

Math 30-2 Set Theory Lesson 2 Practice Questions

[Solutions at the end]

Use the following information to answer the next 2 questions.

In a Western Canadian High School, there are 82 grade 12 students. Of these students, 29 participate in badminton and 27 participate in track and field. There are 38 students who participate in neither sport.

1. Determine the number of students who participate *only* in track and field.
2. Determine the number of students who participate in *only* one of these two sports.

Use the following information to answer the next question.

A group of 104 grade 7 students were asked two questions:

- Did their family own a pet?
- Did they have a younger sibling?

There were twice as many students who *only* own a pet as compared to the number of students who neither own a pet nor have a younger sibling.

There were 17 students who owned a pet and have a younger sibling.

There were 24 students who *only* have a younger sibling.

3. The number of students who own a pet is

A) 48

B) 52

C) 59

D) 65

Use the following information to answer the next question.

Two Math 30-2 students spent the afternoon at the local rink collecting data about Coke and Pepsi drinking preferences.

Let  $C = \{\text{number of people who drink Coke}\}$

Let  $P = \{\text{number of people who drink Pepsi}\}$

Their results indicated that:

- $C \cap P = 16$
- $C \cup P = 64$
- $(C \cup P)' = 11$
- There were 20 people who *only* drink Coke.

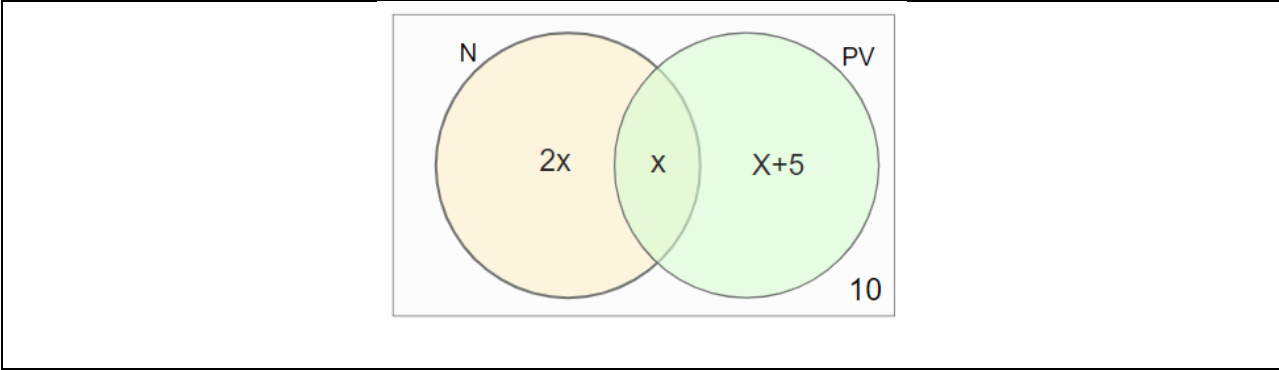
4. The number of people in the Universal set, **and** the number of people who *only* drink Pepsi is

- A) 91 **and** 22      B) 91 **and** 28      C) 75 **and** 22      D) 75 **and** 28

Use the following information to answer the next question.

The 47 staff at a particular school were asked if they had a Netflix account, a Prime Video account, both, or neither. The results indicated that:

- There were twice as many people who had a Netflix account *only* compared to those who had both accounts.
- There were 5 more people who had a Prime Video account *only* compared to those who had both accounts.
- There were 10 people who had neither account.



5. How many people had either a Netflix account *only* or a Prime Video account *only*?

Use the following information to answer the next two questions.

A Junior High school is trying to promote a fine arts program and their enrolment in Drama and Music have been steadily increasing. The number of students enrolled in the courses this year is shown below.

Drama only	23
Music only	17
Drama and Music	20
Neither course	32

6. The number of students in the Universal set is \_\_\_\_.

7. The number of students **not** enrolled in music is \_\_\_\_.

8. If  $A \subset B$ , then

- A) All the elements in B must also be in A.
- B) The union of A and B is the empty set.
- C) The intersection of A and B is A.
- D) The complement of B is A.

Math 30-2 Set Theory Lesson 2 Practice Questions **Solutions**

Use the following information to answer the next 2 questions.

