TOPIC 1: SET CONCEPTS

Introduction

What is a set?

The collection of well-defined things/objects is termed as a set. An object or anything in a group/set is an element or member of that set. The symbol that shows that an element is a member of the given set is ∈

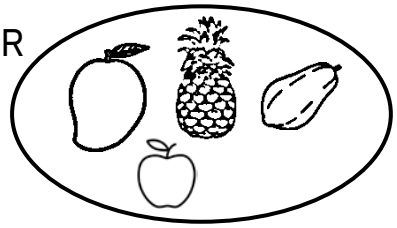
Identifying sets

To identify a set, we use a capital letter and a common name for all the members in that set.

Example

Identify the set below

R

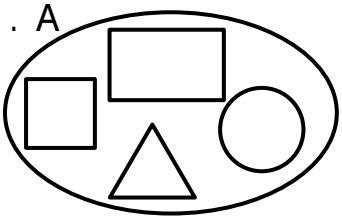


R is a set of fruits

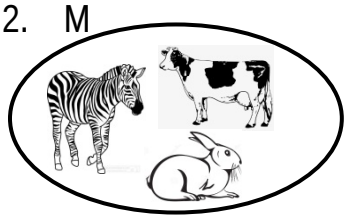
Exercise 1:1

Identify the following sets

1 . A



2. M



3. T

4. R = {a, e, i, o, u}

5. F = {chair, desk, stool}

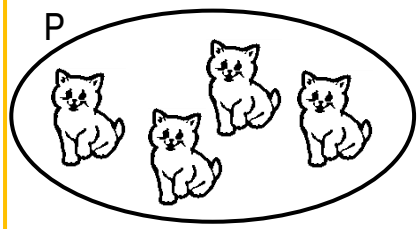
Naming of sets

Sets are named according to the number and type of objects they have.

Example

Name the set below

P



P is a set of 4 cats

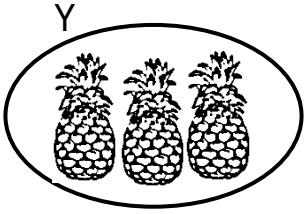
Exercise 1:2 Name the given sets below

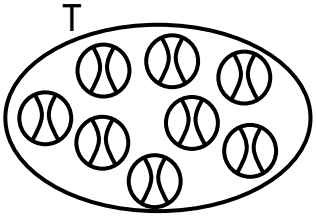
1. B = {0,1,2,3,4,5}

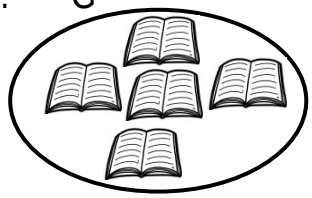
2. N = {  }

TOPIC 1: SET CONCEPTS

Name the following sets

3. Y 

4. T 

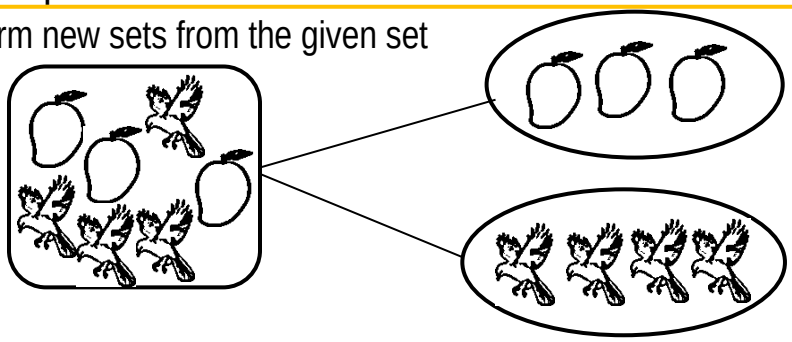
5. G 

Forming sets

We form sets by sorting items of the same type, colour or size from the given set.

Example

Form new sets from the given set

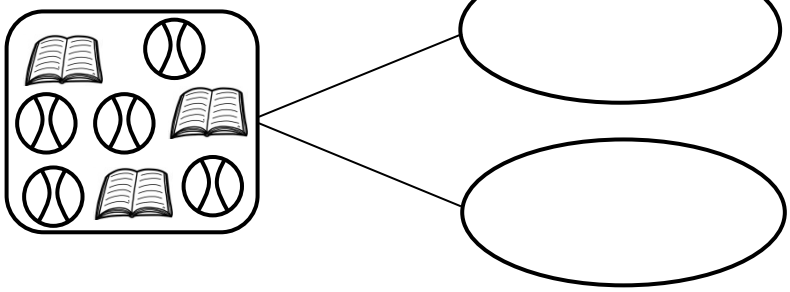


A set of 3 mangoes

A set of 4 birds

Exercise 1:3

Form new sets and name them



A set of _____

A set of _____

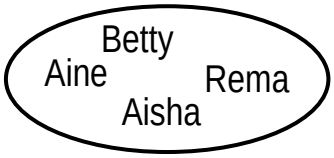
Listing members in a given set

To list members in a set, use curly brackets "{ }". Separate each member from another using a comma.

Example 1

List members of set K

K



K = {Aine, Betty, Rema, Aisha}

Example 2

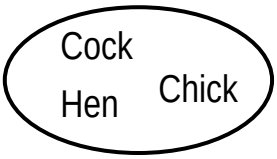
R is a set of vowel letters. List members of R

R = {a, e, i, o, u}

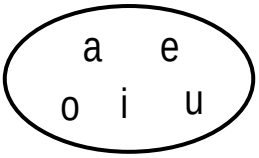
Exercise 1:4

List the elements of each of the following sets.

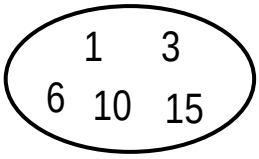
1. M



2. N



3. T



4. W is a set of 3 names of shapes
5. Z is a set of 4 names of fruits
6. H is a set of the first four prime numbers

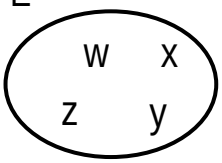
Finding number of elements in a set

To find the number of elements in a set, count the number of objects in the given set.

Example 1

How many members are in E?

E



E has 4 members

Example 2

Given the set below. Find n(M)

M

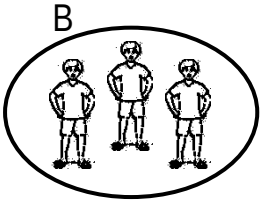
n(M) = 3

Exercise 1:5

1. Given that L = {a, b, c, d}. Find n(L)
2. If R = {pen, pencil, book}, find n(R)
3. If X = {0,2,4,6,8}, find n(X)
4. Given that C = {4,6,8,9,10}. Find n(C)

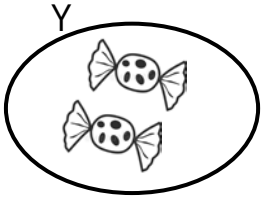
Find the number of members in each set.

5. B



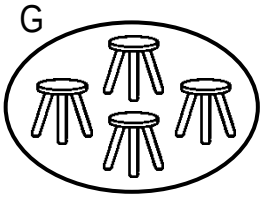
B has ___ members

6. Y



Y has ___ members

7. G



G has ___ members

Finite and infinite sets

*- Sets whose members can be counted are called **finite sets**/countable sets e.g.*

P = {5, 10, 15, 20, 25}. We can count elements in P, therefore P is a finite set and n(P) = 6

Examples of finite sets

1. Q = {natural numbers less than 25}
2. V = {vowel letters}

- A set whose members cannot be counted/uncountable is called an ***infinite set*** *e.g.*

N = {natural numbers}. There are many natural numbers and the list is too big that no one can write all of them. To write such infinite sets, we have to write some of the elements followed by three dots (…) indicating continuity.

Therefore;

N = {natural numbers} can be written as N = {1, 2, 3, 4, 5 …}

Exercise 1:6

1. State whether finite or infinite set.
   a) A = {vowel letters}
   b) M = {prime numbers}
   c) Y = {multiples of 7}
   d) B = {factors of 12}
   e) D = {composite numbers less than 12}
   f) Z = {beans, maize, millet}
   g) Q = {odd numbers between 6 and 13}
   h) R = {integers less than $^{+}3$}
2. Given that P = {even numbers less than 10}. Find n(P)
3. If K = {triangular numbers}, list elements of set K
4. Given that W = {prime numbers less than 12} and R = {odd numbers less than 12}. Which of the given sets has more members?
5. If E = {days of the week starting with letter T}. Find n(E)

Identifying empty sets

- A set that cannot be found or with no member is an empty set. The symbol Ø stands for empty set.

Examples of empty sets

1. P = {books with legs}
2. B = {birds with 3 eyes each}

Exercise 1:7

1. State whether empty set or not empty set.
   a) Y = {dogs with 4 legs each}
   b) Z = {breast feeding men}
   b) Q = {walking trees}
   c) E = {girls with 10 fingers each
   d) P = {days of the week starting with letter P}
   e) R = {goats with 7 legs}
2. Given that H = {months of the year starting with letter z}. Find n(H)
3. Given that Y is a set of 4 girls with three heads each. Write down elements of Y.

Identifying equivalent and non-equivalent sets

- Sets with the same number of elements are called equivalent sets (↔)

- Sets which do not have the same number of elements are called non-equivalent sets(↮)

Example 1

M = {a,b,c,d,e} and N = {1,2,3,4,5}. M has 5 members and N has 5 members but members

in M are different from those in N.
so, M and N are equivalent sets. This can also be written as M ↔ N

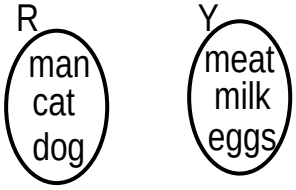
Example 2

Given two sets; K and P. K = {0,2,4,6,8} and P = {3,5,7,9}.

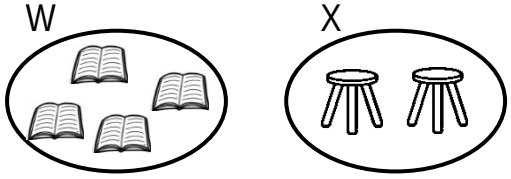
K has 5 members and P has 4 elements.
so, K is not equivalent to P. This can also be written as K ↮ P

Exercise 1:8

1. Identify using symbols ↔ or ↮
   a) A = {girl, boy, baby}
      C = {meat, milk}
   b) T = {w, x, y, z}
      K = {4, 8, 12, 16}
   c) P = {2, 3, 5, 7, 11}
      C = {4, 6, 8, 9, 10, 12}
   d) S = {1, 4, 9, 16, 25, 36}
      E = {0, 2, 4, 6, 8, 10}
2. Count the elements and write equivalent or non equivalent.
   a) M = {a, b, c, d, e, f}
      K = {1, 2, 3, 4}
      M and K are _____ sets
   b) P = {2, 3, 5, 7, 11}
      C = {4, 6, 8, 9, 10}
      P and C are _____ sets
   c) R Y



      R and Y are ____ sets
   d) W X



      W and X are ____ sets

Differentiating equal sets from equivalent sets

- Sets with the same number of elements of the same type are called equal sets (=)

Example

R = {3, 9, 12, 15} and P = {12, 3, 15, 9}

R and P are equal sets
This can also be written as R = P

Exercise 1:9

1. Identify using the symbols = or ↔
   a) B = {a, b, c, d} and D = {b, c, d, a}
   b) A = {6, 4, 8, 9} and C = (8, 9, 4, 6}

c) X = {a, e, i, o, u}
Y = {1, 3, 6, 10, 15}

d) M = {knife, spoon, fork}
N = {spoon, fork, knife}

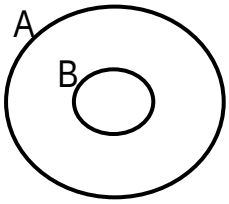
2. Two sets A and D are equal sets. Given that A = {2, 3, 5, 7, 11}. Find n(D)

Subsets

A subset is a set obtained from the original set.

