SET

A **set** is a collection of distinct objects, called **elements** of the set
A set can be defined by describing the contents, or by listing the elements of the set, enclosed in curly brackets.

Example 1

Some examples of sets defined by describing the contents:

1. The set of all even numbers between 1 to 10 = {2, 4, 6, 8}
2. Prime numbers below 20 will be {2, 3, 5, 7, 11, 13, 17}

A set simply specifies the contents; order is not important. The set represented by {1, 2, 3} is equivalent to the set {3, 1, 2}.

NOTATION

Usually, a variable isused to represent a set, to make it easier to refer to that set later.

The symbol ∈ means "is an element of".

A set that contains no elements, { }, is called the **empty set** and is notated ∅

Example 2

Let $A = \{1, 2, 3, 4\}$
To notate that 2 is element of the set, we write $2 \in A$

Sometimes a collection might not contain all the elements of a set. For example, {2, 4} is a set of even number although they are not the only even numbers. While {2, 4}is a set, we can also say it is a **subset** of the larger set of all even numbers.

SUBSET

A **subset** of a set *A* is another set that contains only elements from the set *A*, but may not contain all the elements of *A*.

If B is a subset of A, we write $B \subseteq A$

A **proper subset** is a subset that is not identical to the original set—it contains fewer elements.

If B is a proper subset of A, we write $B \subset A$

The number of subsets in a set are given by 2^n (where n is the number of elements in that set)

Example 3

Consider these three sets:

A = the set of all even numbers
B = {2, 4, 6}
C = {2, 3, 4, 6}
Here B ⊂ A since every element of B is also an even number, so is an element of A.
More formally, we could say B ⊂ A since if x ∈ B, then x ∈ A.
It is also true that B ⊂ C.
C is not a subset of A, since C contains an element, 3, that is not contained in A

The total number of subsets that be obtained from set B are $2^3 = 8$ since set B contains 3 elements, i.e. { }, {2}, {4}, {6}, {2,4}, {2,6}, {4,6}, and {2, 4, 6}

Union, Intersection, and Complement

UNION, INTERSECTION, AND COMPLEMENT

The **union** of two sets contains all the elements contained in either set (or both sets). The union is notated $\boldsymbol{A \cup B}$. More formally, $x \in A \cup B$ if $x \in A$ or $x \in B$ (or both)

The **intersection** of two sets contains only the elements that are in both sets. The intersection is notated $\boldsymbol{A \cap B}$. More formally, $x \in A \cap B$ if $x \in A$ and $x \in B$.

The **complement** of a set A contains everything that is *not* in the set A. The complement is notated A', or A^c, *or sometimes* $\sim A$.

Example 4

Consider the sets:

A = {red, green, blue}
B = {red, yellow, orange}
C = {red, orange, yellow, green, blue, purple}

Find the following:

1. Find $A \cup B$
2. Find $A \cap B$
3. Find $A^c \cap C$

Answers

1. The union contains all the elements in either set: $A \cup B$ = {red, green, blue, yellow, and orange} **Notice we only list red once**.

2. The intersection contains all the elements in both sets: $A \cap B$ = {red}

3. Here we're looking for all the elements that are *not* in set *A* and are also in *C*. $A^c \cap C$ = {orange, yellow, purple}

EXAMPLE 5

Using the sets from the example 4, find $A \cup C$ and $B^c \cap A$

Answer

AUC = {red, green, blue, orange, yellow, purple}

$B^c \cap A = \{\text{green, blue, purple}\}$

Universal set

A **universal set** is a set that contains all the elements we are interested in. This would have to be defined by the context.

A complement is relative to the universal set, so A^c contains all the elements in the universal set that are not in *A*.

Example 6

1. If we were discussing searching for books, the universal set might be all the books in the library.
2. If we were grouping your Facebook friends, the universal set would be all your Facebook friends.
3. If you were working with sets of numbers, the universal set might be all whole numbers, all integers, or all real numbers

Example 7

Suppose the universal set is U = all whole numbers from 1 to 9. If $A = \{1, 2, 4\}$, then $A^c = \{3, 5, 6, 7, 8, 9\}$.

As we saw earlier with the expression $A^c \cap C$, set operations can be grouped together.

Grouping symbols can be used like they are with arithmetic – to force an order of operations.

Example 8

Suppose $H = \{\text{cat, dog, rabbit, mouse}\}$,
$F = \{\text{dog, cow, duck, pig, rabbit}\}$,
and $W = \{\text{duck, rabbit, deer, frog, mouse}\}$

1. Find $(H \cap F) \cup W$
2. Find $H \cap (F \cup W)$
3. Find $(H \cap F)^c \cap W$

Solutions

1. We start with the intersection: $H \cap F = \{\text{dog, rabbit}\}$. Now we union that result with W: $(H \cap F) \cup W = \{\text{dog, duck, rabbit, deer, frog, mouse}\}$

2. We start with the union: $F \cup W = \{\text{dog, cow, rabbit, duck, pig, deer, frog, mouse}\}$. Now we intersect that result with H: $H \cap (F \cup W) = \{\text{dog, rabbit, mouse}\}$

3. We start with the intersection: $H \cap F = \{\text{dog, rabbit}\}$. Now we want to find the elements of W that are *not* in $H \cap F$. $(H \cap F)^c \cap W = \{\text{duck, deer, frog, mouse}\}$

VENN DIAGRAM

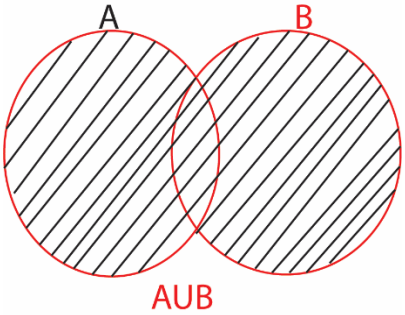
A Venn diagram represents each set by a circle, usually drawn inside of a containing box representing the universal set. Overlapping areas indicate elements common to both sets.

Basic Venn diagrams can illustrate the interaction of two or three sets.

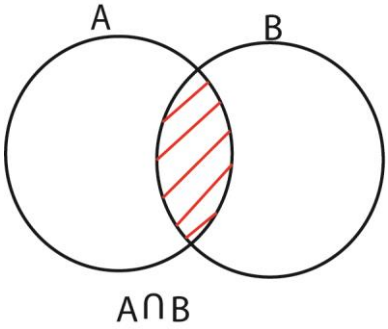
Example 9

Create Venn diagrams to illustrate $A \cup B$, $A \cap B$, and $A^c \cap B$

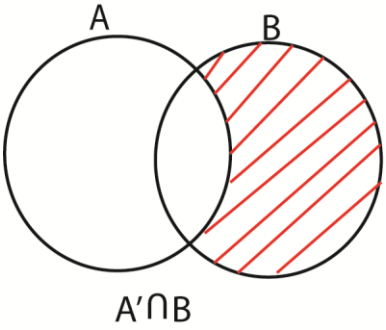
(i) $A \cup B$ contains all elements in *either* set.



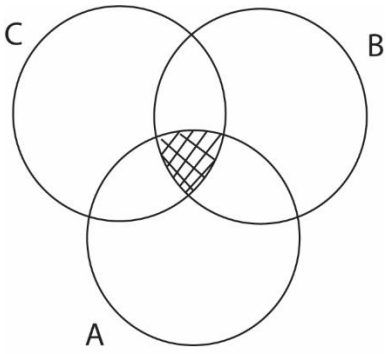
(ii) $A \cap B$ contains only those elements in both sets—in the overlap of the circles.



A^c will contain all elements *not* in the set A. $A^c \cap B$ will contain the elements in set B that are not in set A.



Example 10 Create Venn diagrams to illustrate: $A \cap B \cap C$



Cardinality

The number of elements in a set is the cardinality of that set.

The cardinality of the set A is often notated as $|A|$ or $n(A)$

Example 11

Let $A = \{1, 2, 3, 4, 5, 6\}$ and $B = \{2, 4, 6, 8\}$.

What is the cardinality of B? $A \cup B$, $A \cap B$?

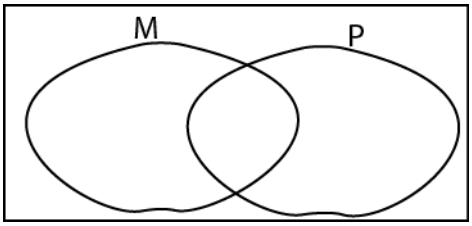
Answers

The cardinality of B is 4, since there are 4 elements in the set.
The cardinality of $A \cup B$ is 7, since $A \cup B = \{1, 2, 3, 4, 5, 6, 8\}$, which contains 7 elements.
The cardinality of $A \cap B$ is 3, since $A \cap B = \{2, 4, 6\}$, which contains 3 elements.

