

Math 30-2

Unit 1: Set Theory

Exam

Formula Sheet is attached

Name: _____

Date Written: _____

Total: ____/22 Marks

Good Luck!!!!!!

Mathematics 30–2 Formula Sheet

Relations and Functions

Graphing Calculator Window Format

$$x: [x_{\min}, x_{\max}, x_{\text{scl}}]$$

$$y: [y_{\min}, y_{\max}, y_{\text{scl}}]$$

Exponents and Logarithms

$$y = a^x \leftrightarrow x = \log_a y$$

$$\log_b c = \frac{\log_a c}{\log_a b}$$

Laws of Logarithms

$$\log_b (M \cdot N) = \log_b M + \log_b N$$

$$\log_b \left(\frac{M}{N} \right) = \log_b M - \log_b N$$

$$\log_b (M^n) = n \log_b M$$

Exponential functions

$$y = a \cdot b^x$$

Sinusoidal functions

$$y = a \cdot \sin(bx + c) + d$$

$$\text{Period} = \frac{2\pi}{b}$$

Quadratic equations

$$\text{For } ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Probability

$$n! = n(n-1)(n-2)\dots 3 \cdot 2 \cdot 1, \\ \text{where } n \in N \text{ and } 0! = 1$$

$${}_n P_r = \frac{n!}{(n-r)!}$$

$${}_n C_r = \frac{n!}{(n-r)!r!}$$

$${}_n C_r = \binom{n}{r}$$

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

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

$$P(A \cap B) = P(A) \cdot P(B)$$

$$P(A \cap B) = P(A) \cdot P(B | A)$$

Logical Reasoning

A' Complement

$\emptyset$ Empty set

$\cap$ Intersection

$\subset$ Subset

$\cup$ Union

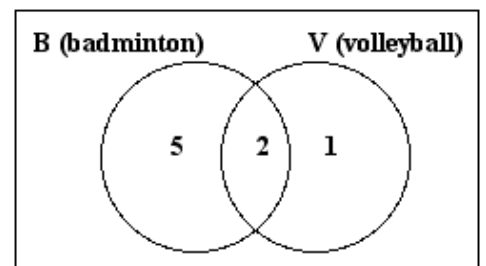
Multiple Choice and Numerical Response Please record the best solution below each question. (9 marks)

1. What is the meaning of *complement* in set theory?

- A. All the elements in the universal set that are not identical.
 - B. A set of elements that work well in a given set.
 - C. All the elements of the universal set that do not belong to a subset of it.
 - D. All the elements that are opposite of the elements in a given set.
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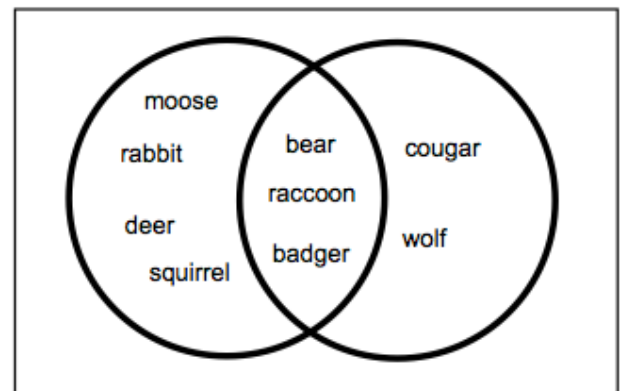
2. There are 28 students in a math class. The number of students on the badminton team and the number of students on volleyball team are shown in the Venn diagram. How many students are on at least one of the badminton or on volleyball team?

- A. 2
- B. 5
- C. 8
- D. 7



3. Consider the following Venn diagram of herbivores and carnivores. Determine the number of elements in $(H \cap C)'$.

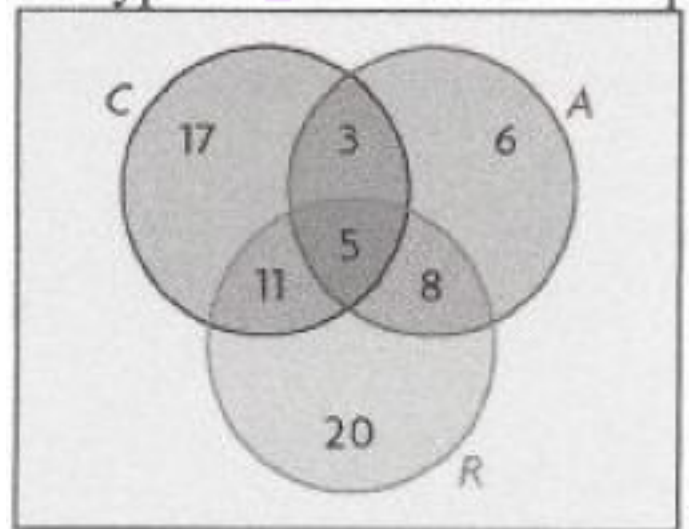
- A. 6
- B. 9
- C. 4
- D. 3



4. A summer camp offers canoeing, rock climbing, and archery. The following Venn diagram shows the types of activities the campers like.