A set containing some or all members of the mother set is called a subset.

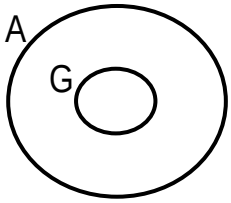
Look at the Venn diagram below



- The relationship between A and B is; B is a subset of A
- All members of set B are also members of set A

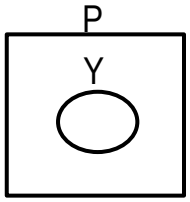
Example 1

1. Draw a diagram to show that all goats (G) are animals (A)



Example 2

2. Describe the relationship between P and Y

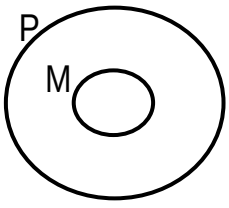


Y is a subset of P

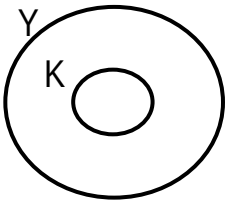
Exercise 1:10

1. Describe the relationship between the sets below.

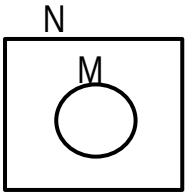
a)



b)



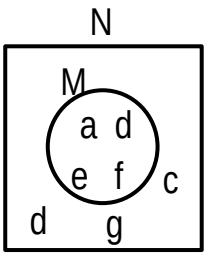
c)



2. Draw Venn diagrams to describe the following;
   a) All boys (B) are males (M)
   b) All birds (B) are vertebrates (V)
   c) AUB = A
   d) C∩D = C

3. Given that A = {whole numbers} and B = {1, 8, 27, 64, 125}. Describe the relationship between A and B.

3. Study the Venn diagram below and use it to answer questions that follow.



i) Describe relationship between the two sets
ii) List all members of set N
iii) Which set has more members?
iv) Find n(N)

Listing subsets

- The smallest subset is the empty set and the largest subset is the set itself.

Example 1

If S = { △ , ▭ }. List all possible subsets from S

{ }, { △ }, { ▭ }, { △ , ▭ }

Example 2

Given that H = {w, r, p}. List all subsets that can be obtained from H

{ }, {w}, {r}, {p}, {w, r}, {w, p}, {r, p}, {w, r, p}

Exercise 1:11

1. List all possible subsets that can be obtained from the following sets

a) B = {a}
b) R = {15}
c) J = {1, 8, 27}
d) D = {a, b}
e) K = {cup}
f) Y = {e, r, v}
g) W = {0, 1, 2}
h) S = { □ , ▭ }
i) T = {cat, rat}

2 The subsets of N are given below;

{ }, (k, b}, {b}, {k}

i) List all elements of N
ii) Find n(N)

Finding number of subsets

Remember: *An empty set is a subset of any given set*

Study the table below carefully

Set	Listed subsets	No of subsets
{ }	{ }	1
{a}	{ }, {a}	2
{a, b}	{ }, {a}, {b}, {a, b}	4
{a, b, c}	{ }, {a}, {b}, {c}, {a, b}, {a, c}, {b, c}, {a, b, c}	8

From the table above, the number of subsets is in a sequence of 1, 2, 4, 8 …

Work in pairs

Find the next number in the sequence; 1, 2, 4, 8, …

Expected response

Approach 1

1, 2, 4, 8, 16

x2 x2 x2 x2

Approach 2

1, 2, 4, 8, 16

2^0 2^1 2^2 2^3 2^4

$2^4 = 2x2x2x2 = 16$

Approach 2 shows that the pattern used is related to powers of 2; {2^0, 2^1, 2^2, 2^3…}. The powers; 0,1,2,3 and 4 are the number of elements in the sets in the table on page 7. We normally use letter "*n*" to represent the unknown number of elements in a set.
So, the formula we use to find the number of subsets in a set is 2^n where *n* is the number of elements in the given set.

Example 1

Given that L = {b}. How many subsets are in set L?

No. of subsets $= 2^n$
$= 2^1$
$= 2$ subsets

Example 2

If K = {r, t, s, y, d, f}, find the number of subsets that can be obtained from K

No. of subsets $= 2^n$
$= 2^6$
$= 2x2x2x2x2x2$
$= 64$ subsets

Exercise 1:12

1. Find the next two numbers in the sequence using the idea of powers of 2;
   a) 1, 2, 4, 8, 16, ___, ___
   b) 64, 32, 16, 8, ___, ___
   c) 16, 32, 64, 128, ___, ___
   d) 1, 4, 16, 64, ___, ___

2. Find the number of subsets in each of the following sets.
   a) W = { }
   b) X = {m}
   c) Y = {Δ, ▭, □}
   d) Z = {a, e, i, o, u}
   e) P = {2, 3, 5, 7, 11, 13}
   f) T = {1, 3, 6, 10, 15}

3. How many subsets can be obtained from a set with the following elements?
   a) 1 element
   b) 3 elements
   c) 6 elements
   d) 5 elements
   e) 4 elements
   f) 10 elements

4. Find the number of subsets that can be obtained from the following sets if,
   a) n(V) = 7
   b) n(M) = 0
   c) n(S) = 3
   d) n(H) = 8
   e) n(W) = 5
   f) n(R) = 9

Expressing numbers as powers of 2

Example 1

Express 16 as powers of 2

2	16
2	8
2	4
2	2
	1

16 = 2x2x2x2

16 = 2^4

Example 2

Express 8 as powers of 2

2	8
2	4
2	2
	1

8 = 2x2x2

8 = 2^3

Exercise 1:13

Express the following as powers of 2

a) 32
b) 64
c) 128
d) 8
e) 16
f) 512
g) 2048
h) 1
i) 1024

Finding the number of elements when number of subsets is given

Example 1

Given that T has 32 subsets, how many elements are in T?

2^n = No. of subsets
2^n = 32
$2^n = 2x2x2x2x2$
$2^n = 2^5$
n = 5
T has 5 elements

2	32
2	16
2	8
2	4
2	2
	1

Example 2

M has 1 subset. Find n(M)

2^n = No. of subsets
2^n = 1
$2^n = 2^0$
n = 0
n(M) = 0

Exercise 1:14

1. How many elements are in a set with
   a) 8 subsets
   b) 4 subsets
   c) 16 subsets
   d) 1 subset
   e) 128 subsets
   f) 512 subsets
   g) 1024 subsets
   h) 4096 subsets

2. The subsets of A are given below.
{m}, { }, {n}, {m, n}, {n, p}, {m, p}, {m, p, n}, {p}. Find n(A)

3. Given that set X has 64 subsets, find n(X)

4. Two sets A and B have 80 subsets altogether. If A = {w, x, y, z}. Find n(B)

Proper subsets

If the universal or super set is excluded from the subsets, the rest including the empty set are proper subsets. The formula used to find the number of proper subsets in a set is $(2^n)-1$

Example 1

List all proper subsets in K if K = {a, s}
{ }, {a}, {s}

Example 2

Given that D = {w, e, b}. List all proper subsets in D
{ }, {w}, {e}, {b}, {w, e}, {w, b}, {e, b}

Example 3

How many proper subsets in
K = {a, b, e, w, o}

No. of proper subsets $= (2^n) - 1$
$= (2^5) - 1$
$= (2x2x2x2x2) - 1$
$= 32 - 1$
$= 31$ proper subsets

Exercise 1:15

1. List all proper subsets that can be obtained from each of the following sets.
   a) M = {a}
   b) N = {w, n, k}
   c) R = {m, e}
   d) T = {□, △}
   e) A = {rabbit, rat, cat}
   f) W = {0,1,2}

2. How many proper subsets can be obtained from the following sets?
   a) P = {w, e, n}
   b) C = {1, 8, 27, 64}
   c) T = {1, 3, 6, 10, 15, 21}
   d) E = {0,2}
   e) K = {a, b, c, d, e, f, g, h}
   f) R = {city, village, town}
   g) S = {1, 4, 9, 16, 24, 36, 49, 64}
   h) P = {2, 3, 5, 7, 11, 13, 17, 19, 23, 29}

3. Find the number of proper subsets that can be obtained from a set with the following
   a) 2 elements
   b) 4 elements
   c) 3 members
   d) 5 members
   e) 8 elements
   f) 9 members

4. Given that n(Y) = 7. How many proper subsets can be obtained from Y?

Finding the number of elements in a set when the number of proper subsets is given

Example 1

M has 31 proper subsets. Find n(M)

$(2^n) - 1$ = Number of proper subsets

$(2^n) - 1 = 31$

$(2^n) - 1 + 1 = 31 + 1$

$2^n = 32$

$2^n = 2x2x2x2x2$

$2^n = 2^5$

$n = 5$

$n(M) = 5$

2	32
2	16
2	8
2	4
2	2
	1

Example 2

Given that H has 7 proper subsets, how many elements are in H?

$(2^n) - 1$ = Number of proper subsets

$(2^n) - 1 = 7$

$(2^n) - 1 + 1 = 7 + 1$

$2^n = 8$

$2^n = 2x2x2$

$2^n = 2^3$

$n = 3$

H has 3 elements

2	8
2	4
2	2
	1

Exercise 1:16

1. How many elements are found in a set with the following proper subsets?
   a) 3 proper subsets
   b) 1 proper subset
   c) 15 proper subsets
   d) 7 proper subsets
   e) 63 proper subsets
   f) 127 proper subsets
   g) 31 proper subsets
   h) 511 proper subsets
   i) 255 proper subsets
2. Given that G has 63 proper subsets. Find n(G)
3. Find the value of n in each of the following equations
   a) $2^n - 1 = 7$
   b) $2^n + 1 = 17$
   c) $2^n - 6 = 26$
   d) $2^n + 37 = 101$

Venn diagrams

A Venn diagram is a diagram that uses circles to represent sets pictorially inside a rectangle called the universal set. Elements that are common to more than one set are represented by the intersection of the two circles. Separate circles are sets that have no intersection.