Exercise

1. In the space below, draw a Venn diagram to show that all girls (G) are Female (F)

2. Akiku Primary School, there are 86 children. 54 of them like porridge (P) and 42 like milk (M), 36 like both porridge. Some children do not like either. Represent this information in the Venn *diagram below.*



(b) Find the total number of children who like only one kind of the two foods.

(c) Find the number of children who do not like any of the two foods.

3. A and B are sets. Draw a Venn diagram to represent the relation: AuB = A

4. Of the 400 people invited to Kato's wedding, 200 attended the service, 300 attended the reception, while 50 were absent at both places. With a clearly labeled Venn diagram, find the number of people who attended both the service and the reception.

5. P and Q are sets. Draw a Venn diagram to represent the relationship between P∩Q.

6. At her birthday party, Betty received 30 guests. 11 of the guests took Pepsi-cola (P), 13 guests took Mirinda (M), 15 took Coke (C). Given that:

   3 Guests took Pepsi and Mirinda only.

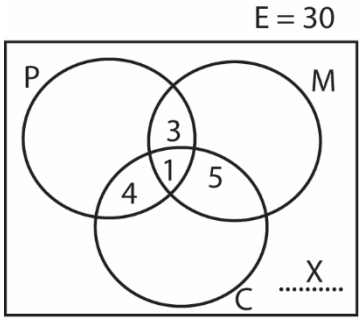
   5 guests took Mirinda and Coke only.

   4 guests took Pepsi and Coke only

   1 guest took all the three sodas

   x guests did not take any of the Sodas.

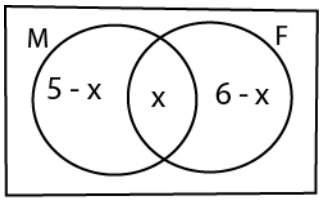
   (a) Complete Venn diagram below:



(b) Find the number of guests who did not take any of the three sodas.

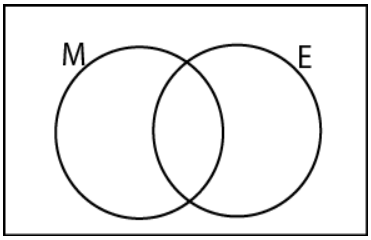
(c) Find the number of guests who took only one type of soda

7. In a home of 8 people, 5 like eating meat (M), 6 like eating fish (F) and x people like both. Use the Venn diagram below to find x.



8. In a class of 40 pupils, 20 like Mathematics (M), 35 like English (E) and *2* pupils do not like any of the two subjects.

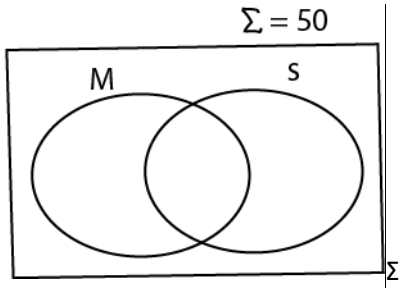
(a) Complete the Venn diagram belowε



(b) Find the number of pupils who like both subjects

9. In class of 50 boys, 40 like Mathematics (M) and 25 like Science (S). Some boys (X) like both subjects and 2 do not like any of the two subjects.

a). Show this information in a Venn diagram below.



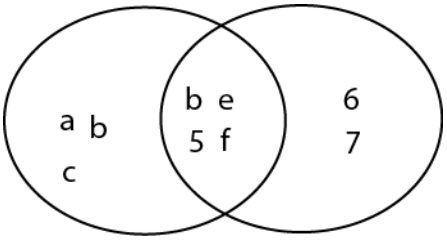
b) How many boys like both Mathematics and Science?

c) How many boys like Mathematics only?

d) How many boys like Science only?

10. If set P = {1, 2, 3, 4} and PUQ = {1, 2, 3, 4, 5, 6}. Find the number of set Q.

11. Use the Venn diagram below to find: n(CUD)



12. In a family of 15 children, 9 eat matooke (M), 12 eat potatoes (P) and t eat both. Draw a Venn diagram to show this information.

13. In a class of 29 pupils, 9 eat fish (F), 5 eat both meat and fish, and P eat meat (M) only.

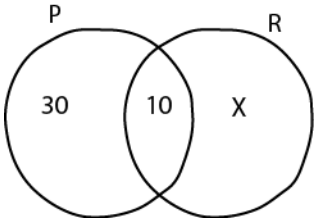
a) Represent this information on a Venn diagram.

b) Use the diagram to find the value of P

c) Find the total number of pupils who eat meat.

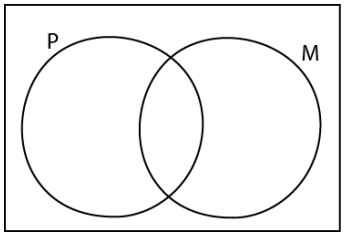
14. Given that; P = (2, 3, 5, 7} and Q = *{6, 9},* find P∩Q.

15. A class of 70 pupils eat posho (P) and Rice (R) as shown in the Venn diagram. Find the Valve of *x*



16. In class of 60 pupils, 25 drink pepsi cola (P), n drink Mirinda (M) only, 20 drink both Pepsi cola and Mirinda. 5 drink none of these.

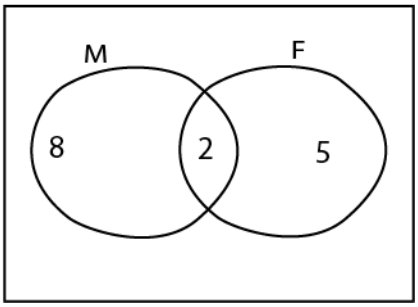
a) Represent this information in the Venn diagram given below.



b) Find the value of n.

c) How many pupils drink one type of soda only?

17. The Venn diagram below shows the number of children who eat meat (M) and fish (F). Find number of all the children who eat meat.



18. Given that R = { 2, 4, 6, 8} and Q={l,2,3,5,6,7}Find: n(RUQ)

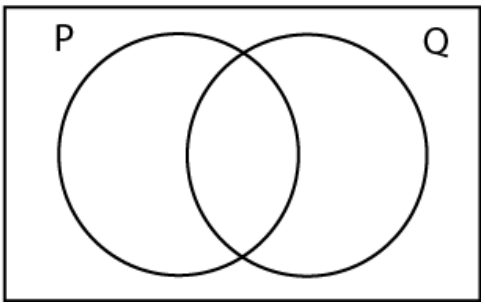
19. In a class of 20 pupils where two languages are spoken, 14 speak luganda (L), 15 speak Kiswahili (K).

a) Draw a Venn diagram and show the information given.

b) Find the number of pupils who speak both Luganda and Kiswahili.

c) Find the number of pupils who speak one language only.

20. If P= **{1,2,3,4,5,6}** and Q= {2,3,4,5,T} , represent this information on the Venn diagram below.



21. In Hatari Boys primary school, 60 boys who represented the school in the country sports day played the following games:

24 played hockey (H),

19 played rugby (R),

23 played football (F),

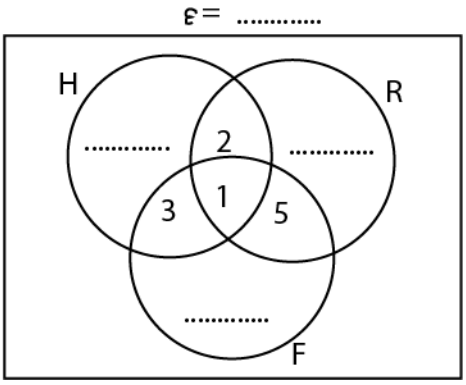
2 played both hockey and rugby only,

3 played football and hockey only.

5 played football and rugby only, and

1 played all the three games

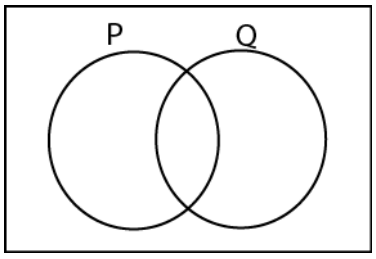
a. Fill in the blank spaces in the Venn diagram above



b. How many boys played only one game?

c. How many boys did not play any game?