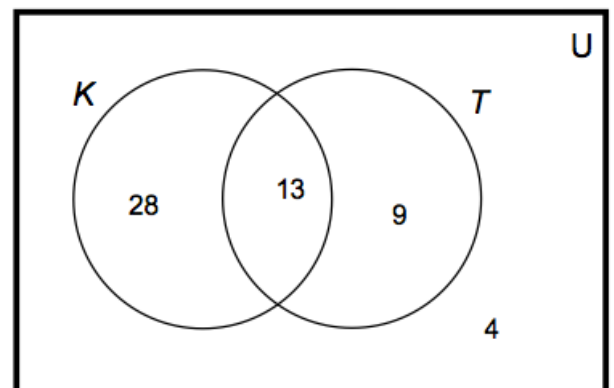
Use the diagram to determine $n((A \setminus C) \setminus R)$

- A. 8
- B. 22
- C. 6
- D. 5



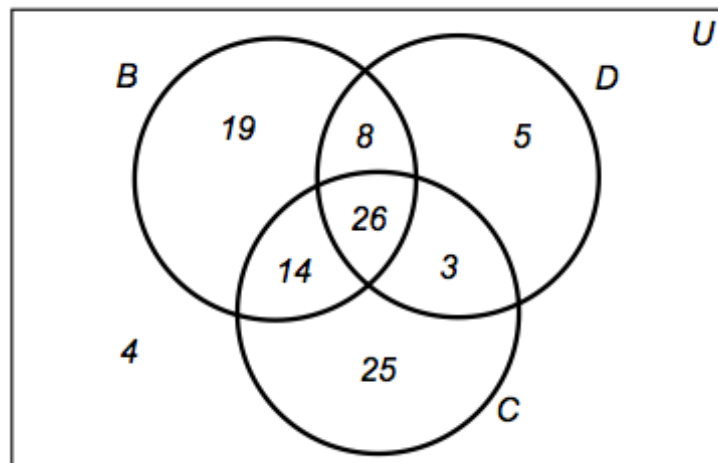
5. A restaurant offers Thai (T), and Korean food (K). The following Venn diagram shows the types of food the customers like. How many customers are in the region $(K) - (T \cap K)$?

- A. 4
- B. 13
- C. 15
- D. 28



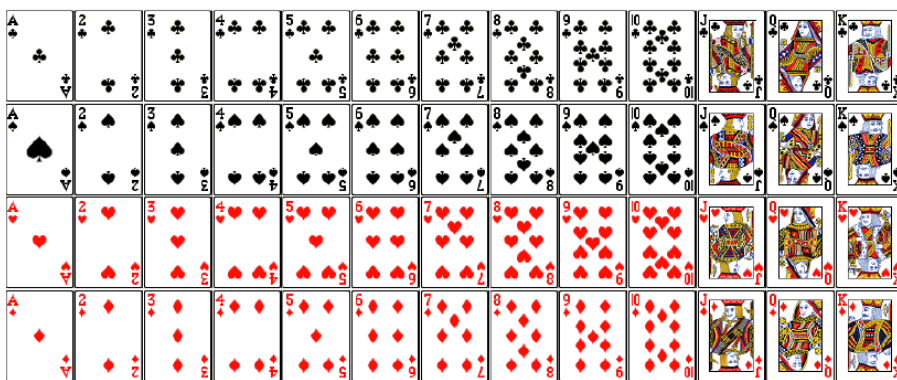
6. Some table games use a board, dice, or cards, or a combination these. The following Venn diagram shows the number of games that use these tools. Use the diagram to determine the number of games in $(D \cup B)'$.

- A. 29
- B. 25
- C. 69
- D. 75



Numerical Response

7. If you draw a card at random from a standard deck of cards, shown below, you will draw a card that is either red (R) or black (B). The cards will also either be a number card (N) or a face card (F).