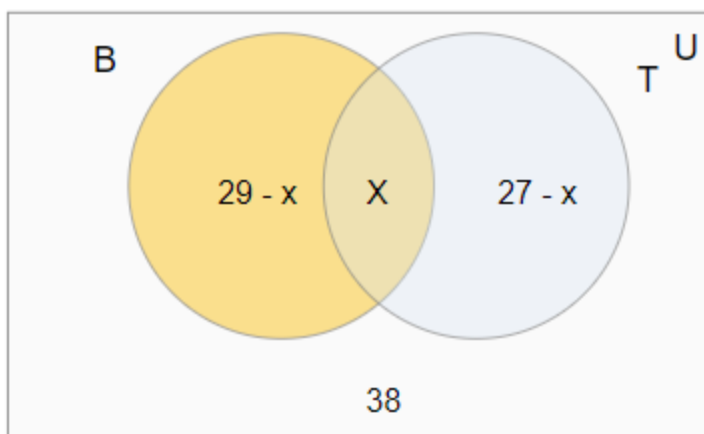
In a Western Canadian High School, there are 82 grade 12 students. Of these students, 29 participate in badminton and 27 participate in track and field. There are 38 students who participate in neither sport.

1. Determine the number of students who participate *only* in track and field.
  
2. Determine the number of students who participate in *only one* of these two sports.

**Solution**

**Illustrate the information in a Venn diagram.**

## Venn Diagram



### The Task

Determine the over-lap, or the number of students who participate in both badminton and track and field.

The total number of these 4 sections must add up to the universal number.

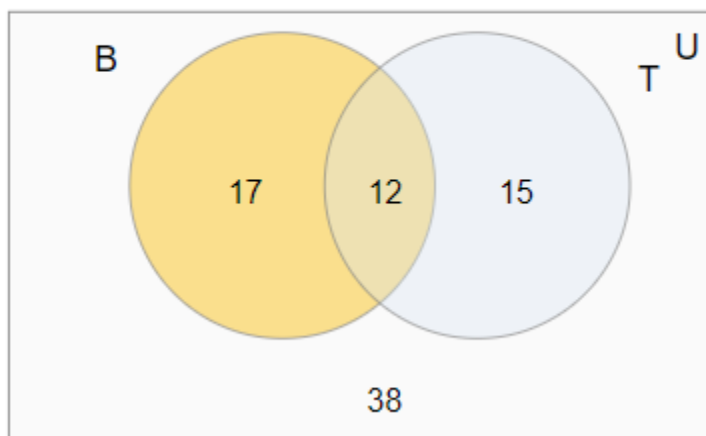
$$(29 - x) + (x) + (27 - x) + 38 = 82$$

$$94 - x = 82$$

$$x = 12$$

There are 12 students who participate in both badminton and track and field. The specific values for the 4 sections of the Venn diagram can now be determined.

## Venn Diagram



There are 4 sections:

- Only Badminton
- Both Badminton and Track
- Only Track
- Neither Badminton or Track

The total number of these 4 sections must add up to the universal number.

$$17 + 12 + 15 + 38 = 82$$

1. The number of students who participate only in track and field is 15.
2. The number of students who participate in only one sport is the sum of 17 and 15. There are 32 students who participate in only one sport.

Use the following information to answer the next question.

A group of 104 grade 7 students were asked two questions:

- Did their family own a pet?
- Did they have a younger sibling?

There were twice as many students who *only* own a pet as compared to the number of students who neither own a pet nor have a younger sibling.

There were 17 students who owned a pet and have a younger sibling.

There were 24 students who *only* have a younger sibling.

