 = \frac{7.25}{10.834} \cdot 100 = 66.92$$

- 7) In your Psychology course you have earned the following exam scores: 74, 81, 56, and 70. With one exam remaining, what do you need to score so that you pass the course with a "C"?

$$\frac{[74 + 81 + 56 + 70] + ?}{5} = 70$$

$$\frac{281 + ?}{5} = 70$$

$$281 + ? = 350$$

$$? = 69 \text{ on remaining exam}$$

- 8) Show if the following statements are logically equivalent or not: "If Stephanie does not study for the quiz, then she will not miss the game." and "If Stephanie studies for the quiz, then she will miss the game."

$p =$ Stephanie does study for the quiz.
 $q =$ Stephanie will miss the game.

$\sim p \rightarrow \sim q \not\equiv p \rightarrow q$

p	q	$\sim p$	$\sim q$	$\sim p \rightarrow \sim q$	$p \rightarrow q$
T	T	F	F	T	T
T	F	F	T	F	F
F	T	T	F	T	T
F	F	T	T	T	T

- 9) Write the statement in symbolic form: "An automatic transmission is included or power door locks are not optional."

$$p \vee \sim q$$

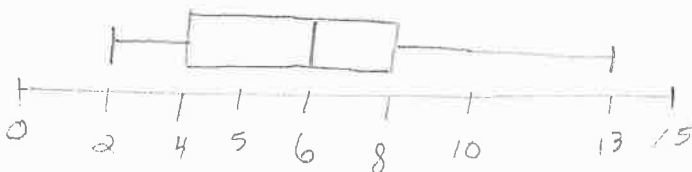
- 10) Find the Mean, Median, Mode, Five-Number Summary, and construct a Box-and-Whisker plot for the following: 6, 4, 2, 8, 11, 6, 6, 4, 8, 11, 6, 2, 13, 8, 6, 6, 2, 4, 8, 6

Mean: 6.35

Median: 6

Mode: 6

Five-Number Summary: 2, 4, 6, 8, 13



11) State the *Contrapositive* of the following statement: $a \rightarrow \sim(b \vee c)$

$$\sim(\sim(b \vee c)) \rightarrow \sim(a)$$

$$(b \vee c) \rightarrow \sim a$$

12) $\emptyset \subseteq$ any set S True or False? Explain for credit.

See exam #1

BONUS(Five Points)

First negate "If a coin and a six-sided cube is used, then the list of all possible outcomes is even." and then use a DeMorgan law re-phrase the statement in a logically equivalent form.

* *It is not true that if a coin and a six-sided cube is used, then the list of outcomes is even.*

$$\sim(p \rightarrow q)$$

* *It is not true that if the list of outcomes is not even, then a coin and a six-sided cube is not used.*

$$\sim(\sim q \rightarrow \sim p)$$

Equivalent

p	q	$\sim p$	$\sim q$	$(p \rightarrow q)$	$\sim(p \rightarrow q)$	$(\sim q \rightarrow \sim p)$	$\sim(\sim q \rightarrow \sim p)$
T	T	F	F	T	F	T	F
T	F	F	T	F	T	F	T
F	T	T	F	T	F	T	F
F	F	T	T	T	F	T	F