

Math 3201
Exam 1 – Set Theory

Name: _____

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

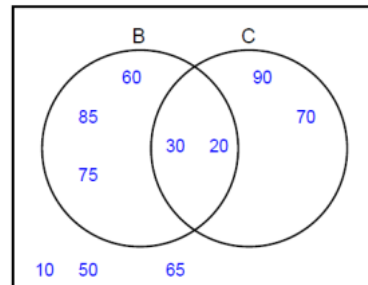
$$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C)$$

Multiple Choice: Circle the correct response. [2 marks each]

- Given $A = \{1, 3, 6, 8, 9, 12, 15\}$ and $B = \{6, 9, 12\}$, which is TRUE?
 - B is the complement of A
 - $A \cap B = \emptyset$
 - A and B are disjoint sets
 - $B \subset A$
- If Set $A = \{-2, 0, 2, 4, 6, 8, 10\}$, which represents set notation?
 - $A = \{2x \mid x \in R\}$
 - $A = \{2x \mid x - 1 \leq x \leq 5, x \in I\}$
 - $A = \{2x \mid 1 \leq x \leq 5, x \in I\}$
 - $A = \{2x \mid 1 \leq x \leq 7, x \in I\}$
- U is the universal set of playing cards in a standard 52-card deck, S is the set of all spades, B is the set of all 26 Black cards and D is the set of all diamonds. Which statement is true?
 - $S \subset B$
 - $B \subset S$
 - $S \cup B = U$
 - $S \cup D = U$

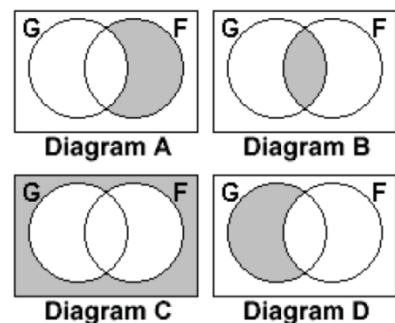
- What is the complement of B or C, $(B \cup C)'$?

- $\{20, 30\}$
- $\{10, 50, 65\}$
- $\{10, 50, 65, 60, 70, 75, 85, 90\}$
- $\{20, 30, 60, 70, 75, 85, 90\}$



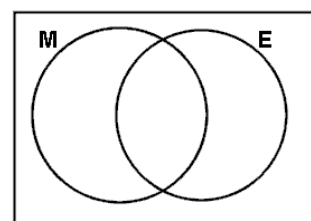
- The Diagrams below represents a class of children. G is the set of girls and F the set of children who like football. Which diagram is the shading that represents boys who like football?

- Diagram A
- Diagram B
- Diagram C
- Diagram D



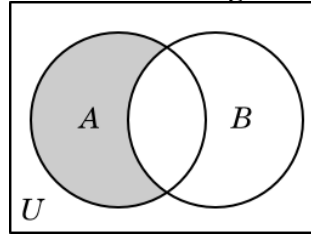
- In a class there are 30 students.
 - 21 students like Math
 - 16 students like English
 - 6 students don't like Math or English
 How many students like both Math and English?

- 5
- 7
- 13
- 24



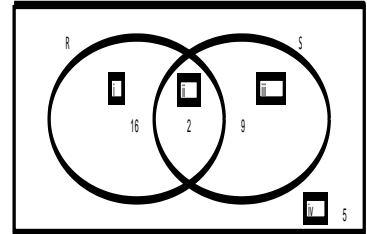
7. Which of the following represents the shaded area in the Venn diagram below?

- A) B'
- B) A
- C) $B \setminus A$
- D) $A \setminus B$



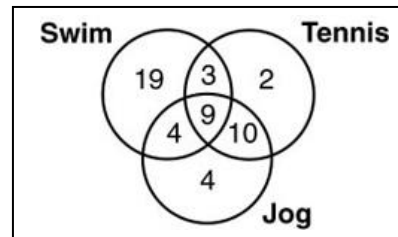
8. A Girl Guide leader has 30 girls in her group. In this group, 16 of them are good runners, 11 of them are good swimmers, 2 of them are good runners and good swimmers and 5 are neither good runners nor good swimmers. Jason drew this Venn diagram to represent this information. In which region is his error?

- A) i
- B) ii
- C) iii
- D) iv



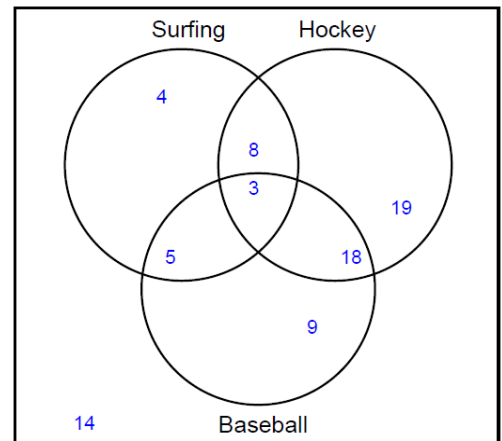
9. What is the value of $n((S \cup T) \setminus J)$ in the following diagram?