3. The number of students who own a pet is

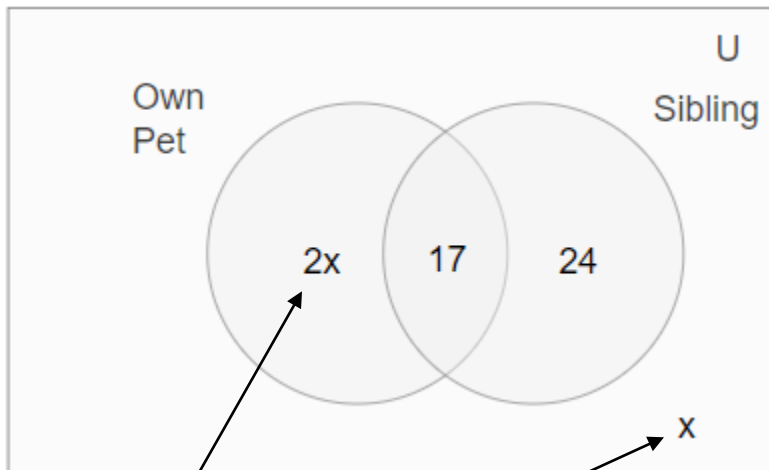
B) 48

B) 52

C) 59

D) 65

**Solution**



Set up an equation to solve for  $x$ .

$$(2x) + (x) + 17 + 24 = 104$$

$$3x + 41 = 104$$

$$3x = 63$$

$$x = 21$$

There are 21 students who neither own a pet nor have a younger sibling.

There are 42 students who *only* own a pet.

The number of students owning a pet is the sum of the student who *only* own a pet, and the students who *both* own a pet and have a younger sibling.

There are  $42 + 17$ , or 59 students who own a pet.

Use the following information to answer the next question.

Two Math 30-2 students spent the afternoon at the local rink collecting data about Coke and Pepsi drinking preferences.

Let  $C = \{\text{number of people who drink Coke}\}$

Let  $P = \{\text{number of people who drink Pepsi}\}$

Their results indicated that:

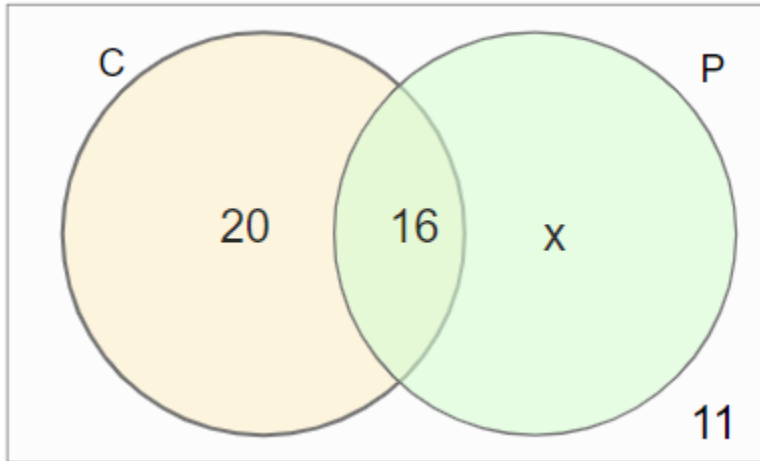
- $C \cap P = 16$
- $C \cup P = 64$
- $(C \cup P)' = 11$
- There were 20 people who *only* drink Coke.

4. The number of people in the Universal set, **and** the number of people who *only* drink Pepsi is

- B) 91 **and** 22      B) 91 **and** 28      C) 75 **and** 22      D) 75 **and** 28

**Solution**

The **sum** of the union of  $C$  and  $P$  ( $C \cup P = 64$ ) and the complement of the union ( $(C \cup P)' = 11$ ) is equal to the Universal set. The number in the Universal set is 75.



To determine the number of people who drink *only* Pepsi, subtract the sum of  $(20 + 16 + 11)$  from 75.

There are 28 people who drink *only* Pepsi.

