Principles of Algebra 30

Key

Set Theory Assignment (5.1-5.3)

Show all your work for full marks and use proper set notation to answer the questions!

1. Tania recorded the 16 possible sums that can occur when you roll two four-sided dice.

- S = {all possible sums} $\{2,3,4,5,6,7,8\}$
- L = {all sums less than 4} $= \{2,3\}$
- G = {all sums greater than 4} $\{5,6,7,8\}$
- F = {all sums equal to 4} $= \{4\}$

a. What is $n(L \text{ or } G)$?

$\{2,3,4,5,6,7,8\}$

5

b. List the subsets using set notation.

LCS

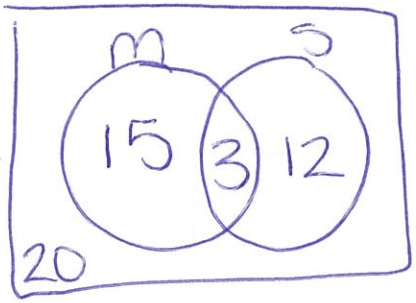
GCS

FCS

2. Carlos surveyed 50 students about their favorite subjects in school. He recorded his results.

Favorite Subject	Number of Students
mathematics	18
science	15
neither mathematics nor science	20

Determine how many students like mathematics and science.



$18+15-x=30$

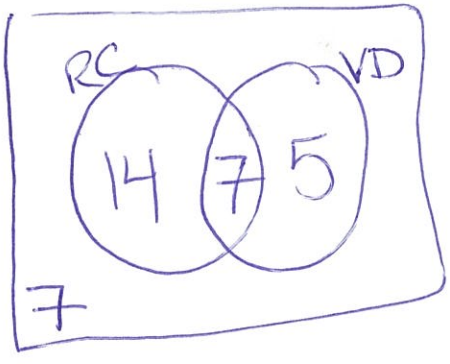
$33-x=30$

$-x=-3$

$x=3$

3. Mr. Sherry's physics class is visiting the local amusement park. He has 33 students. Of these students, 21 plan to ride the roller coaster and 12 plan to ride the vertical drop. There are 7 students who do not plan to ride either attraction.

Determine how many students plan to ride only the roller coaster.



$21+12-x=26$

$33-x=26$

$x=7$

14

4. Given the following situation:

- The universal set U = {positive integers less than 20} = $\{1,2,3,\ldots,17,18,19\}$
- X = {4, 5, 6, 7, 8}
- P = {prime numbers of U} = $\{1,2,3,5,7,11,13,17,19\}$
- O = {odd numbers of U} = $\{1,3,5,\ldots,15,17,19\}$

Determine $n(X \text{ and } P \text{ and } O)$.

$\{5,7\}$

2

5. **a)** Indicate the multiples of 2 and 3, from 1 to 50, using set notation.

$T = \{2,4,6,\ldots,46,48,50\} = \{x \mid 2x,\ 1 \le x \le 25,\ x \in I\}$

$R = \{3,6,9,\ldots,42,45,48\} = \{y \mid 3y,\ 1 \le y \le 16,\ x \in I\}$

$U = \{1,2,3,\ldots,48,49,50\}$

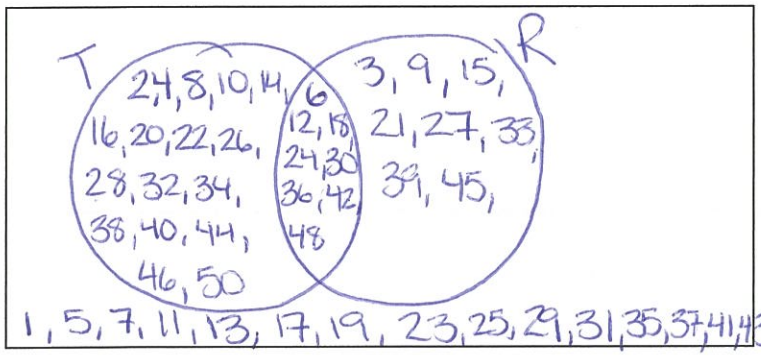
b) List any subsets.

~~TCU~~

$T \subset U$

$R \subset U$

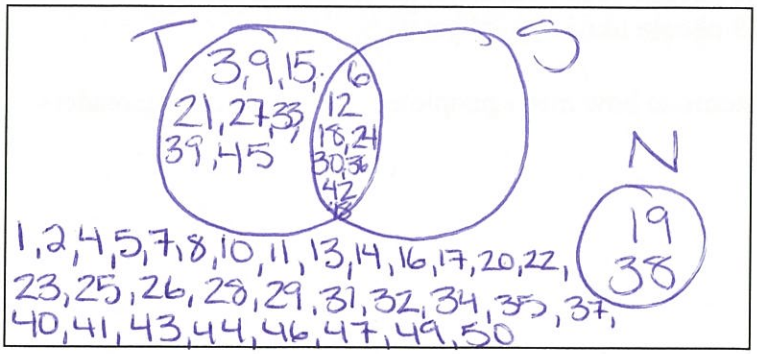
c) Represent the sets and subsets in a Venn diagram.