Venn diagrams were introduced by an English logician called John Venn (1834 - 1923)

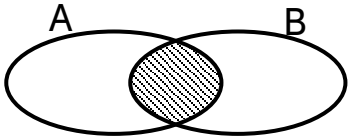
Identifying intersection (∩) and union (U)

- Common members form the intersection set (∩)

- All members without repeating the common members form the union set (U)

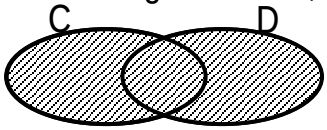
Example 1

On the Venn diagram below, shade A∩B



Example 2

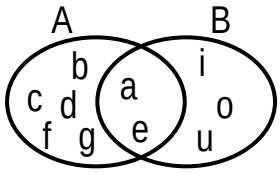
On the Venn diagram below, shade CUD



Example 3

Given that A = {a, b, c, d, e, f, g}
and B = {a, e, i, o, u}. Find

i) A∩B



A∩B = {a, e}

ii) AUB

AUB = {c, b, d, g, a, f, e, i, o, u}

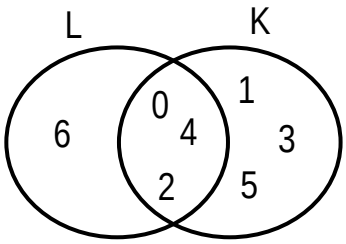
iii) n(A∩B)

A∩B = {a, e}

n(A∩B) = 2

Example 4

Given that K∩L = {0, 2, 4}, L ={0, 2, 4, 6}
and KUL = {0, 1, 2, 3, 4, 5, 6}. Find n(K)



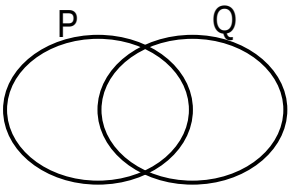
K = {0, 4, 2, 1, 3, 5}

n(K) = 6

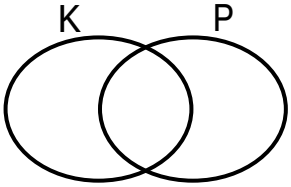
Exercise 1:17

1. In the Venn diagram below, shade:

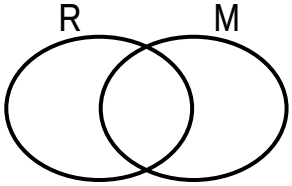
a) P∩Q



b) KUP

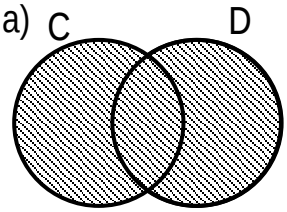


c) R∩M

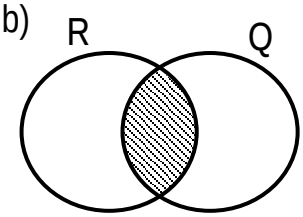


2. Describe the shaded region.

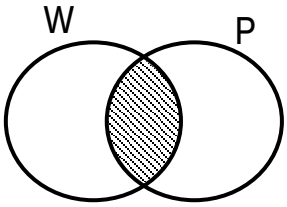
a)



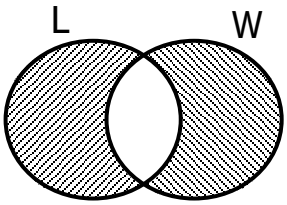
b)



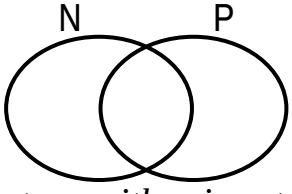
c)



3. Describe the un shaded region



4. On the Venn diagram below, shade either set N or set P or both.

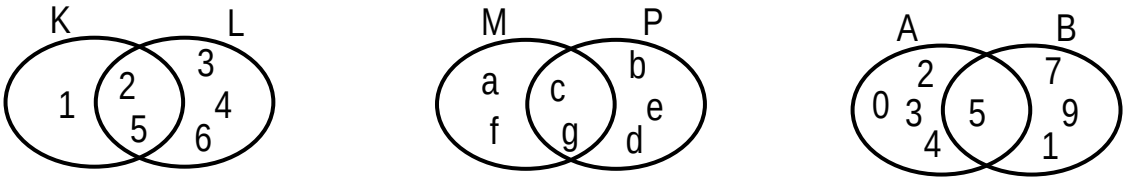


→ *The operation in which the elements that are either in set A or in set B or in both set A and set B is called the union of two sets*

4. A = {1, 2, 3, 4, 5, 6} and R = {3, 4, 5, 6, 7, 8, 9}. List members of A∩R

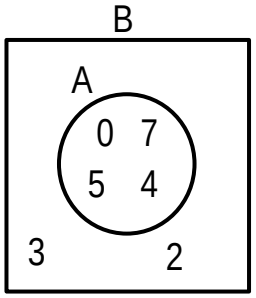
5. Given that M = {0, 1, 2, 3, 4, 5, 6, 7} and N = {1, 3, 6, 10, 15}. Find
   i) MUN
   ii) n(M∩N)
   iii) n(MUN)
   iv) M∩N

6. Use the given Venn diagram to find;
   i) KUL
   ii) M∩P
   iii) n(AUB)



7. Given that W = {p, q, r, s}, W∩Y = {q, r} and WUY = {a, b, p, c, r, s, q}. Find n(Y)

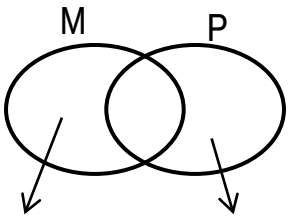
8. Study the Venn diagram below.



   a) Describe the relationship between A and B
   b) List all elements of set B
   c) Find
      i) AUB
      ii) n(A∩B)

Finding difference of sets

Study the Venn diagram below



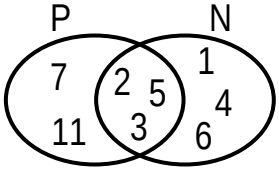
M only or (M – P)

P only or (P – M)

Note: *The word only is used to exclude members of other regions on the Venn diagram*

Example

Given that P = {2, 3, 5, 7, 11} and N = {1, 2, 3, 4, 5, 6}. Find n(P – N)

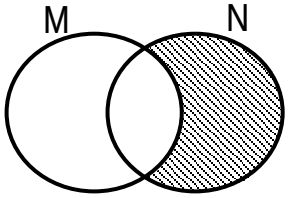


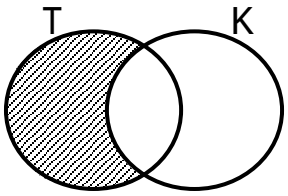
P – N = {7, 11}

n(P – N) = 2

Exercise 1:18

1. Describe the shaded region.

a) 

b) 

2. Given that A = {w, p, q, r, s, t} and B = {r, a, t, s}. Find

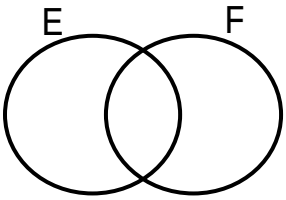
i) A – B

ii) n(B – A)

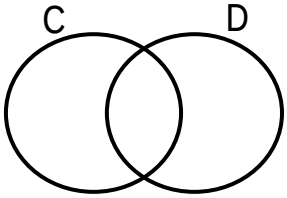
iii) n(AUB)

3. In the Venn diagram below, shade:

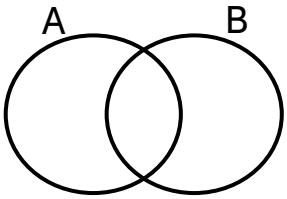
a) E – F



b) C only



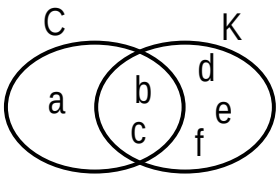
c) B – A



4. Draw Venn diagrams and shade.

i) AUB ii) M∩N iii) K – T iv) P – R v) M but not Y

5. Study Venn diagram below.



Find; i) CUK

ii) n(C∩K)

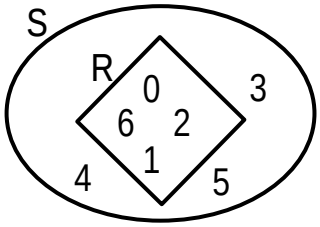
iii) K – C

iv) n(C) only

6. Given that P = {prime numbers less than 10} and N = {natural numbers less than 7}.
Find; i) n(P – N) ii) n(PUN) iii) n(N) only

7. Given that R = {0, 1, 2, 7, 8}, R∩T = {2, 8, 7} and RUT = {0, 1, 2, 3, 4, 5, 6, 7, 8}.
Find n(T) only

8. Study the Venn diagram below.



a) List members of S

b) Find; i) S – R

ii) n(R∩S)

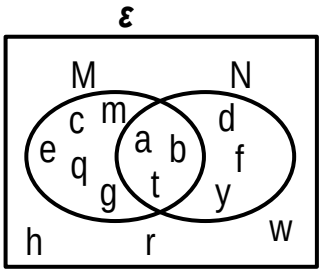
TOPIC 1: SET CONCEPTS

Universal set (ε)

This is the set that contains all elements involved in a problem under consideration.

Example

Given the Venn diagram below;



Find;

i) MUN

MUN = {e, c, g, m, q, a, b, t, d, f, y}

ii) M∩N

M∩N = {a, b, t}

iii) M – N

M – N = {e, c, g, q, m}

iv) n(ε)

ε = { e, c, g, m, q, a, b, t, d, f, y, h, r, w}

n(ε) = 14

v) n(MUN)'

(MUN)' = {h, r, w}

n(MUN)' = 3

vi) (N∩M)'

(M∩N)' = { e, c, g, m, q, d, f, y, h, r, w}

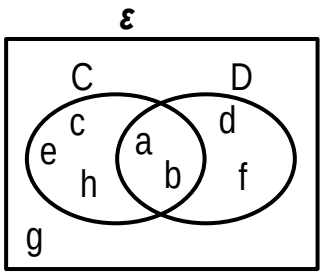
vii) n(N – M)'

(N – M)' = { e, c, g, m, q, a, b, t, h, r, w}

n(N – M)' = 11

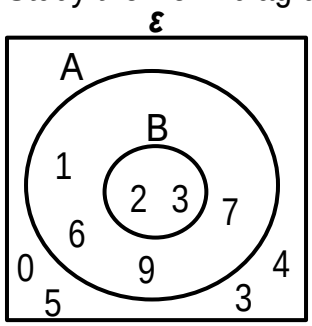
Exercise 1:19

1. Study the Venn diagram below.



Find; i) CUD
ii) C∩D
iii) C – D
iv) n(ε)
v) n(CUD)'
vi) n(C∩D)'
vii) n(D – C)'
viii) n(C)'

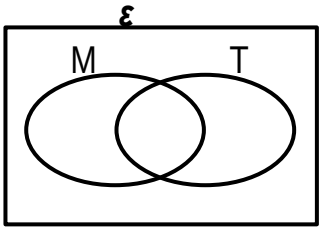
2. Study the Venn diagram below



Find; i) BUA
ii) n(B∩A)
iii) n(ε)
iv) A – B
v) n(AUB)'
vi) n(A∩B)'
vii) n(A – B)'

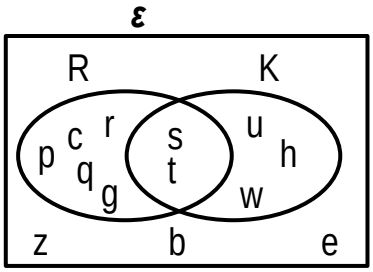
3. Given that ε = {c, e, b, a, y, z, x, d, w}, M = {w, d, c, x} and T = {x, z, y}

a) Represent the given information on the Venn diagram below.



b) Find; i) n(MUT)'
ii) n(M∩T)
iii) n(M – T)'

4. Study the Venn diagram below.



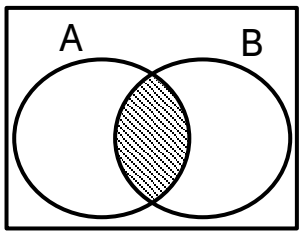
a) List elements in;
i) set K ii) RUK iii) (R – K)'

b) Find; i) n(R) iv) n(R)'
ii) n(RUK) v) n(ε)
iii) n(K∩R) vi) n(RUK)'