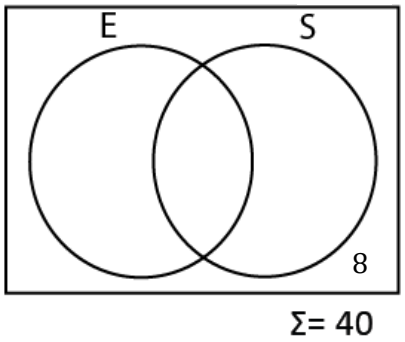
22. In the Venn diagram below, shade the complement of P U Q



23. In a class of 40 pupils, 25 like English (E), 15 like Science (S), y pupils like both English and Science and 8 do not like any of the two subjects.

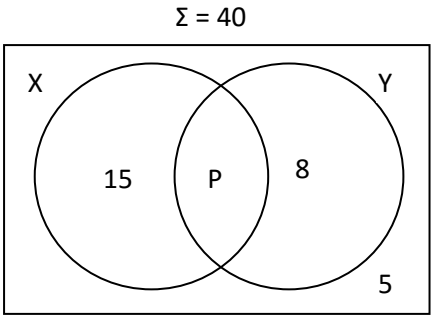
Use this information to answer questions (a) and (b).

(a) Complete the Venn diagram.



(b) Find the value of y.

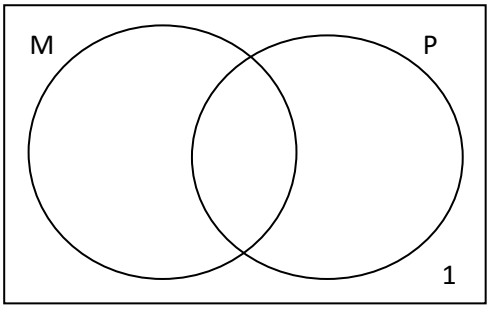
24. Study the Venn diagram below and find the value of P.



25. Seventy children were taken to a clinic for immunization.

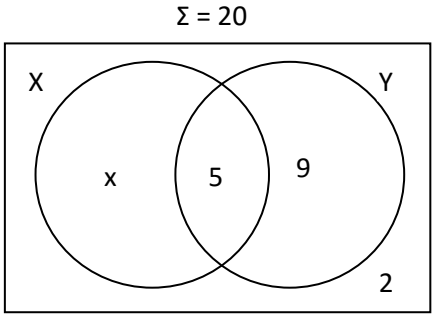
45 children were immunized against measles (M)
x children were immunized against polio (P)
6 children were immunized against measles and polio.
1 child was not immunized at all.

(a) Represent the above information in the Venn diagram below:



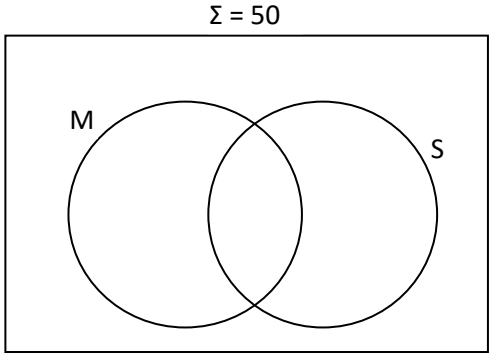
(b) Find the number of children who were immunized against polio only.

26. Use the Venn diagram below to find the value of *x*



27. In a primary seven class of 50 pupils, 27 like Mathematics (M), 22 like science(S), x pupils like both mathematics and science and 3 pupils do not like any of the two subjects.

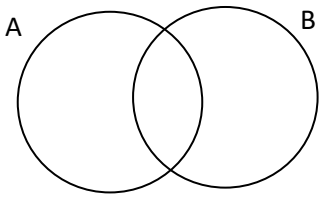
(a) Represent this information in the Venn diagram given below.



(b) Find the value of x (2 marks)

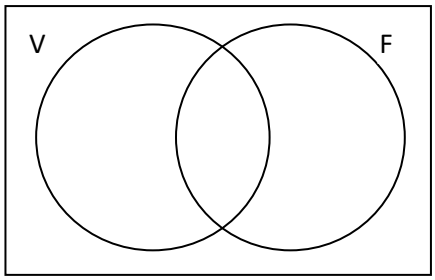
(c) Find the number of pupils who like only one subject. (2 marks)

28. In the diagram below, shade the region that represents only the members of set B



29. In a class of 30 students ,20 play, volleyball(V), 15 play football(F), (x) play both volley ball and football and 2 do not play any of the two games.

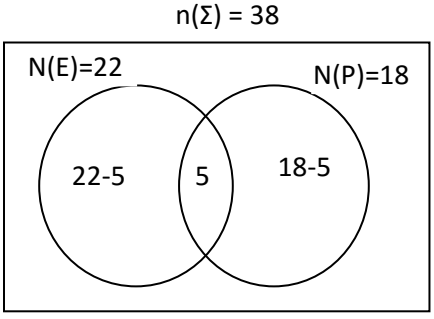
(a) Use the information given above to complete the Venn diagram below. (2 marks)



(b) Find the value of x (2 marks)

(c) Find the number of student who play only one game. (2 marks)

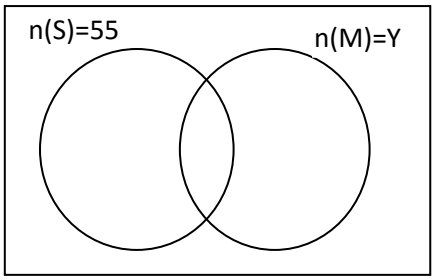
30. Study the Venn diagram below carefully and answer the question that follows.



Find n(EUP)'

31. At a birthday part, 72 guests were invited. 55 were served with soda (S), Y were served with mineral water (M) while 7 did not take any of the two drinks and 17 were served with both drinks.

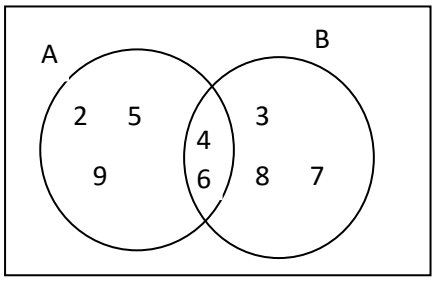
(a) Represent the above information on the Venn diagram (3marks)



(b) Find the valve of Y

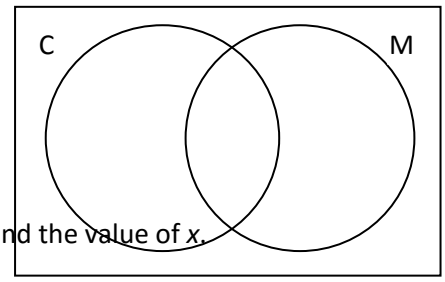
(c) How many guest were served with one drink only? (2marks)

32. In the Venn diagram below, find n(A∩B)



33. At a birthday party attended by 40 guest, 18 ate chicken (c) only ,13 ate meat (M) only, x guest ate both chicken and meat and 4 did not eat any of the two dishes.

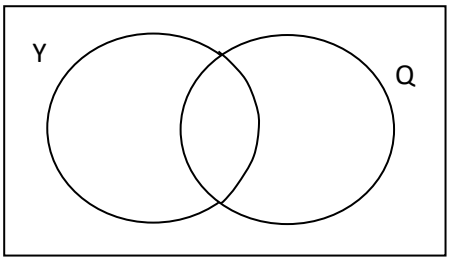
a) Use the information given above to complete the Venn diagram below.



b) Find the value of *x*. (02 marks)

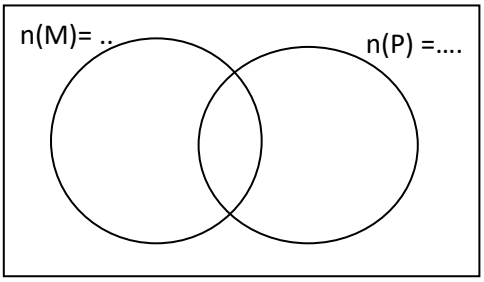
c) How many guests did not eat meat at all? (02 marks)

34. In the Venn diagram below, shade the area (YUQ)'



35. In a class party of 51 pupils, 28 drank Mirinda (M). 29 drank Pepsi (P), Y drank both Mirinda and Pepsi while 6 did not drank any of the two soda.

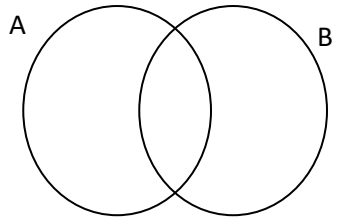
(a) Use the information given above to complete the Venn diagram below



(2marks)

(b) Find the valves of y.