- A) 24
- B) 32
- C) 47
- D) 51



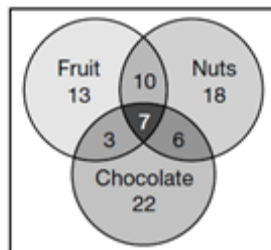
10. The following Venn diagram shows the number of students who like Surfing (S), Hockey (H), Baseball (B), a combination of these sports or neither sport. What is $n(S \cup H)$?

- A) 11
- B) 31
- C) 57
- D) 69



Constructed Response: Answer all questions and show all workings.

11. The Venn diagram below shows the three types of food ingredients students picked as things they like in dessert: nuts, fruit, and chocolate. [5]

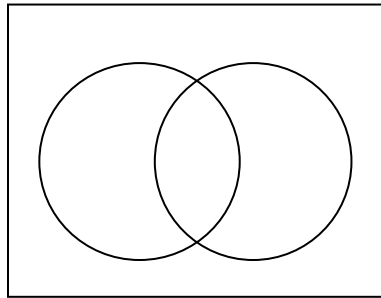


- (a) How many students like desserts with nuts **and** chocolate? _____
- (b) How many students would like a combination of all three ingredients in a dessert? _____
- (c) How many students like desserts with nuts only? _____
- (d) How many students like desserts with fruit and nuts but no chocolate? _____
- (e) How many students were polled in the survey? _____

12. A game store polled 150 customers about whether they preferred to play strategy games or games of chance. 106 liked strategy games and 99 liked games of chance, while 20 liked neither strategy nor games of chance.

a) Use the Principle of Inclusion and Exclusion to determine how many customers like both strategy games and games of chance. [3]

b) Draw a Venn diagram to represent the sets. [2]



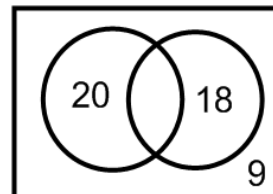
c) How many liked strategy games but not games of chance? _____ [1]

d) How many liked games of chance but not strategy games? _____ [1]

13. Tommy was given the following sets and asked to represent them using a Venn diagram.

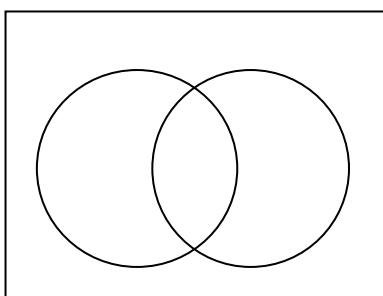
- U is the universal set
- A and B are subsets of U
- $n(U) = 45$ $n(A) = 20$, $n(B) = 18$
- $n(A \cup B)' = 9$

He filled the Venn diagram as follows:



He made an error in the above diagram. Explain how. **Redraw a new Venn diagram with the corrected version.** [6]

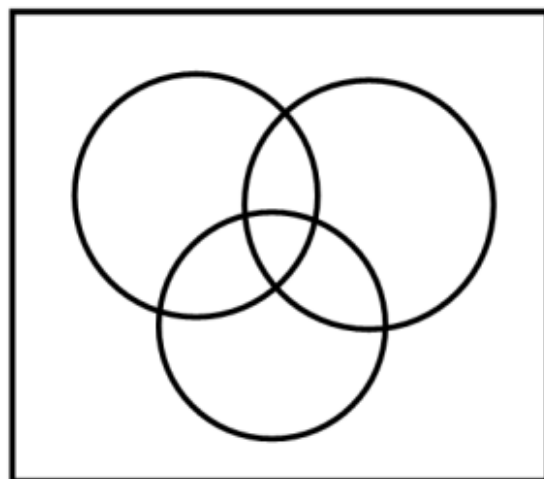
ERROR: _____



14. All 35 students in Mr. Hunt's math class are taking at least one science course of Physics, Chemistry or Biology.

- 16 take Physics
- 18 take Biology
- 21 take Chemistry
- 7 takes Physics and Chemistry but not Biology
- 5 takes Biology and Chemistry but not Physics
- 2 takes Physics and Biology but not Chemistry

a) How many students take all three subjects? [7]



b) How many students are only taking one science course? [2] _____

15. 66 students were surveyed to determine their travel interests.

- 32 students wanted to go to Spain
- 27 students wanted to go to New York
- 44 students wanted to go to Paris
- 16 students wanted to go to New York and Paris
- 18 students wanted to go to Paris and Spain
- 10 students wanted to go to all three destinations

How many students wanted to go to New York and Spain but not Paris? [7]