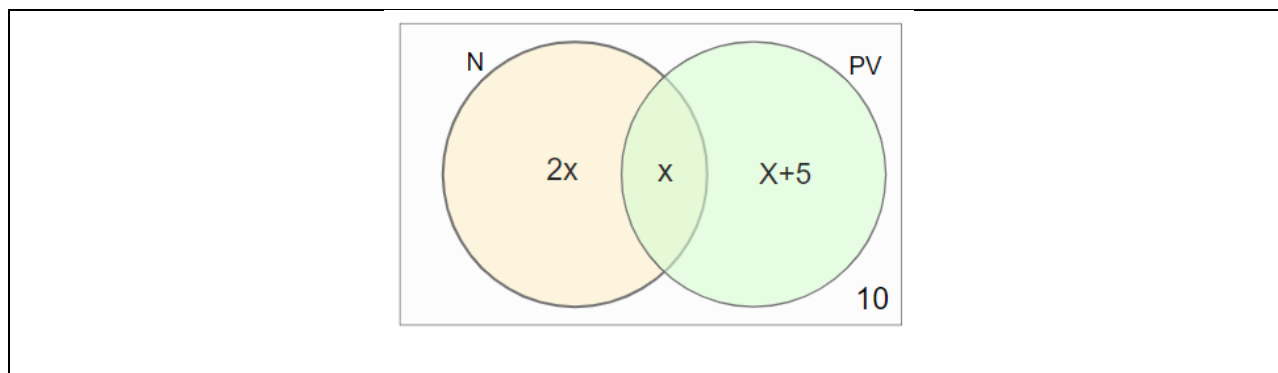


Use the following information to answer the next question.

The 47 staff at a particular school were asked if they had a Netflix account, a Prime Video account, both, or neither. The results indicated that:

- There were twice as many people who had a Netflix account *only* compared to those who had both accounts.
- There were 5 more people who had a Prime Video account *only* compared to those who had both accounts.
- There were 10 people who had neither account.





5. How many people had either a Netflix account *only* or a Prime Video account *only*?

**Solution**

Since the number in the Universal set is 47, and there are only 4 regions in the Universal set, an equation can be set up:

$x$  = the number of people who own both accounts.

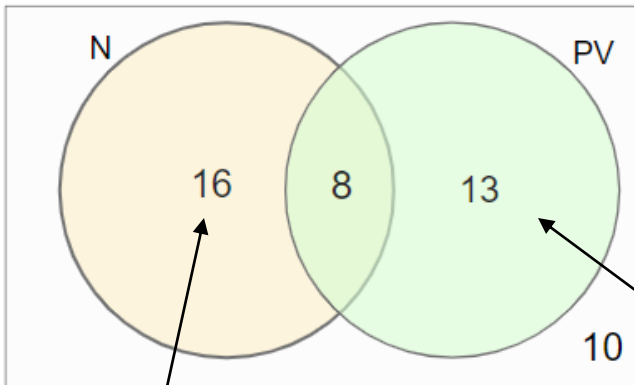
$$(2x) + (x) + (x + 5) + 10 = 47$$

$$4x + 15 = 47$$

$$4x = 32$$

$$x = 8$$

The balance of the Venn diagram can now be determined.



There are 16 people who *only* a Netflix account, and 13 people who *only* have a Prime Video account. The final answer is the total of these numbers.

There were 29 people had either a Netflix account *only* or a Prime Video account *only*.

Use the following information to answer the next two questions.

A Junior High school is trying to promote a fine arts program and their enrolment in Drama and Music have been steadily increasing. The number of students enrolled in the courses this year is shown below.

Drama only	23
Music only	17
Drama and Music	20
Neither course	32

6. The number of students in the Universal set is 92.

**Solution**

The Universal set consists of the sum of these 4 numbers, because there are no other options. The sum of  $23 + 17 + 20 + 32$  is 92.

7. The number of students **not** enrolled in music is 55.

**Solution**



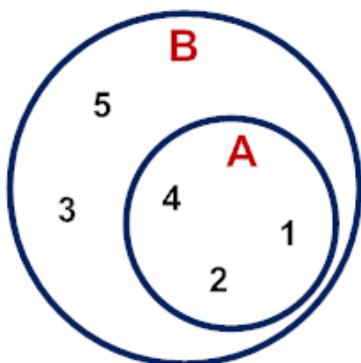
The students **not** enrolled in Music are represented by 23 (Drama only) and 32 (neither). The sum of these numbers is 55.

8. If  $A \subset B$ , then

- E) All the elements in B must also be in A.
- F) The union of A and B is the empty set.
- G) The intersection of A and B is A.
- H) The complement of B is A.

**Solution**

The diagram below is an example of where A is a subset of B.



Answer A) is **false**. All the elements of B are not in A. However, all the elements of A are in B.

Answer B) is **false**. The union of A and B, in this example, is 1, 2, 3, 4, and 5. It is not the empty set.

Answer C) is **true**. The intersection, or common elements of the two sets, are 1, 2, and 4. These are all the elements of set A.

Answer D) is **false**. The complement of B are values that are not in the circle of set B. To say that the complement is set A (1, 2, and 4) can therefore not be true.