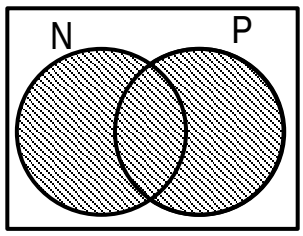
Describing parts of Venn diagrams

Examples

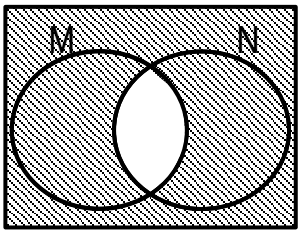
Describe the shaded regions

a)


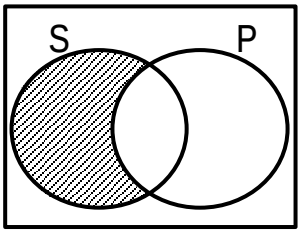
A∩B

c)


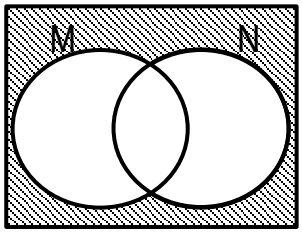
NUP

e)


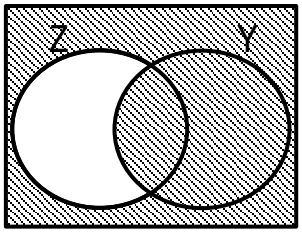
(M∩N)'

b)


S only *or* S – P

d)


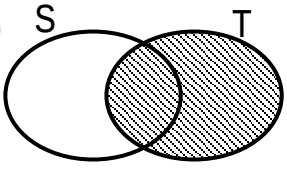
(MUN)'

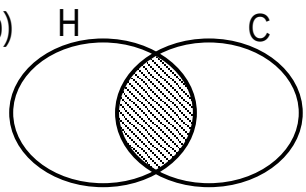
f)


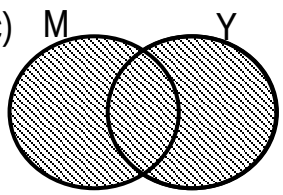
(Z – Y)'

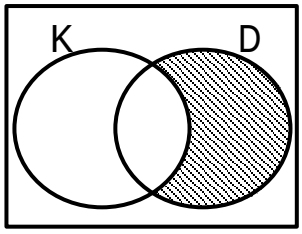
Exercise 1:20

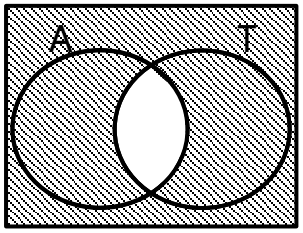
1. Describe the shaded region.

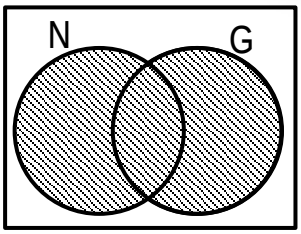
a)


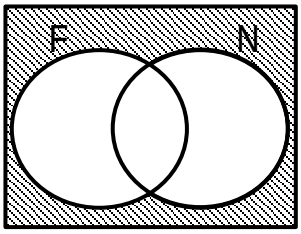
b)


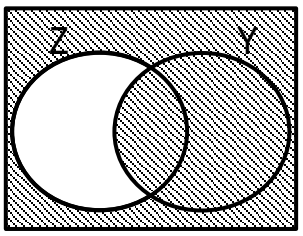
c)


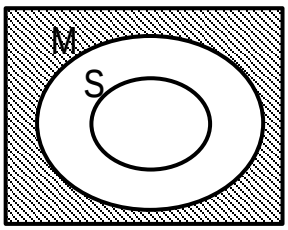
d) 

f) 

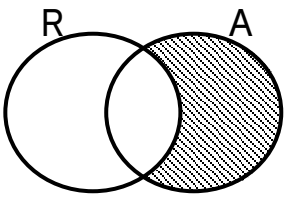
h) 

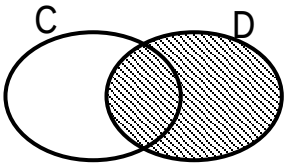
e) 

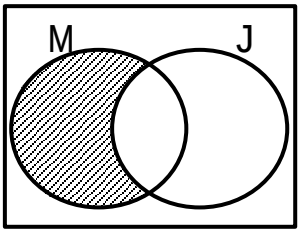
g) 

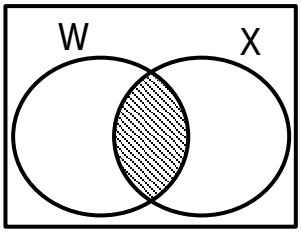
i) 

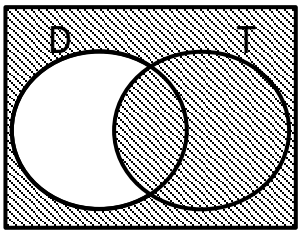
2. Describe the un shaded regions.

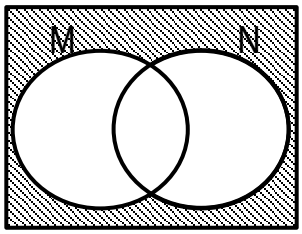
a) 

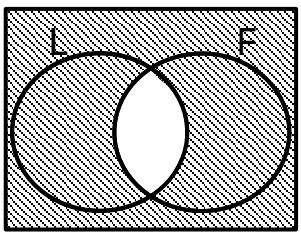
b) 

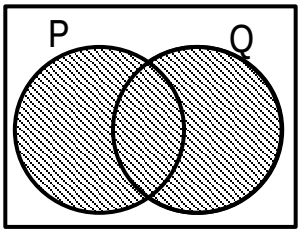
c) 

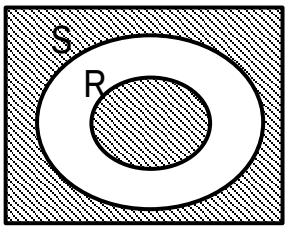
d) 

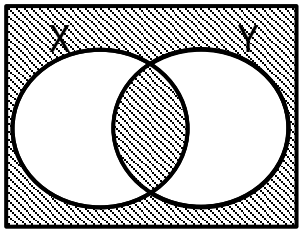
f) 

g) 

h) 

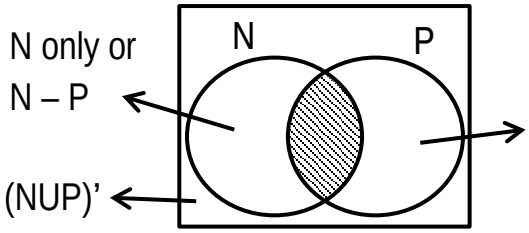
i) 

j) 

k) 

Recognizing regions of the universal set

Study the Venn diagram below



From the Venn diagram, N∩P is shaded

N = N only + (N∩P)

P = P only + (N∩P)

N only = N – (N∩P) *or* (NUP) – P

P only = P – (N∩P) *or* (NUP) – N

N∩P = N – N only *or* P – P only *or* (NUP) – (N only + P only) *or* (N + P + (NUP)') - *ε*

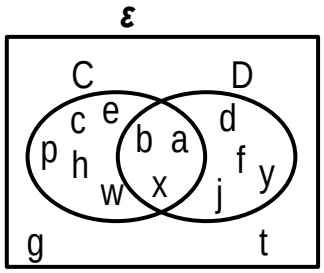
NUP = N only + (N∩P) + P only *or* N + P only *or* N only + P

ε = (NUP) + (NUP)' *or* N only + (N∩P) + P only + (NUP)' *or* N + P only + (NUP)' *or* N only + P + (NUP)'

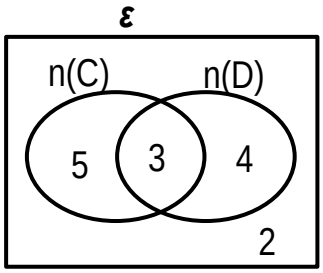
(NUP)' = *ε* – (NUP) *or* *ε* – (N only + N∩P + P only) *or* *ε* – (N + P only) or *ε* – (N only + P)

Study the Venn diagrams below

1.



2.



We can use diagram 2 to find

i) n(C)

n(C) = n(C) only + n(C∩D)
= 5 + 3
= 8

ii) n(CUD)

n(CUD) = n(C) only + n(C∩D) + n(D)
= 5 + 3 + 4
= 12

iii) n(*ε*)

n(*ε*) = n(C) only + n(C∩D) + n(D) only + n(CUD)'
= 5 + 3 + 4 + 2
= 14

iv) n(D)'

n(D)' = n(C) only + n(CUD)'
= 5 + 2
= 7

v) n(C∩D)'

n(C) only + n(D) only + n(CUD)'
5 + 4 + 2
n(C∩D)' = 11

Exercise 1:21

1. Given that n(K – H) = 15, n(K∩H) = 7 and n(H – K) = 12. Find n(K)

2. Given that n(R) = 20, n(S) = 30 and n(R∩S) = 8. Find
   i) n(R – S) ii) n(S – R) iii) n(RUS) iv) n(R∩S)'

3. If n(A) = 16, n(B) = 30 and n(A∩B) = 10. Draw a Venn diagram and find;
   i) n(A – B) ii) n(AUB) iii) n(A)'

4. Given that n(A – B) = 10, n(B – A) = 15, n(A∩B) = 12 and n(AUB)' = 3. Find;
   i) n(AUB) ii) n(A) iii) n(***ε***) iv) n(A∩B)'

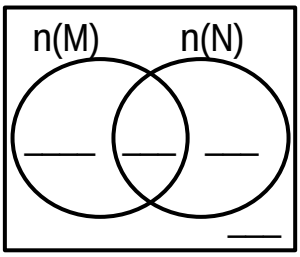
5. Given that n(F) = 20, n(T – F) = 15, n(T∩F) = 12 and n(TUF)' = 5
   a) Draw a complete Venn diagram to show the above information.
   b) Find;
      i) n(TUF) ii) n(***ε***) iii) n(F)'

6. Given that n(K) = 15, n(P – K) = 8, n(P)' = 11 and n(PUK)' = 5. With the help of a Venn diagram, find
   i) n(P) ii) n(K∩P)' iii) n(KUP) iv) n(***ε***)

7. Given that n(PUQ) = 15, n(P-Q) = 3 and n(Q – P) = 8. Find n(P∩Q)

8. If n(N)' = 10, n(M)' = 8, n(MUN) = 14 and n(***ε***) = 17.
   a) Use the given information to complete the Venn diagram below.

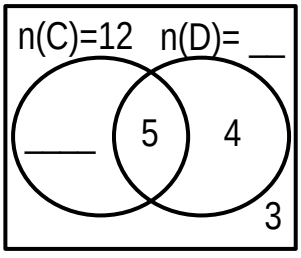
n(***ε***) = 17.



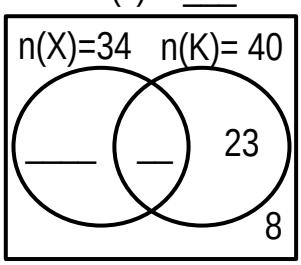
b) Find;
   i) n(M)
   ii) n(M∩N)/
   iii) n(N – M)/

Complete each of the Venn diagrams below.