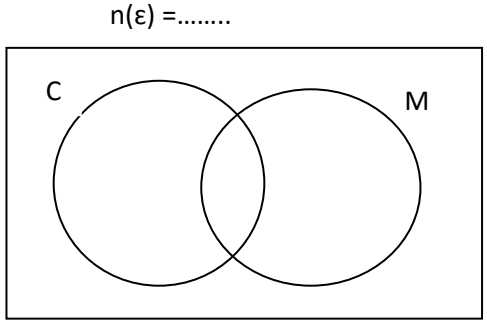
36. In the Venn diagram below, shade the area $(A \cap B)^{-1}$



37. At party attended by 60 pupils, 42 ate Chicken (C), (k +8) ate Meat (M) only K pupils ate both chicken and meat while 6 did not eat any of the two items.

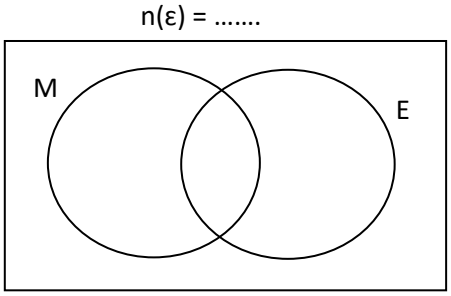
(a) Use the information given above to complete the Venn diagram below.

(3marks)



38. In a class of 60 pupils, 30 like English (E), Y like mathematics (M) only, 10 like both subject and 5 do not like any of the two subjects.

(a) Use the information given to complete the Venn diagram below. (02 marks)

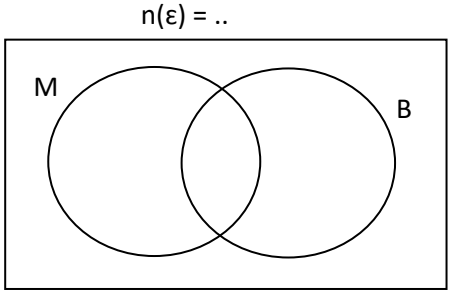


(b) Find the valve of y (02 marks)

(c) How many pupils like Mathematics altogether? (01 marks)

39. In a village of 49 farmers, 20 grow millets (M). 25 grow beans (B) and y farmers grows both millet and beans. 3y farmers grow neither of the two food crops.

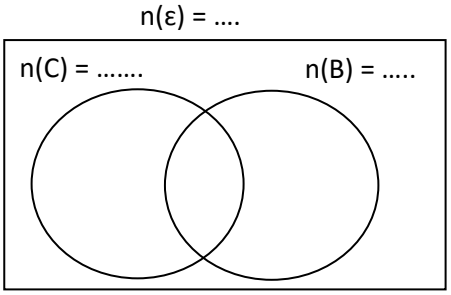
(a) Use the information given above to complete the Venn diagram below. (03 marks)



40. A birthday party attended by 76 guests, 47 were served with beef (B) and 18 were served with both beef and chicken (C). y guest were served with chicken only while (y-5) were not served with any of the two dishes

(a) Use the information above to complete the Venn diagram below.

(02marks)

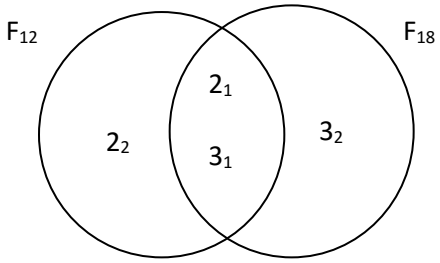


(b) Find the valve of y (2marks)

(c) Find the number of guests who were served with chicken (01mark)

41. The Venn diagram below shows the prime factors of 12 and 18

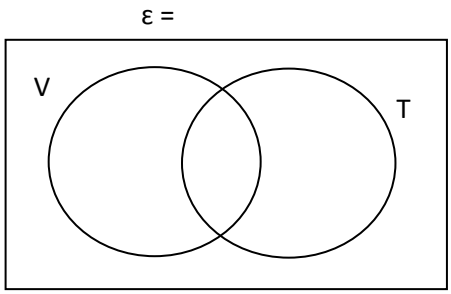
Use it to answer the question that follows



Find the lowest common multiple of 12 and 18.

42. In a class, 31 pupils play tennis (T) and (d + 5) play volley ball (V) only D pupils play both games while 3 play neither of the games.

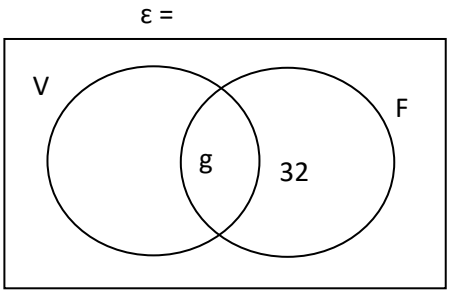
(a) Use the above information to complete the Venn diagram below. (02marks)



(b) If 27 pupils play volleyball altogether, find the valve of *d* (02marks)

43. In a class, 32 pupils play football (F) only. g play both volley ball (V) and football, (2g – 10) play volley ball but not football while (g-2) play neither of the two games.

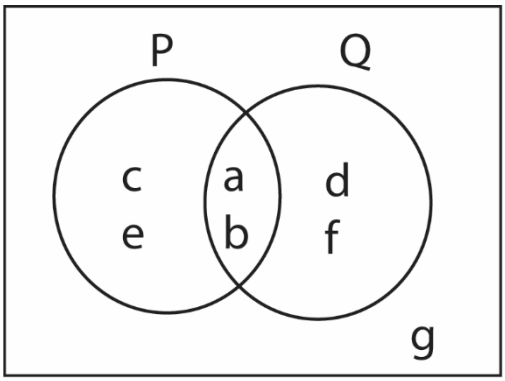
(a) Complete the Venn diagram below using the above information.



(b) Given that 62 pupils play one game only, find the value of g. (02marks)

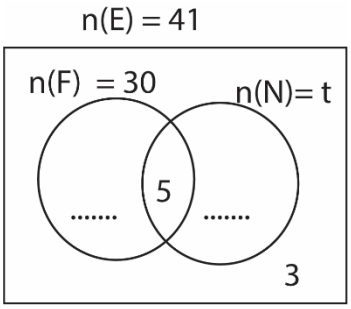
(c) Calculate the number of pupils in the class. (02marks)

44. Use the Venn diagram below to find n(P∩Q)'



45. In a class of 41 pupils, 30 play football (F), t play netball and 5 play both Football and Netball. 3 pupils do not play any of the two games. 3 pupils do not play any of the two games.

(a) Use the above information to complete the Venn diagram below. (02marks)



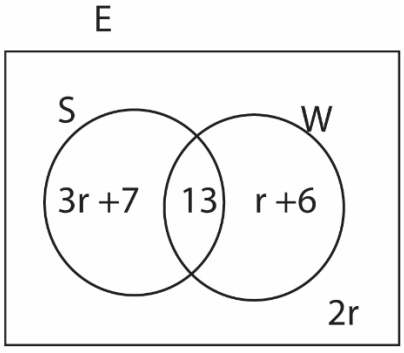
(b) Find the value of t. (02marks)

46. Given that P = {a, b, c, d, e, f, g} and Q = {b, a, f, e, h), find n(PUQ)

47. At a party, guests were served with soda (S) and mineral water (W) as shown in the Venn diagram below. Study and use the Venn diagram to answer the questions that follow.

(a) If 32 guests were served with soda, find

(i) The value r (02marks)



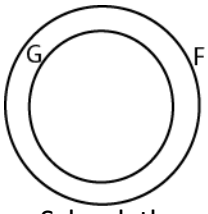
(ii) The total numer of guests who attended the party (02marks)

(b) Find the probability that a guest picked at random did not take any drink. (01marks)

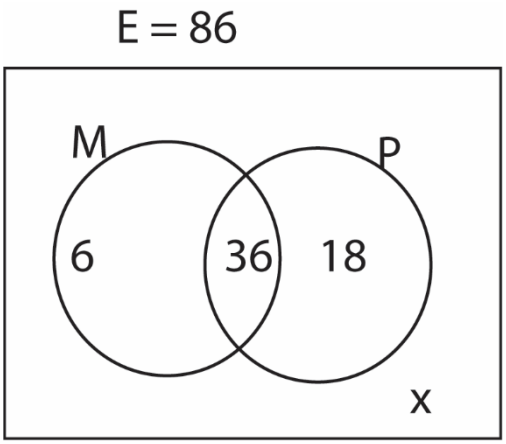
Answers

Exercise

1. In the space below, draw a Venn diagram to show that all girls (G) are Female (F)



2. Akiku Primary School, there are 86 children. 54 of them like porridge (P) and 42 like milk (M), 36 like both porridge. Some children do not like either. Represent this information in the Venn *diagram below.*



n(ε) = 86

n(P)=54

n(M)=42

n(P ∩ M) = 36

let n (P U M)' = x

where n(P U M)' is the number of pupils who do not like any

n(P)only = 54-36 =18

n(M)only = 42-36 =6

= n(P)only + n(M)only

= 18+6

=24

(b) Find the number of children who do not like any of the two foods.