6. a) Draw a Venn diagram to represent these sets:

- the universal set U = {natural numbers from 1 to 50 inclusive}
- T = {multiples of 3}
- S = {multiples of 6}
- N = {multiples of 19}

= {19, 38}



T = {3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48}

S = {6, 12, 18, 24, 30, 36, 42, 48}

b) List the disjoints sets, if there are any.

N and T

N and S

c) Is each statement true or false? Explain.

i) $T \subset S$ F

ii) $S \subset T$ T

iii) $N \subset N$ T

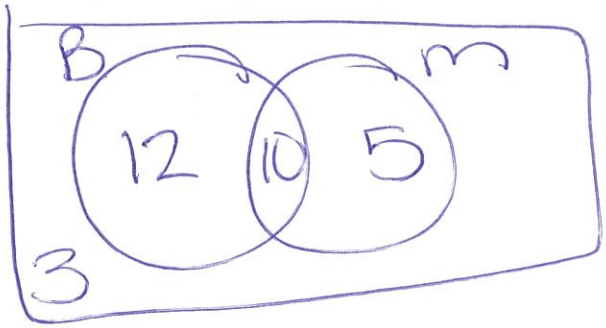
iv) T′ = {even numbers from 1 to 50} F

v) In this example, the set of natural numbers from 51 to 100 is { }. T

7. Paul asked 30 people who saw a movie based on a popular book if they liked the book or the movie.

- 3 people did not like the movie or the book.
- 15 people liked the movie.
- 22 people liked the book.

Determine how many people liked both the movie and the book, how many liked only the movie, and how many liked only the book.



$15 + 22 - x = 27$

$x = 10$

$n(m \cap B) = \boxed{10}$

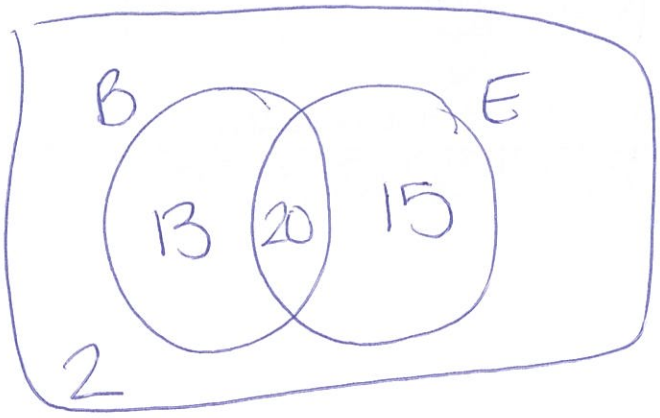
$n(m \setminus B) = \boxed{5}$

$n(B \setminus m) = \boxed{12}$

8. Dorothy asked 50 people outside a bookstore if they preferred physical books or electronic readers.

- 2 people said they did not read books.
- 20 people liked both physical books and electronic readers.
- 13 people liked only physical books.

Determine how many people liked only electronic readers.

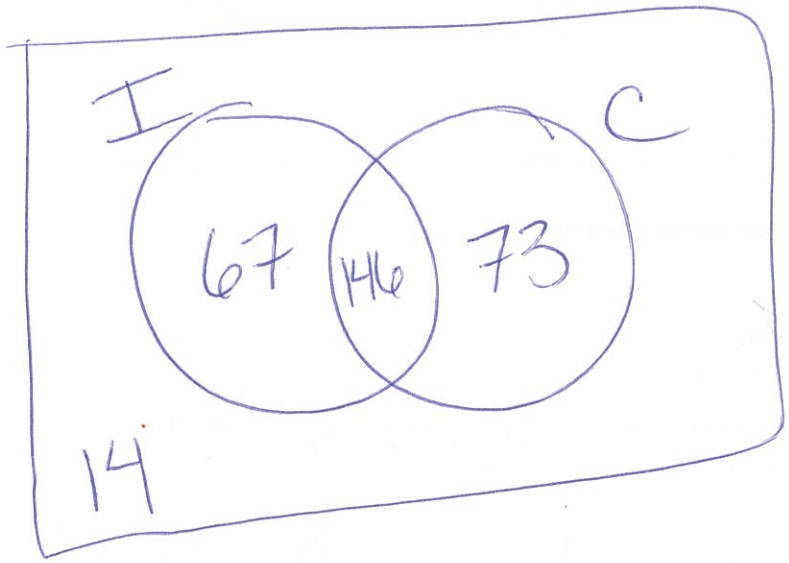


15

9. A restaurant survey asked 300 people if they preferred Indian or Chinese food.

- 146 people liked both.
- 213 people liked Indian food.
- 219 people liked Chinese food.

Determine how many people did not like Indian or Chinese food. Draw a Venn diagram to show your solution.



14