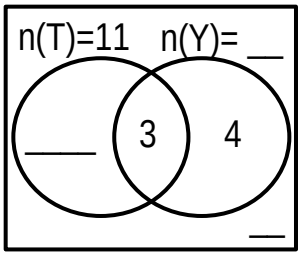
9. n(***ε***) = ___



10. n(***ε***) = ___



11. n(***ε***) = 17

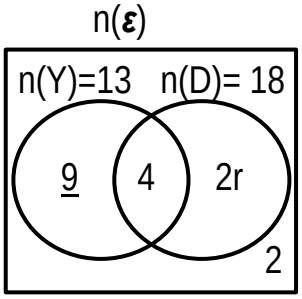


Finding the unkown values in Venn diagrams

Example 1

The Venn diagram below represents number of elements in two sets Y and D. Use it to answer questions that follow

a) Complete it



n(Y) only

13 – 4 = 9

b) Find the value of r

2r + 4 = 18

2r + 4 – 4 = 18 – 4

2r = 14

$\frac{2r}{2} = \frac{14}{2}$

r = 7

c) Find n(ε)

18 + 9 + 2 = 29

or

13 + 2r + 2

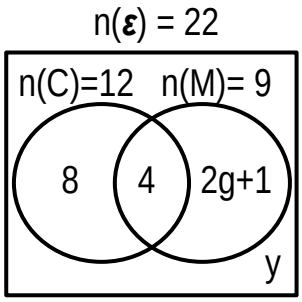
13 + (2x7) + 2

13 + 14 + 2

29

Example 2

Find the value of g and the value of y in the Venn diagram below;



Value of g

2g + 1 + 4 = 9

2g + 5 = 9

2g + 5 – 5 = 9 – 5

2g = 4

$\frac{2g}{2} = \frac{4}{2}$

g = 2

Value of y

y + 9 + 8 = 22

y + 17 = 22

y + 17 – 17 = 22 - 17

y = 5

Or

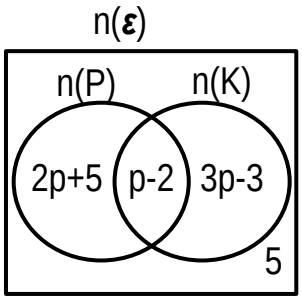
y = 22 – (9+8)

y = 22 – 17

y = 5

Example 3

Study the Venn diagram below



a) If n(K) = 11, find the value of p

3p - 3 + p - 2 = 11

3p + p – 3 – 2 = 11

4p – 5 = 11

4p – 5 + 5 = 11 + 5

$\frac{4p}{4} = \frac{16}{4}$

p = 4

b) Find n(P∩K)'

2p + 5 + 3p – 3 + 5

2p + 3p + 5 + 5 - 3

5p + 7

(5x4) + 7

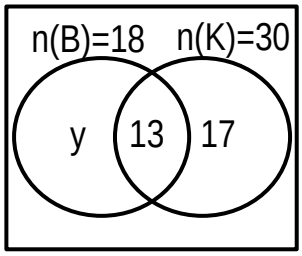
20 + 7

27

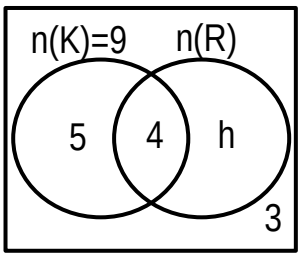
Exercise 1:22

1. Find the value of the unknown in the Venn diagrams below.

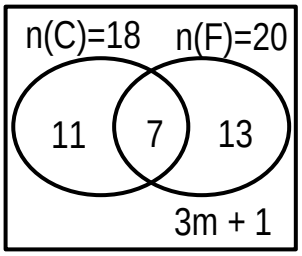
a) $n(\varepsilon)$



b) $n(\varepsilon) = 19$

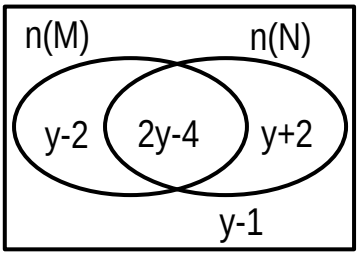


c) $n(\varepsilon) = 38$



2. Study the Venn diagram below

$n(\varepsilon) = 4y - 1$



a) Find the value of y

b) Find;

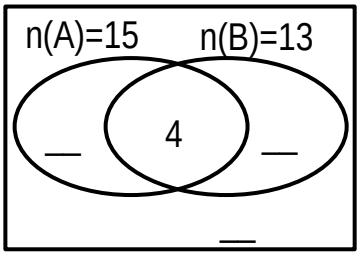
i) $n(\varepsilon)$

ii) n(M)

iii) $n(M \cap N)'$

iv) n(MUN)

3. In the Venn diagram below, n(A) = 15, n(B) = 13 and $n(AUB)' = p$.



a) Complete the Venn diagram

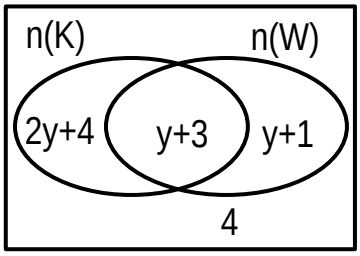
b) Find the value of p if $n(\varepsilon) = 32$

c) Find; i) $n(A \cap B)'$

ii) n(AUB)

4.Study the Venn diagram below

$n(\varepsilon)$



a) Given that n(W)' = 14, find the value of y.

b) Find;

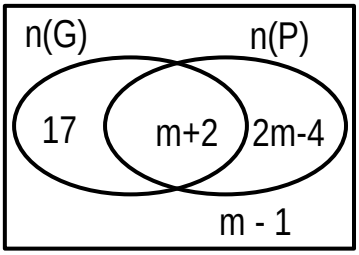
i) n(K)

ii) $n(\varepsilon)$

iii) $n(K \cap W)'$

5. Study the Venn diagram below

$n(\varepsilon)$



a) If n(G) only = n(P), find the value of m.

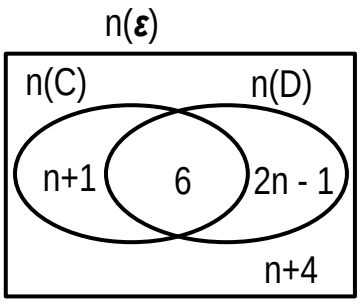
b) Find;

i) $n(\varepsilon)$

ii) n(P)

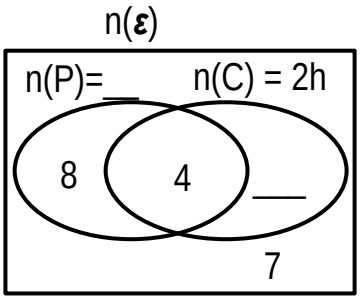
iii) n(GUP)'

6. In the Venn diagram below, n(CUD)' = n(D) only. Use it to answer questions that follow.



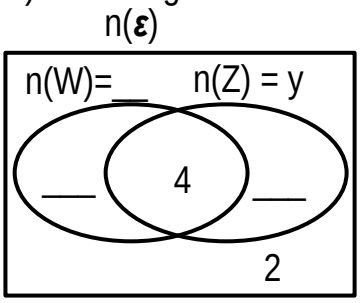
a) Find the value of n.
b) Find;
   i) n(C)
   ii) n(ε)
   iii) n(C∩D)

7. In the Venn Venn diagram below, n(P) only = 8, n(P∩C) = 4, n(C) = 2h and n(PUC)' = 7



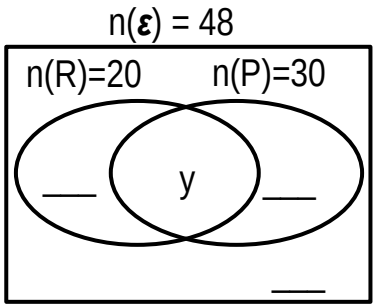
a) Complete the Venn diagram using the given information
b) If n(P∩C)' = 17, find
   i) n(C) only
   ii) n(ε)
   iii) n(PUC)

8. Given that n(W) = 12, n(Z) = y, n(WUZ)/ = 2 and n(W∩Z) = 4.
   a) Use the given information to complete the Venn diagram below.



b) If n(ε) = 19, find the value of y.
c) Find;
   i) n(Z) only
   iii) n(W∩Z)'

9. Given that n(R) = 20, n(P) = 30, n(P∩R) = y, n(RUP)' = 3 and n(ε) = 48



a) Complete the given Venn diagram
b) Find the value of y.
c) Find;
   i) n(P) only
   ii) n(R∩P)'

10. Given that n(B)/ = 21, n(A∩B) = 4, n(B) only = y, n(AUB)' = 3 and n(ε) = 24
    a) Find the value of y
    b) Find n(A∩B)'

TOPIC 1: SET CONCEPTS

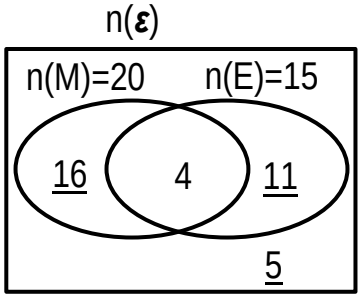
Using Venn diagrams to solve problems in real life situation

Part I

Example

In a class, 20 pupils like mathematics (M), 15 pupils like English (E), 4 like both mathematics and English while 5 pupils like neither of the two subjects.

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



n(M) only = 20 – 4
= 16

n(N) only = 15 – 4
= 11

b) Find the total number of pupils in the class.

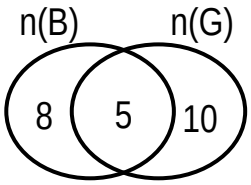
16 + 4 + 11 + 5
36 pupils

b) How many pupils like only one subject?

16 + 11
27 pupils

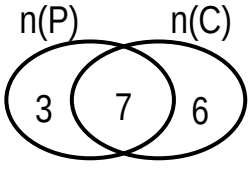
Activity 1:23

1. The Venn diagram below shows the number of of pupils who eat beans (B) and ground nuts (G). Use it to answer questions that follow.



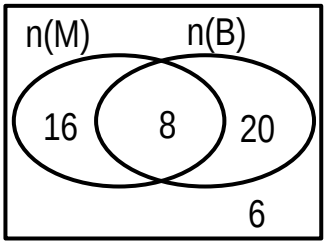
a) How many pupils eat both beans and ground nuts?
b) Find the number of pupils who eat beans altogether.
c) How many pupils eat only one type of food.

2. In a class, some pupils eat posho (P) and cassava (C) as shown in the Venn diagram below. Study the Venn diagram and use it to answer questions that follow.



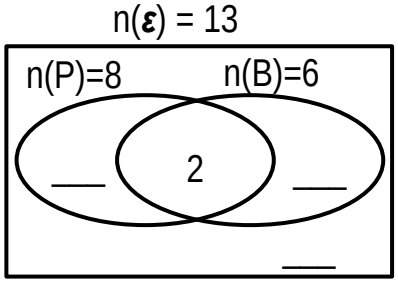
a) Find the number of pupils who eat posho.
b) How many pupils eat cassava?
c) Calculate the number of pupils who eat only one type of food.

3. In a village, farmers grow maize (M) and beans (B) as shown in the Venn diagram below.



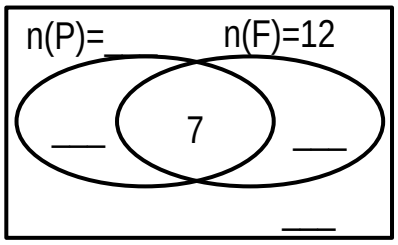
a) Find the number of farmers who grow maize.
b) Find the total number of farmers in the village.
c) Calcuate the number of farmers who grow only one type.
d) Find the number of farmers who do not grow beans.