From the Venn diagram above

18+36+6+x =86

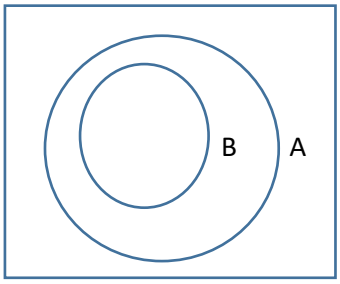
60 + x = 86

60-60+ x = 86 – 60

X= 26

Hence (P U M)' = 26

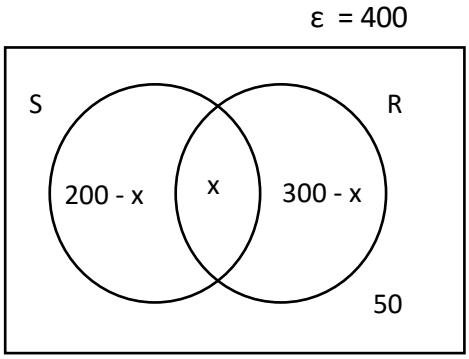
3. A and B are sets. Draw a Venn diagram to represent the relation: AuB = A



4. Of the 400 people invited to Kato's wedding, 200 attended the service, 300 attended the reception, while 50 were absent at both places. With a clearly labeled Venn diagram, find the number of people who attended both the service and the reception.

S = attended service; R = Attended reception

n(ε) = 400; n(S) = 200 n(R) = 300 let n(SUR)' = x



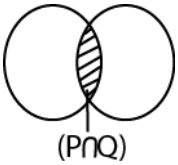
$200 - x + x + 300 - x + 50 = 400$

$550 - x = 400$

$x = 150$

Hence, the number of people who attended both = 150

5. P and Q are sets. Draw a Venn diagram to represent the relationship between P∩Q.



6. At her birthday party, Betty received 30 guests. 11 of the guests took Pepsi-cola (P), 13 guests took Mirinda (M), 15 took Coke (C). Given that:

5 Guests took Pepsi and Mirinda only.

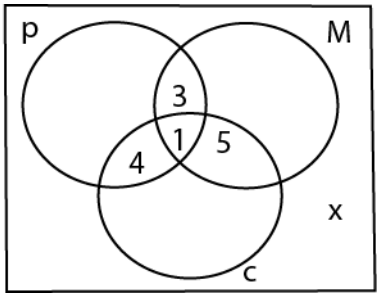
5 guests took Mirinda and Coke only.

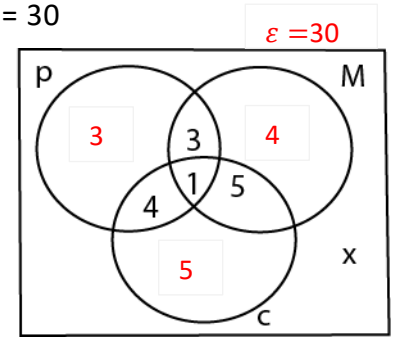
6 guests took Pepsi and Coke only

1 guest took all the three sodas

x guests did not take any of the Sodas.

(a) Complete Venn diagram below: = 30





(b) Find the number of guests who did not take any of the three sodas.

Number of students that did not take any soda

$x + 3 + 3 + 4 + 4 + 4 + 1 + 5 + 5 = 30$

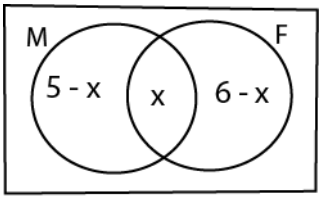
$x + 25 = 30$

$x = 5$

(c)Find the number of guests who took only one type of soda

Number of guest who took one type of soda only = 3 + 4 + 5 = 12

7. In a home of 8 people, 5 like eating meat (M), 6 like eating fish (F) and x people like both. Use the Venn diagram below to find x.



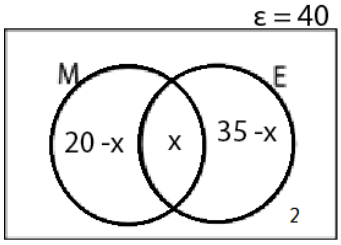
$5-x+x+6-x=8$

$11-x=8$

$x=3$

8. . In a class of 40 pupils, 20 like Mathematics (M), 35 like English (E) and *2* pupils do not like any of the two subjects.

(a) Complete the Venn diagram belowε



(b) Find the number of pupils who like both subjects

Value of x

$40 = 20 - x + x + 35 - x + 2$

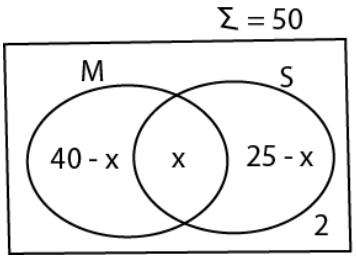
$40 = 57 - x$

$x = 17$

$\therefore$ the number of students that like both subjects = x = 17

9. In class of 50 boys, 40 like Mathematics (M) and 25 like Science (S). Some boys (X) like both subjects and 2 do not like any of the two subjects.

a). Show this information in a Venn diagram below.



b) How many boys like both Mathematics and Science?

From the Venn diagram the number of student that like both subjects = x

$40 – x + x + 25 – x + 2 = 50$

Collecting like terms

$67 – x = 50, => x = 17$

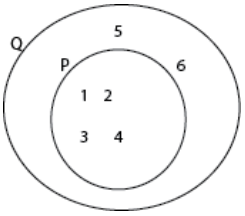
c). How many boys like Mathematics only?

n(M) only = 40 – 17 = 23

d)How many boys like Science only?

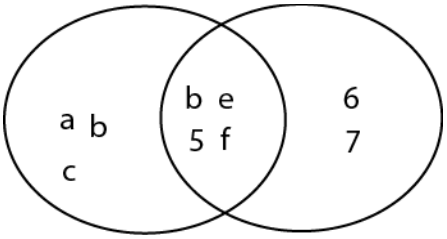
n(S) only = 25 – 17 = 8

10. If set P = { 1, 2, 3,4} and PUQ = {1,2, 3, 4, 5,6}. Find the number of set Q.



Q = {1, 2, 3, 4, 5 and 6}

11. Use the Venn diagram below to find: n(CUD)

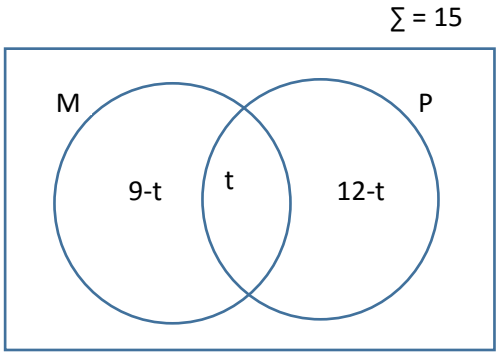


(CUD) ={a, b, c , b, e, 5, f, 6, 7}

n(CUD) = 9

12. In a family of 15 children, 9 eat matooke (M), 12 eat potatoes (P) and t eat both.

(a) Draw a Venn diagram to show this information.



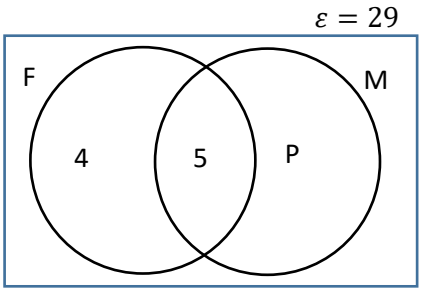
(b) Find the value of t

$9 - t + t + 12 - t = 15$

$t = 6$

13. In a class of 29 pupils, 9 eat fish (F), 5 eat both meat and fish, and P eat meat (M) only.

a) Represent this information on a Venn diagram.



b) Use the diagram to find the value of P

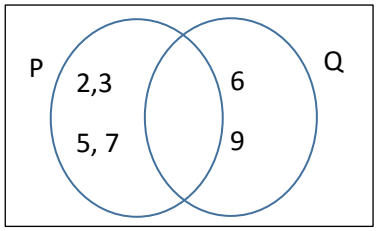
$4 + 5 + P = 29$

$= 20$

c) Find the total number of pupils who eat meat.