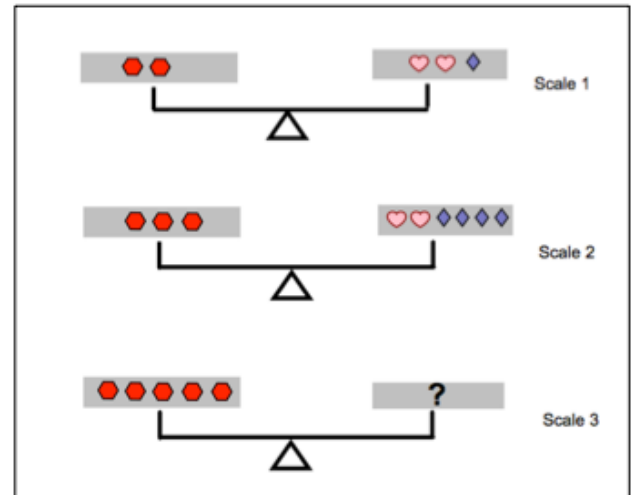
Determine the number of elements of N and F .

Record your answer in the numerical response box below.

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9. Scales one and two are in perfect balance. Which combination of hearts and diamonds should be placed in the empty pan in Scale three to maintain that perfect balance?

- A. 
- B. 
- C. 
- D. 



Answer the following questions. Remember to show all your work.

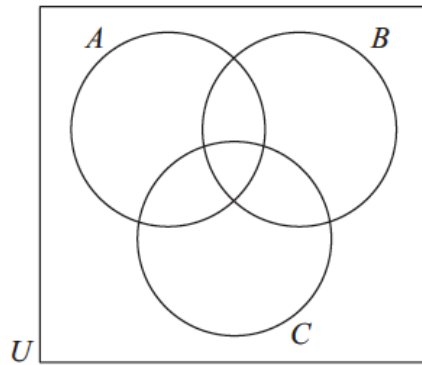
Written Response (14 marks)

1. a. Organize the following sets into a Venn Diagram (2 marks)
 - $U = \{\text{the natural numbers from 1 to 20}\}$
 - $O = \{\text{the odd numbers}\}$
 - $E = \{\text{the even numbers}\}$
 - $P = \{\text{prime numbers}\}$



- b. List the complement of each set. List any disjoint sets. (2 marks)

2. On the Venn Diagram, shade $A' \cup (B \cup C)$. (1 mark)



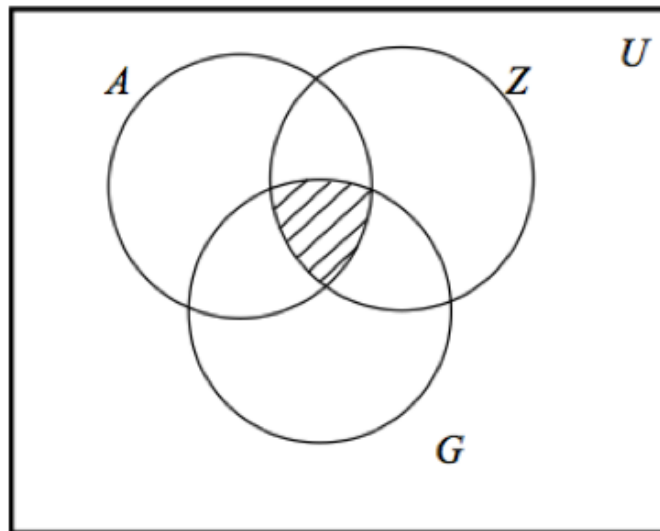
3. There were 193 people that were up for an award at the Grammy. Of these,
- 115 were vocalist
 - 98 played an instrument
 - 86 were songwriters
 - 22 were vocalist and played an instrument but were not a songwriter
 - 15 played an instrument and were songwriters but not a vocalist
 - 29 were vocalist and songwriters but did not play an instrument
 - 35 did all three

Of those who attended, how many did neither? (3 marks)

4. Maila, Khizer, Chris, and Jordan all live on the same street. One is a chef, one is a police officer, one is an editor, and one is a travel agent.
- Jordan and Chris eat dinner with the editor.
 - Maila and Khizer carpool with chef.
 - Chris watches soccer on television with the chef and the editor.

Use the statements above to determine which person is the chef. Explain your reasoning. (2 marks)

5. A group of 35 tourists can choose between visiting the Aero Space Museum of Calgary (A), the Calgary Zoo (Z), or the Glenbow Museum (G).
- 18 went to the Aero Space Museum, 21 went to the zoo, and 23 went to the Glenbow Museum.
 - 2 went to both museums but not the zoo.
 - 3 went to the Aero Space Museum and the zoo only.
 - 6 went to the Glenbow Museum and the zoo only.
- a. How many tourists went to all three attractions? Use a Venn diagram to help with your answer. **(3 marks)**



- b. Using set notation, provide one way to identify the shaded region. **(1 mark)**