4. In a group of 13 pupils, 8 got pens (P), 6 got books (B), 2 got both items while 5 got neither of the two items.



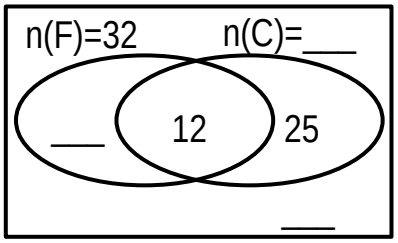
a) Complete the Venn diagram
b) Find the number of pupils who did not get books.
c) Calculate the number of pupils who got only one type of items.

5. At a party, guests were served with Pepsi (P) and Fanta (F). 8 were served with Pepsi only, 12 were served with Fanta, 4 were served with neither of the two drinks while 7 were served with both Pepsi and Fanta.



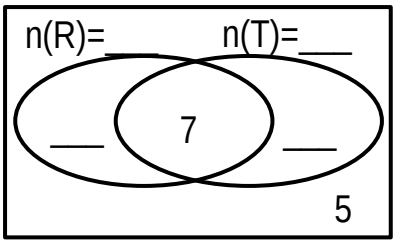
a) Complete the Venn diagram given.
b) Find the number of guests who attended the party.
c) Calculate the number of pupils who took only one type of drinks

6. On a speech day, P.7 pupils were served with fish (F) and chicken (C), 32 were served with fish, 27 were not served with chicken, 12 were served with both chicken and fish while 25 were served with chicken only.



a) Complete the given Venn diagram.
b) Find the total number of pupils in P.7.
c) Calculate the total number of pupils who were not served with fish.

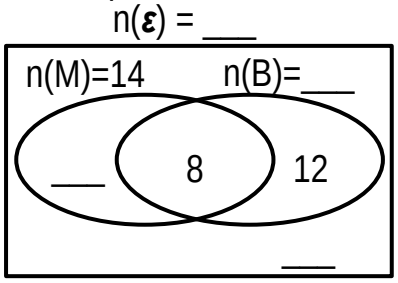
7. On a certain village, 10 families have televisions (T), 7 have both televisions and radios (R), 5 have neither televions nor radios while 21 familes do not have televisions



a) Complete the Venn diagram
b) How many families have radios?
c) The average number of number of children in each family is 3 , find the total number of children in the village.

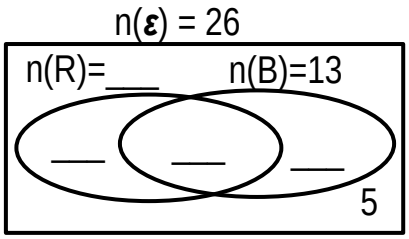
8. Children were taken to the hospital to be immunised against Polio (P) and Measles (M). 16 were immunised against polio only, 4 were immunised against both polio and measles, 3 children were not immunised at all while 26 children were immunised against only one disease
   a) Draw a Venn diagram to represent the given information.
   b) How many children were taken for immunisation?

9. In a village, there are 28 farmers. 14 grow maize (M), 12 grow beans only and 8 grow both crops.



a) Complete the venn diagram correctly.
b) How many farmers grow only one type of crops.
c) Find the number of farmers who do not grow maize.

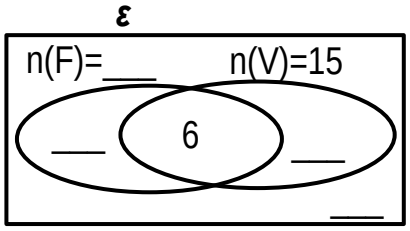
10. A group of 26 pupils were asked the colours of pens they had. It was found out that, some had red pens (R), blue pens (B) and the 5 had no pen. 13 had blue pens and 15 pupils did not have red pens.



a) Complete the given Venn diagram.
b) Find the number of pupils who had only one type of pens.

11. In a club, members play football (F) and volleyball (V). 15 play volleyball, 6 play both games, 4 play neither of the two games, 21 play only one game

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



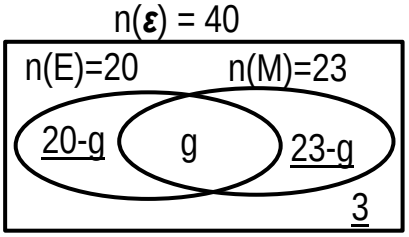
b) Find;
i) the total number of members in the club.
ii) the number of members who do not play football.

Part 2

Example 1

In a class of 40 pupils, 20 like English (E), 23 like mathematics (M), g like both subjects while 3 like neither of the two subjects.

a) Use the given imformation to complete the Venn diagram below.



b) Find the value of g.

$20-g + g + 23-g + 3 = 40$

$20 + 23 + 3 + g - g - g = 40$

$46 - g = 40$

$46 - 46 - g = 40 - 46$

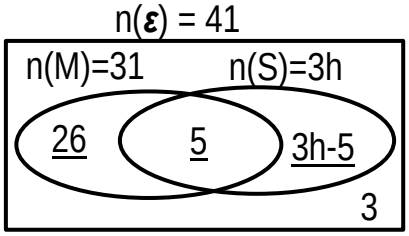
$\frac{-g}{-1} = \frac{-6}{-1}$

$g = 6$

Example 2

A class of 41 pupils was served with mineral water (M) and soda (S). 31 pupils were served with mineral water and 3h were served with soda. 5 were served with both drinks while 3 were not served at all.

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



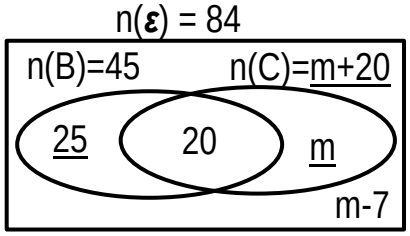
b) How many pupils were served with soda only?

Value of h	Pupils served with soda only
$3h - 5 + 5 + 26 + 3 = 41$	3h - 5
$3h + 5 + 26 + 3 - 5 = 41$	(3x4) - 5
$3h + 29 = 41$	12 - 5
$3h + 29 - 29 = 41 - 29$	7 pupils
$\frac{3h}{3} = \frac{12}{3}$	
$h = 4$	

Example 3

At a birth day party attended by 84 guests, 45 were served with beef (B) and, 20 were served with both chicken(C) and beef. m guests were served with chicken only while (m-7) were not served with any of the two dishes.

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



b) Find the number of guests who were served with chicken.

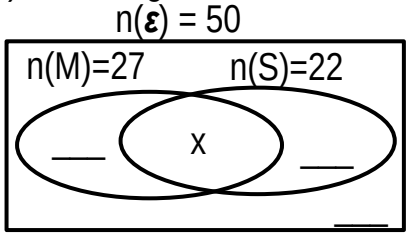
Value of m	Guests who were served with chicken
$m - 7 + m + 20 + 25 = 84$	m + 20
$m + m + 20 + 25 - 7 = 84$	23 + 20
$2m + 38 = 84$	43 guests
$2m + 38 - 38 = 84 - 38$	
$\frac{2m}{2} = \frac{46}{2}$	
$m = 23$	

Exercise 1:24

1. In a class of 30 pupils, 20 like mathematics (M), 15 like English (E) while d like both subjects
   a) Draw a Venn diagram to represent the above information.
   b) Find the value of d.

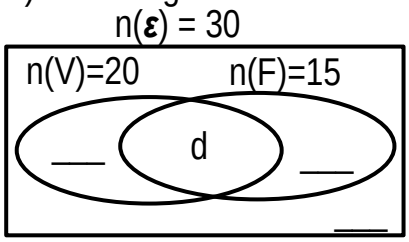
2. In a class of 80 pupils, 45 like art (A), 50 like music (M), 21 like both subjects while g like neither of the two subjects
   With the help of a Venn diagram, find the number of pupils who do not like art.

3. 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) Use the given information to complete the Venn diagram below.



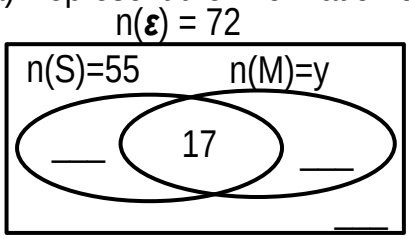
   b) Find the value of x
   c) Find the number of pupils who
      i) like only one subject
      ii) do not like mathematics

4. In a class of 30 students, 20 play volleyball(V), 15 play football(F), d play both games and 2 do not play any of the two games.
   a) Use the given information to complete the Venn diagram below.



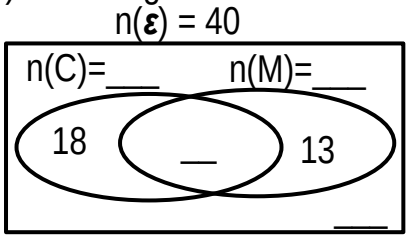
   b) Find the value of d.
   c) Find the number of students who play only one game.
   d) Calculate the number of pupils who do not play volleyball.

5. At a birthday party, 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 information on the Venn diagram below.



   b) How many guests were served one drink only?

6. At a birthday party attended by 40 guests, 18 ate chicken(C) only, 13 ate meat only, f guests ate both chicken and meat and 17 did not eat chicken.
   a) Use the given information to complete the Venn diagram below.

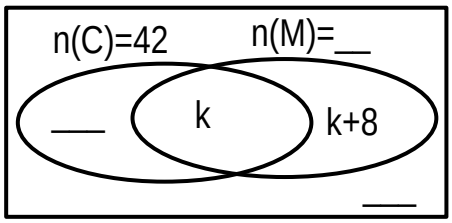


   b) Find the value of f.
   c) How many guests did not eat meat at all?

7. In a class party attended by 51 pupils, 28 drank mirinda (M), 29 drank pepsi (P), y drank both mirinda and pepsi while 6 did not drink any of the two sodas.
   a) Use the given information to draw and complete a Venn diagram.
   b) Find the value of y
   c) Find the number of pupils who drank one type of soda.

8. At a 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 given information to complete the Venn diagram below.

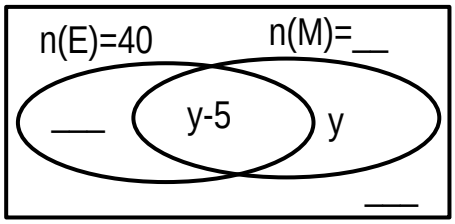
n(***ε***) = 60



   b) Find the actual number of pupils who ate meat.

9. In a class of 60 pupils, 40 like English (E), y like mathematics (M) only, y – 5 like both subjects, 5 do not like any of the two subjects while 45 pupils like one subject only.
   a) Use the given information to complete the Venn diagram below.

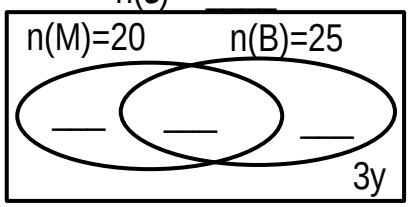
n(***ε***) = 60



   b) Find the number of pupils who like mathematics altogether.

10. In a village of 49 farmers, 20 grow millet (M), 25 grow beans (B) and y grow both millet and beans. 3y farmers grow neither of the two food crops.
    a) Use the given information to complete the Venn diagram below.