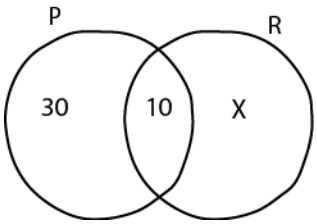
$n(M) = 20 + 5 = 25$

14. Given that; P = (2, 3, 5, 7} and Q = *{6, 9},* find P∩Q.



P∩Q = 0

15. A class of 70 pupils eat posho (P) and Rice (R) as shown in the Venn diagram. Find the Valve of *x*



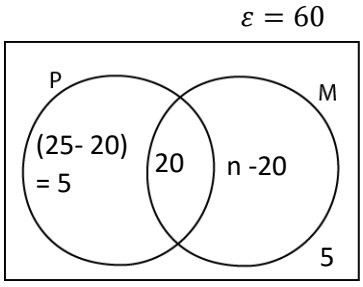
30 + 10 + x = 70

40 + x = 70

x = 30

16. In class of 60 pupils, 25 drink pepsi cola (P), n drink Mirinda (M) only, 20 drink both Pepsi cola and Mirinda. 5 drink none of these.

a) Represent this information in the Venn diagram given below.



b) Find the value of n.

60 = 5 + 20 + n-20 +5

60 =n + 10

n =50

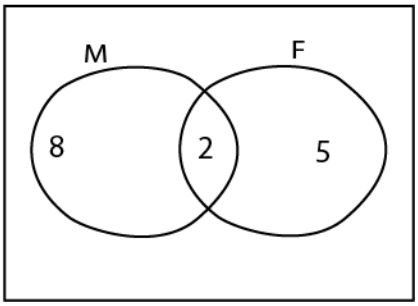
c) How many pupils drink one type of soda only?

Pupils that drink one soda = 5 + n -20

= 5 + (50 - 20)

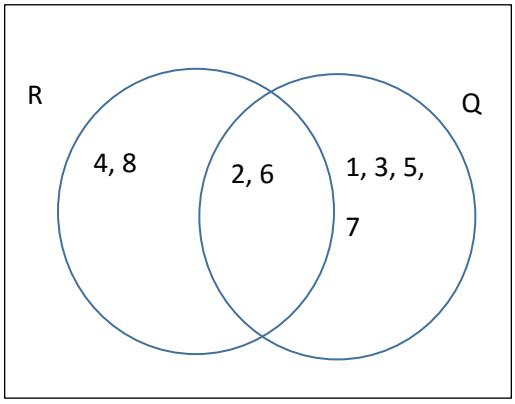
= 35

17. The Venn diagram below shows the number of children who eat meat (M) and fish (F). Find number of all the children who eat meat.



n(M) = 8 +2 = 10

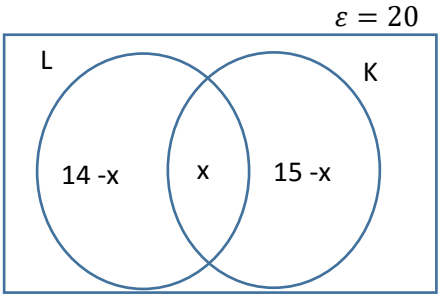
18. Given that R = { 2, 4, 6, 8} and Q={l,2,3,5,6,7}Find: n(RUQ)



n(RUQ) = 8

19. In a class of 20 pupils where two languages are spoken, 14 speak Luganda (L), 15 speak Kiswahili (K).

a) Draw a Venn diagram and show the information given.



Let pupils that speak both language be x

b) Find the number of pupils who speak both Luganda and Kiswahili.

20 = 14 –x + x + 15 – x

20 = 29 – x

x = 9

therefore, number of students that speak both languages = 9

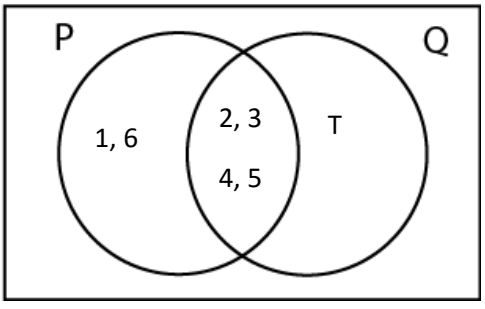
c) Find the number of pupils who speak one language only.

= 14 – 9 + 15 – 9

= 5 + 6

= 11 pupils

20. If P= **{1,2,3,4,5,6}** and Q= {2,3,4,5,T} , represent this information on the Venn diagram below.



21. In Hatari Boys primary school, 60 boys who represented the school in the country sports day played the following games:

24 played hockey (H),

19 played rugby (R),

23 played football (F),

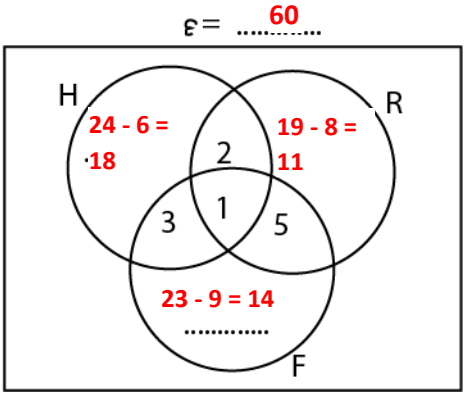
2 played both hockey and rugby only,

3 played football and hockey only.

5 played football and rugby only, and

1 played all the three games

a. Fill in the blank spaces in the Venn diagram above



b. How many boys played only one game?

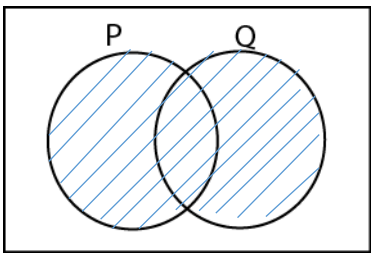
c. Ho Boys that played one game = 18 + 11 + 14 = 43

Boys who did not play any game = 60 – (18 + 2 + 11 + 3 + 1 + 5 + 14)

= 60 – 54

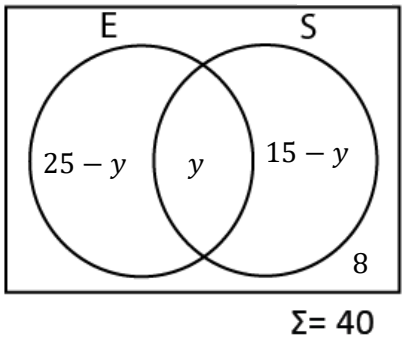
= 6 boys

22. In the Venn diagram below, shade the complement of P U Q



23. In a class of 40 pupils, 25 like English (E), 15 like Science (S), y pupils like both English and Science and 8 do not like any of the two subjects. *Use this information to answer questions (a) and (b).*

(a) Complete the Venn diagram.



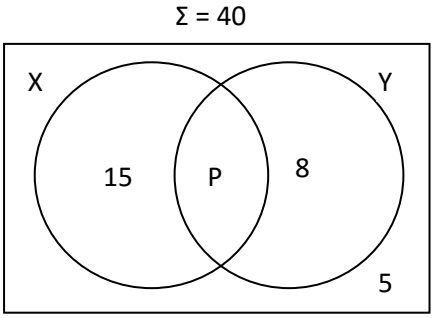
(b) Find the value of y.

40 = 25 – y + y + 15 –y + 8

40 = 48 –y

y = 8

24. Study the Venn diagram below and find the value of P.



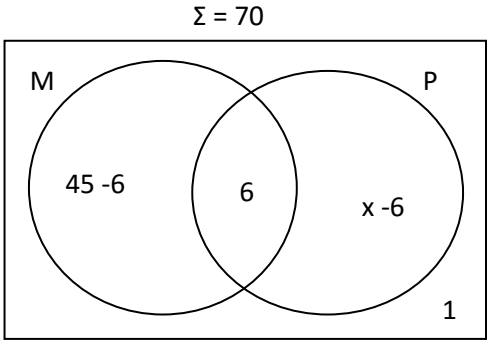
15 + P +8 + 5 = 40

P = 12

25. Seventy children were taken to a clinic for immunization.

45 children were immunized against measles (M)
x children were immunized against polio (P)
6 children were immunized against measles and polio.
1 child was not immunized at all.

(a) Represent the above information in the Venn diagram below:



(b) Find the number of children who were immunized against polio only.

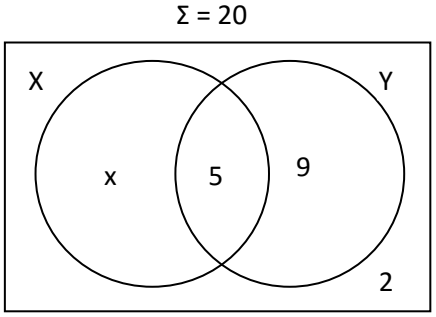
First, we find the value of x.

$45 - 6 + 6 + x - 6 + 1 = 70$

$x = 30$

number of children immunized against polio only = 30 -6 = 24

26. Use the Venn diagram below to find the value of *x*

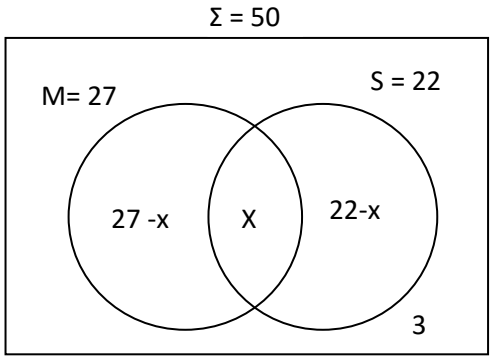


$x + 5 + 9 + 2 = 20$

$x = 4$

27. In a primary seven class of 50 pupils, 27 like Mathematics (M), 22 like science(S), x pupils like both mathematics and science and 3 pupils do not like any of the two subjects.

(a) (a) Represent this information in the Venn diagram given below.



(b) Find the value of x (2 marks)

$27 - x + x + 22 - x + 3 = 50$

$52 - x = 50$

$x = 2$

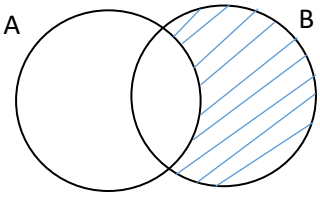
(c) Find the number of pupils who like only one subject. (2 marks)

Number of pupils that like one subject only $= 27 - x + 22 - x$

$= 27 - 2 + 22 - 2$

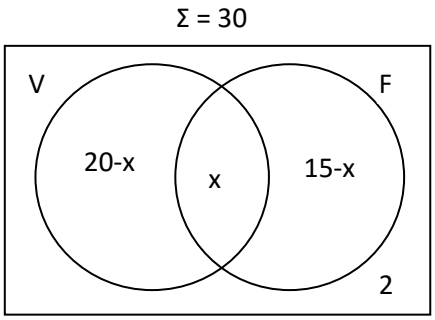
$= 45$

28. In the diagram below, shade the region that represents only the members of set B



29. In a class of 30 students ,20 play, volleyball(V), 15 play football(F), (x) play both volley ball and football and 2 do not play any of the two games.

(a) Use the information given above to complete the Venn diagram below. (2 marks)



(b) Find the value of x (2 marks)

$20 - x + x + 15 - x + 2 = 30$

$37 - x = 30$

$x = 7$

(c) Find the number of student who play only one game. (2 marks)

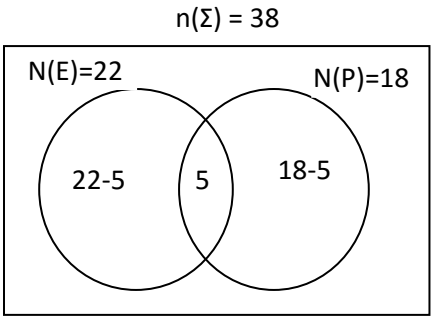
The number of students that play only one game = $20 - x + 15 - x$

$= 35 - 2x$

$= 35 - 2 \times 7$

$= 21$

30. Study the Venn diagram below carefully and answer the question that follows.



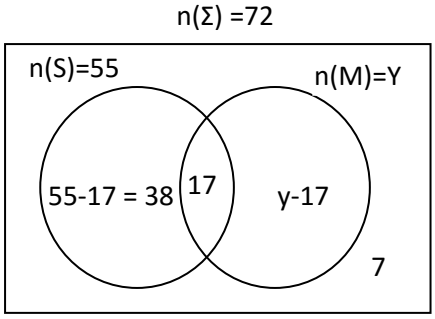
Find n(EUP)'

n (EUP) = 22 – 5 + 5 + 18 -5 = 35

n(EUP)' = 38- 35 = 3

31. At a birthday part, 72 guests were invited. 55 were served with soda (S), Y were served with mineral water (M) while 7 did not take any of the two drinks and 17 were served with both drinks.

(a) Represent the above information on the Venn diagram (3marks)



(b) Find the valve of Y

38 + 17 + Y – 17 + 7 = 72

Y + 45 = 72

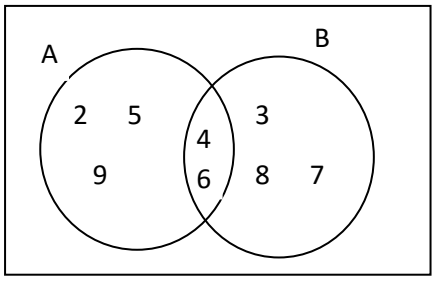
Y = 72 -45 = 27

(c) How many guest were served with one drink only? (2marks)

= n(s) only + n(M) only

= 38 + (27- 17) = 38 + 10 = 48

32. In the Venn diagram below, find n(A⋂B)

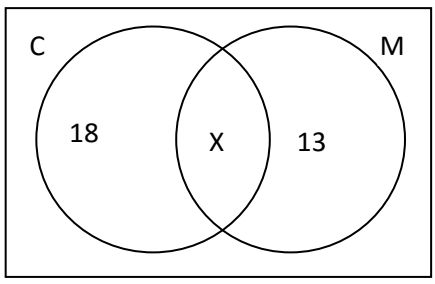


n(A⋂B) =2

33. At a birthday party attended by 40 guest, 18 ate chicken (c) only, 13 ate meat (M) only, x guest ate both chicken and meat and 4 did not eat any of the two dishes.

a) Use the information given above to complete the Venn diagram below.

n(ε) = 40



b) Find the value of *x*. 4 (02 marks)

18 + x +13 +4 = 40

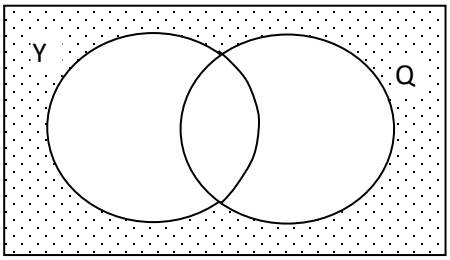
25 + x = 40

x = 5 guest

c) How many guests did not eat meat at all? (02 marks)

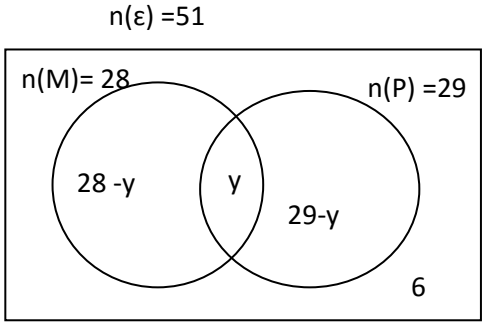
= 18 + 4 = 22 guests

34. In the Venn diagram below, shade the area (YUQ)'



35. In a class party of 51 pupils, 28 drank Mirinda (M). 29 drank Pepsi (P), Y drank both Mirinda and Pepsi while 6 did not drank any of the two soda.

(a) Use the information given above to complete the Venn diagram below (2marks)

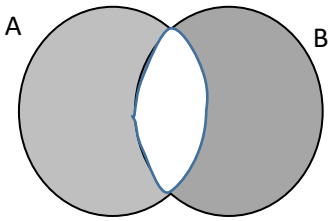


(b) Find the valves of y.

28 - y + y + 29 – y + 6 = 51

y = 12

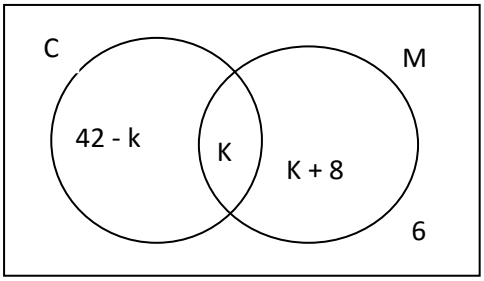
36. In the Venn diagram below, shade the area $(A \cap B)^{-1}$



37. At party attended by 60 pupils, 42 ate Chicken (C), (k +8) ate Meat (M) only K pupils ate both chicken and meat while 6 did not eat any of the two items.