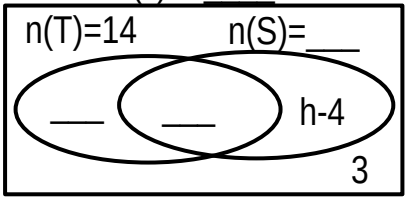
n(***ε***) = ____



    b) Find the number of farmers who grow neither millet nor beans.

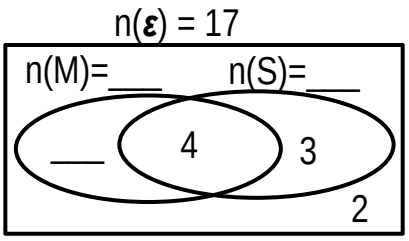
11. In a group of 2h members, 14 play Tennis (T), h – 4 play soccer (S) only, 6 play both games while 3 play neither of the two games.
    a) Use the given information to complete the Venn diagram below.

n(***ε***) = ____



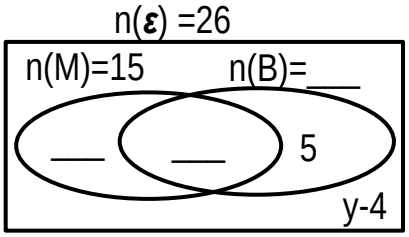
    b) How many members play soccer altogether?

12. In a class of 17 pupils, 4 like both mathematics (M) and science (S), y like one subject only, 3 like sceince only while 2 like neither of the two subjects.
    a) Use the given information to complete the Venn giagram below.



    b) Find the value of y.
    c) How many pupils like mathematics altogether?
    d) Calculate the number of pupils who hate science.

13. In a class of 26 pupils, 15 eat meat (M), 5 eat beans (B) only, y eat meat only while y-4 eat neither of the two dishes.
    a) Use the given information to complete the Venn giagram below.



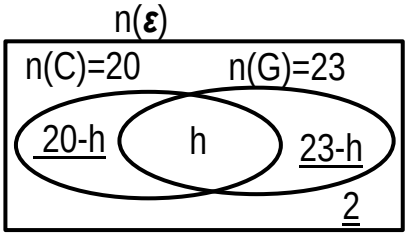
    b) Find the value of y.
    c) Find the number of pupils who eat;
        i) both meat and beans.
        ii) neither of the two dishes.

Part 3

Example 1

In our village, 20 farmers rear cows (C), 23 rear goats (G), h rear both cows and goats while 2 farmers rear neither cows nor goats.

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



b) Given that 33 farmers rear one type of animals only,

i) find the value of h

$20 - h + 23 - h = 33$

$20 + 23 - h - h = 33$

$43 - 2h = 33$

$43 - 43 - 2h = 33 - 43$

$\frac{-2h}{-2} = \frac{-10}{-2}$

$h = 5$

ii) find the total number of farmers in the village

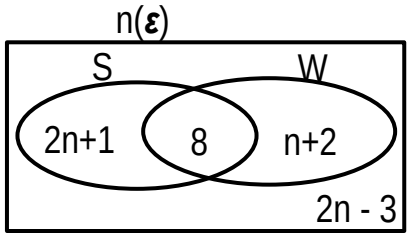
$33 + h + 2$

$33 + 5 + 2$

40 farmers

Example 2

At a party, guests were served with soda (S) and minereal water (W) as shown in the Venn diagram below.



If 13 guests were served with mineral water altogether,

i) Find the value of n

n + 2 + 8 = 13

n + 10 = 13

n + 10 – 10 = 13 – 10

n = 3

ii) Find the total number of guests who attended the party.

2n + 1 + 13 + 2n - 3

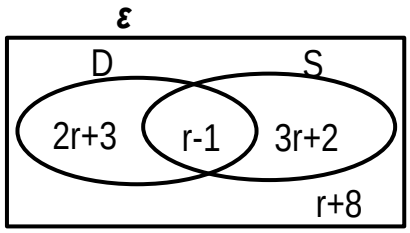
(2x3) + 1 + 13 + (2x3) – 3

6 + 1 +13 +6 – 3

23 guests

Example 3

In a school, pupils like dancing (D) and singing (S) as shown in the Venn diagram below.



a) Given that the number of pupils who like dancing only is the same as the number of pupils who like neither of the two activities.

i) Find the value of r

2r + 3 = r + 8

2r - r + 3 = r – r + 8

r + 3 = 8

r +3 – 3 = 8 – 3

r = 5

ii) Find the total number of pupils who like dancing.

(2r + 3) + (r – 1)

(2x5 + 3) + (5 – 1)

(10 + 3) + 4

13 + 4

17 pupils

b) How many pupils like one activity only?

(2r + 3) + (3r + 2)

(2x5 + 3) + (3x5 + 2)

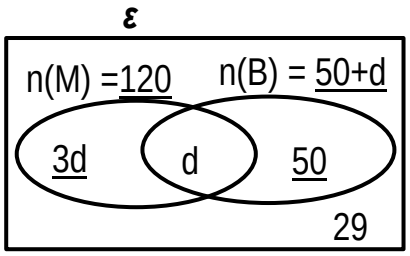
10 + 3 + 15 + 2

30 pupils

Example 4

In a village, 120 farmers grow maize (M), 50 farmers grow beans (B) only, 29 grow neither of the two crops while d farmers grow both crops. The number of farmers who grow maize only is thrice the number of farmers who grow both crops.

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



b) Find the value of d

$3d + d = 120$

$4d = 120$

$\frac{4d}{4} = \frac{120}{4}$

$d = 30$

c) Find the number of farmers who grow;

i) beans altogether.

$50 + d$

$50 + 30$

80 farmers

ii) one type of crop only.

$3d + 50$

$(3 \times 30) + 50$

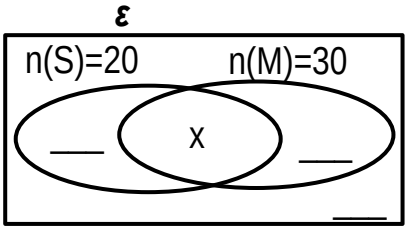
$90 + 50$

140 farmers

Exercise 1:25

1. In a class, 20 pupils like social studies (S), 30 like mathematics (M), x like both subjects while 4 like neither of the two subjects.

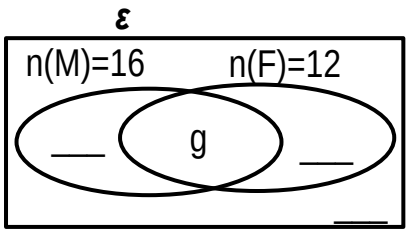
   a) Use the given information to complete the Venn diagram below.



   b) Given that 17 pupils like mathematics only.
      Find the value of x.
   c) How many pupils like only one subject?
   d) Find the total number of pupils in the whole class.

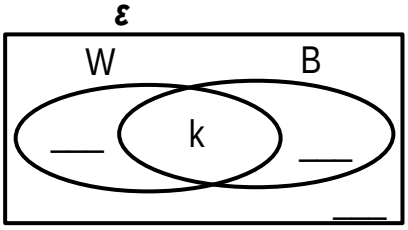
2. In a group, 16 members eat meat (M), 12 members eat fish (F), g members eat both fish and meat while 3 members eat neither of the two dishes.

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



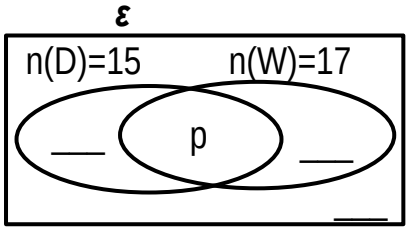
   b) Given that 10 members do not eat meat.
      i) Find the value og g.
      ii) How many members eat meat but not fish?
   c) Work out the total number of members in the group.

3. In a village, farmers use wheel barrows (W) and baskets (B) to carry their harvested crops. 12 farmers use wheel barrows, 20 farmers use baskets, k farmers use both garden tools while 2 farmers use neither of the two tools.
   a) Use the given information to complete the Venn diagram below.



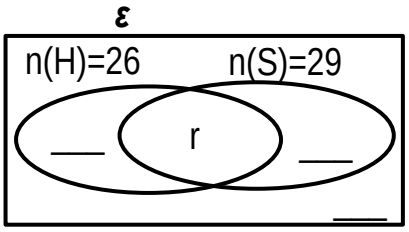
   b) If the number of farmers who use baskets only is thrice the number of farmers who use wheel barrow only, find the value of k.
   c) Find the number of farmers who use one garden tool only.

4. In a class, 15 pupils are in debating club (D), 17 pupils are in wildlife (W), p are in both clubs while 4 are in none of the two clubs.
   a) Use the given information to complete the Venn diagram below.



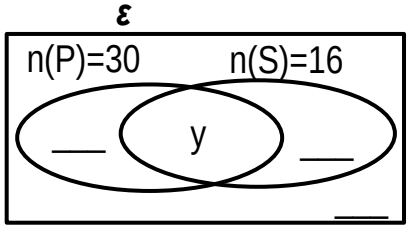
   b) Find the number of pupils in debating club if 18 pupils participate in one club only.
   c) Work out the total number of pupils in the class.

5. In a village, 26 families use Hydro-electricity (H), 29 use solar (S), r use both Hydro electricity and solar while 5 use neither of the two.
   a) Use the given information to complete the Venn diagram below.



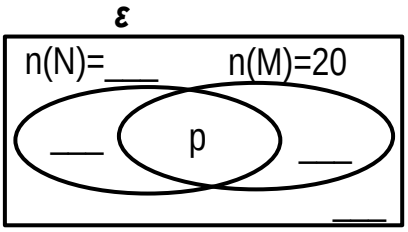
   b) Given that the number of families which do not use solar is equal to the number of families which use solar. Find the value of r.
   c) If the average number of people in each family is 5. Find the total number of people in the village.

6. Last term, 30 schools used Praise exams (P), 16 schools used Sipro exams (S), y used both Praise and Sipro exams while 3 schools used neither of the two examination companies.
   a) Use the given information to complete the Venn diagram below.



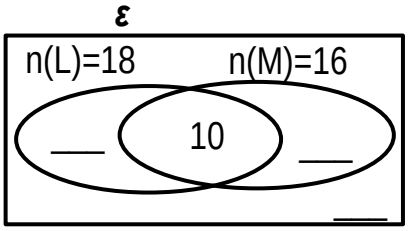
   b) Given that the number of schools which used both campanies was half of the number of schools which used Praise exams only. Find the value y.
   c) Calculate the number of schools which used Praise exams but not Sipro exams.

7. In a class, some pupils like reading novels (N), 20 pupils like reading magazines (M), 9 like reading novels only, p like reading both novels and magazines while p – 1 do not like reading any of the two. The number of pupils who like reading magazines only is 3 times the number of pupils who like reading both novels and magazines.
   a) Use the given information to complete the Venn diagram below.



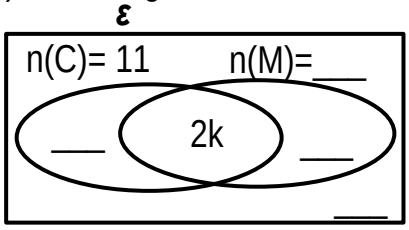
   b) Find the value of p
   c) Find the number of pupils who like reading novels altogether.

8. Ludo (L) and Mweso (M) are indoor games played by people in our village. 18 people play Ludo, 16 play Mweso, 10 play both games, 2p – 8 play Mweso only while 4 play neither of the two games.
   a) Use the given information to complete the Venn diagram below.