(a) Use the information given above to complete the Venn diagram below. (3marks)

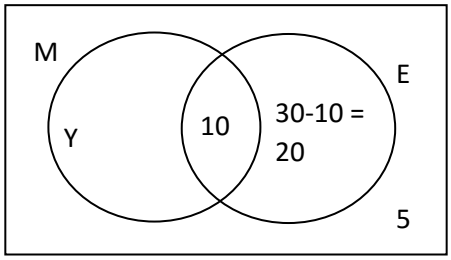
n(ε) =60



38. In a class of 60 pupils, 30 like English (E), Y like mathematics (M) only, 10 like both subject and 5 do not like any of the two subjects.

(a) Use the information given to complete the Venn diagram below. (02 marks)

n(ε) = 60



(b) Find the valve of y (02 marks)

$Y + 10 + 20 + 5 = 60$

$Y + 35 = 60$

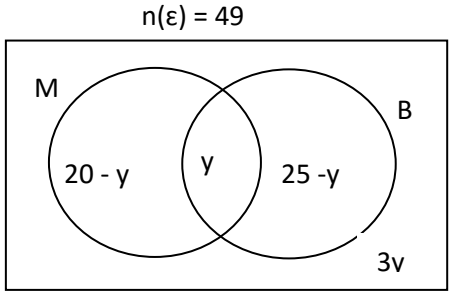
$Y = 25$

(c) How many pupils like Mathematics altogether? (01 marks)

Pupils that like mathematics = y + 10 = 25 + 10 = 35

39. In a village of 49 farmers, 20 grow millets (M). 25 grow beans (B) and y farmers grows both millet and beans. 3y farmers grow neither of the two food crops.

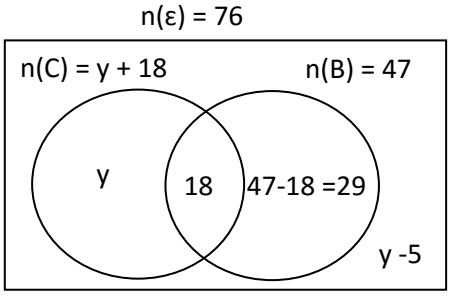
(a) Use the information given above to complete the Venn diagram below. (03 marks)



40. A birthday party attended by 76 guests, 47 were served with beef (B) and 18 were served with both beef and chicken (C). y guest were served with chicken only while (y-5) were not served with any of the two dishes

(a) Use the information above to complete the Venn diagram below.

(02marks)



(b) Find the valve of y (2marks)

Y + 18 +29 + y -5 = 76

2y + 47-5 = 76

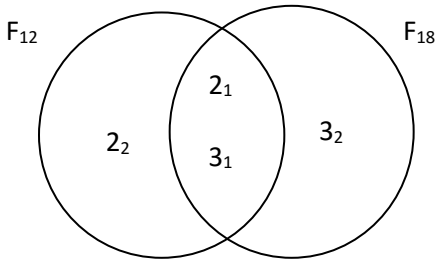
y = 17

(c) Find the number of guests who were served with chicken (01mark)

Guest served with chicken = y +18 = 17 + 18 = 35

41. The Venn diagram below shows the prime factors of 12 and 18

Use it to answer the question that follows

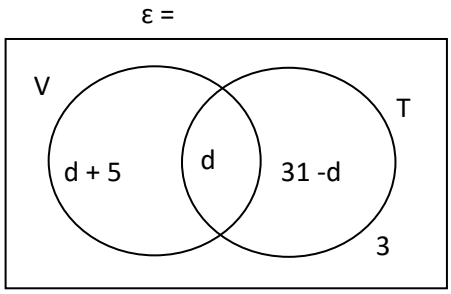


Find the lowest common multiple of 12 and 18.

LCM= $2_1 \times 2_2 \times 3_1 \times 3_2 = 36$

42. In a class, 31 pupils play tennis (T) and (d + 5) play volley ball (V) only d pupils play both games while 3 play neither of the games.

(a) Use the above information to complete the Venn diagram below. (02marks)



(b) If 27 pupils play volleyball altogether, find the valve of *d* (02marks)

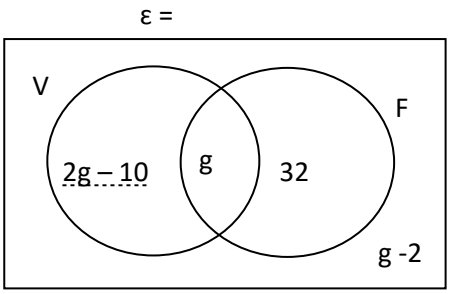
$2d + 5 = 27$

$2d = 22$

$d = 11$

43. In a class, 32 pupils play football (F) only. g play both volley ball (V) and football, (2g – 10) play volley ball but not football while (g-2) play neither of the two games.

(a) Complete the Venn diagram below using the above information.



(b) Given that 62 pupils play one game only, find the value of g. (02marks)

Pupils that play one game only is $(2g – 10 + 32) = 62$

$2g = 40$

$g = 20$

(c) Calculate the number of pupils in the class. (02marks)

Total number of student in class $= (2g - 10) + g + 32 + (g-2)$

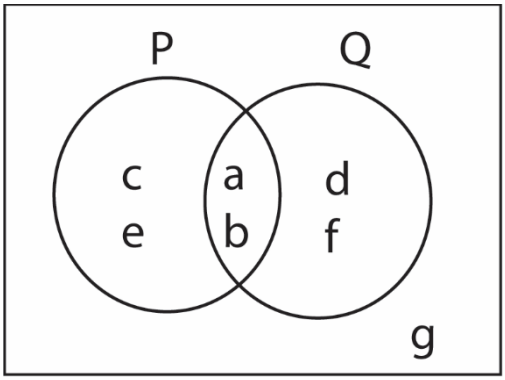
$= (2g + g + g) + (-10 + 32 - 2)$

$= 4g + 20$

$= 4 \times 20 + 20$

$= 100$

44. Use the Venn diagram below to find n(P⋂Q)'

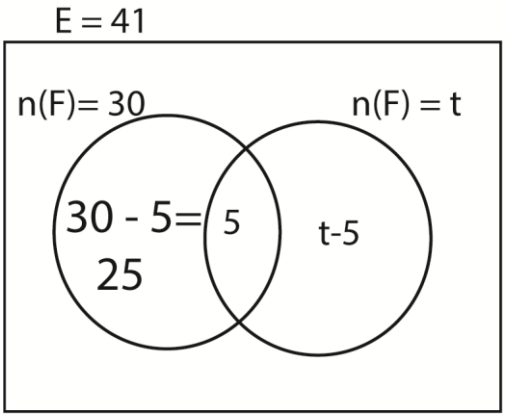


$(P \cap Q)' = \{c, e, d, f, g\}$

$n(P \cap Q)' = 5$

45. In a class of 41 pupils, 30 play football (F), t play netball and 5 play both Football and Netball. 3 pupils do not play any of the two games. 3 pupils do not play any of the two games.

(a) Use the above information to complete the Venn diagram below. (02marks)



(b) Find the value of t. (02marks)

25 + 5 +t-5 = 41

25 + t = 41

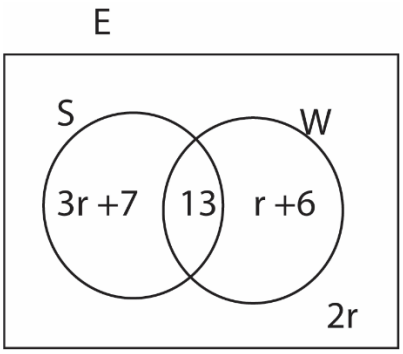
t =16

46. Given that P = {a, b, c, d, e, f, g} and Q = {b, a, f, e, h), find n(PUQ)

(PUQ) = { a, b, c, d, e, f, g, h)

n(PUQ) = 8

47. At a party, guests were served with soda (S) and mineral water (W) as shown in the Venn diagram below. Study and use the Venn diagram to answer the questions that follow.



(a) If 32 guests were served with soda, find

(i) The value r (02marks)

$3r + 7 + 13 = 32$

$3r + 20 = 32$

$3r = 12$

$r = 4$

(ii) The total numer of guests who attended the party (02marks)

$E = 3r + 7 + 13 + r + 6 + 2r$

$= 6r + 26$

$= 6 \times 4 + 26$

$= 24 + 26$

$= 50$

(b) Find the probability that a guest picked at random did not take any drink. (01marks)

The probability $= 2r/50$

$= (2 \times 4)/50$

$= 4/25$