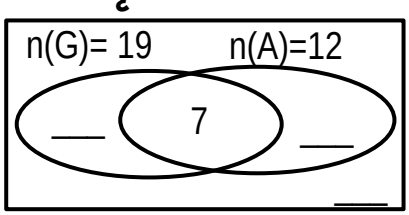
   b) Find the value of p.
   c) Calculate the total number of people who play indoor games in our village.

9. On Sunday, people went to different important places; the church (C) and the market (M) 7 went to the market only, 11 went to church, 2k went to both places, 5 went to neither of the two places while 3 went to church only.
   a) Use the given information to complete the Venn diagram below.



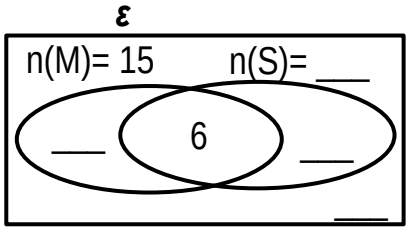
   b) Find the number of people who went to the market.

10. In a group of security guards, 19 use guns (G), 12 use arrows (A), 7 use both arrows and guns while g use neither of the two weapons. The number of security guards who use guns only is 6 times the number of security guards who use none of the two weapons.
    a) Use the given information to complete the Venn diagram below.



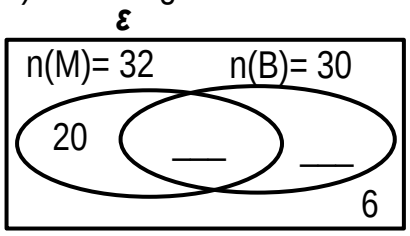
    b) How many security guards use one type of weapon only?

11. In a group, 15 members eat millet (M), y members eat sorghum (S) only, 6 eat both sorghum and millet while 4 eat neither of the two dishes. There are 14 members who eat one type of food only.
    a) Use the given information to complete the Venn diagram below.



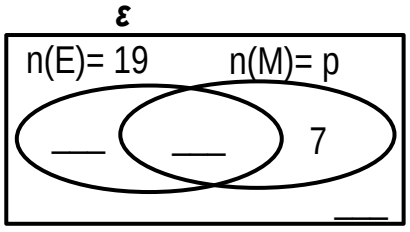
    b) Find the number of members who eat sorghum altogether.

12. In a class, 32 pupils like milk (M), 30 like bread (B), 20 like milk only, y do not like milk while 6 pupils like neither of the two foods.
    a) Use the given information to complete the Venn diagram below.



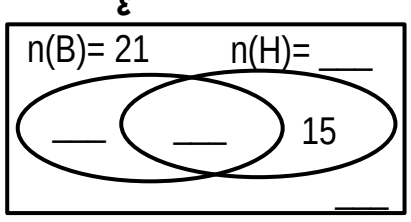
    b) Find the value of y.
    c) Calculate the number of pupils who do not like milk.

13. A group of tourists went to Entebbe airport (E) and Uganda Museum (M). 19 went to Entebbe airport, p went to Uganda Museum, 7 went to Uganda Museum only while 5 went to neither of the two places. Given that 18 tourists did not go to Uganda Museum.
    a) Use the given information to complete the Venn diagram below.



    b) How many tourists went to Uganda Museum?

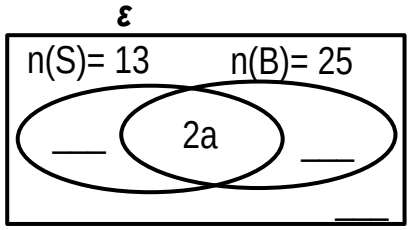
14. In a class, 21 pupils play basketball (B), 15 play hockey (H) only, r+3 play both games while 2r play neither of the two games. Given that 20 pupils do not play hockey.
    a) Use the given information to complete the Venn diagram below.



    b) Find the total number of pupils in the class.

15.In a group. 13 members have smart phones (S), 25 have button phones (B), 2a have both types of phones while 3a have button phones only and this is three times the number of members who have neither of the two types of phones.

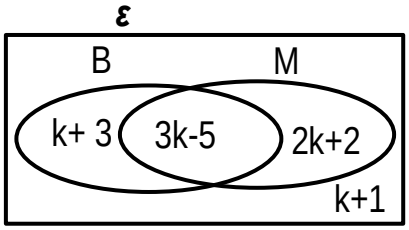
a) Use the given information to complete the Venn diagram below.



b) Find the value of a.

c) Find the number of members who do not have button phones.

16. The Venn diagram below shows the number of pupils who like beans (B) and meat (M) and neither of the two dishes. Use it to answer questions that follow.



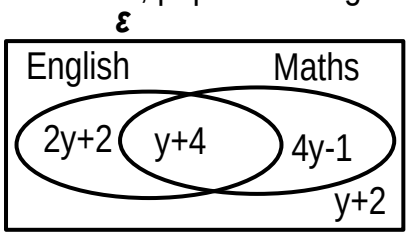
a) Given that 22 pupils like beans altogether

i) find the value of k.

ii) find the number of pupils who like meat.

b) Work out the total number of pupils in the class.

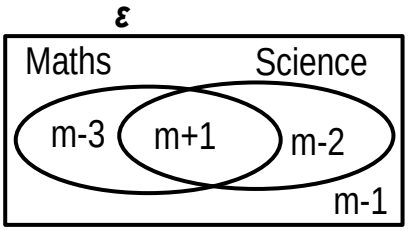
17. In a class, pupils like English and Maths as shown in the Venn diagram below.



a) Given that 7 pupils like both subjects, find the value of y

b) Find the total number of pupils in the class.

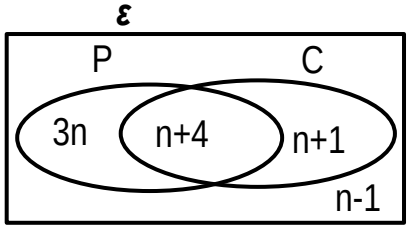
18. The Venn diagram below shows the number of pupils who like maths and science. Use it to answer questions that follow.



a) Solve for m if 7 pupils like one subject only.

b) Find the total number of pupils in the class.

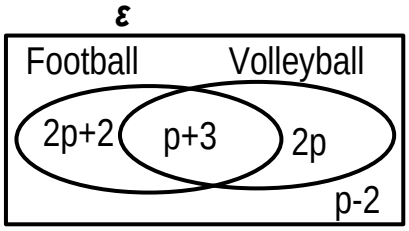
19. In a family, members like posho (P) and cassava (C) as shown in the Venn diagram below.



a) If 11 members do not like cassava, find the number of family members who like cassava altogether.

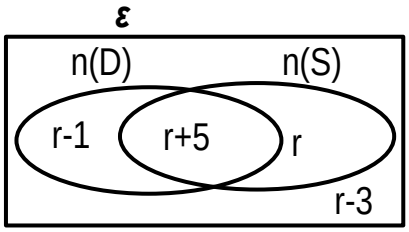
b) Work out the total number of members in that family.

20. In a sports club, members play football and volleyball as shown on the Venn diagram below. Use the Venn diagram to answer questions that follow.



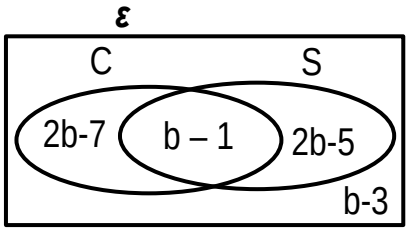
a) If there are 10 more members who play volleyball than football only, find the value of p.
b) Find the number of members who play football altogether.

21. In a class, pupils like singing (S) and dancing (D) as shown on the Venn diagram below.



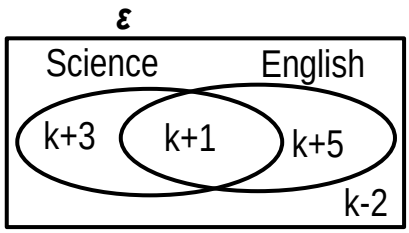
a) Given that the number of pupils who like both singing and dancing is twice the number of pupils who like singing only. Find the value of r
b) Find the total number of pupils in the the class.

22. Farmers keep their money in centenary bank (C) and stanbic bank (S) as shown in the Venn diagram below.



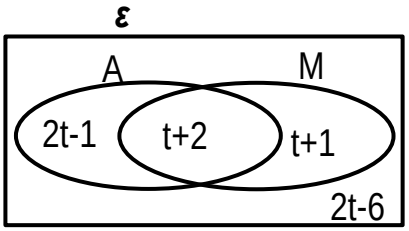
a) If the number of farmers who keep their money in centenary bank only is the same as the number of farmers who do not keep their money in any of the two banks, Find the value of b.
b) Find the number of farmers who keep their money in one bank only.
c) Find the total number of farmers.

23. The Venn diagram below shows the number of pupils who like science and English in a class. Use it to answer questions that follow.



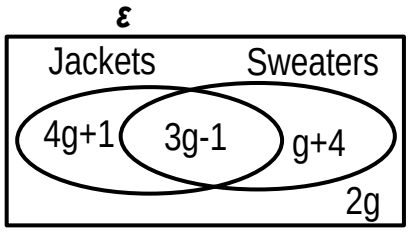
a) If 21 pupils like at least one subject, find the value of k.
b) How many pupils like science altogether?

24. On a staff, teachers use Airtel (A) and MTN (M) as shown in the Venn diagram below.



a) Given that 4 teachers do not use any of the two networks, find the total number of teachers on the staff
c) Find the number of teachers who use at least one network?

25. In a group of cyclists, some wear jackets, sweaters and others wear none of the two clothings as shown in the Venn diagram below.



a) Given that 9 cyclists wear Jackets but not sweaters. Find the value of g..

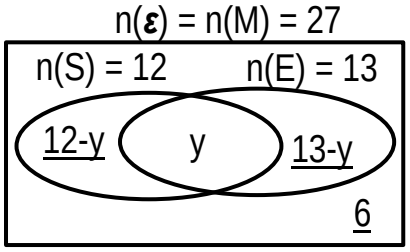
b) How many cyclists wear sweaters altogether?

Part 4

Example

In a class of 27 pupils, all of them like mathematics (M), 12 like both mathematics and science (S), 13 like both mathematics and English (E), y like all the three subjects while 6 like mathematics only.

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



b) Find the value of y

$12 - y + y + 13 - y + 6 = 27$

$12 + 13 + 6 + y - y - y = 27$

$31 - y = 27$

$31 - 31 - y = 27 - 31$

$\frac{-y}{-1} = \frac{-4}{-1}$

$y = 4$

c) How many pupils like two subjects only?

$(12 - y) + (13 - y)$

$(12 - 4) + (13 - 4)$

$8 + 9$

17 pupils

d) How many pupils like at least two subjects?

$(12 - y) + y + (13 - y)$

$(12 - 4) + 4 + (13 - 4)$

$8 + 4 + 9$

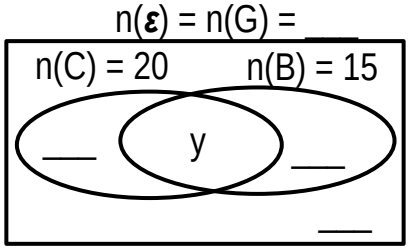
21 pupils

Exercise 1:26

1. In a class of 20 pupils, all of them like English (E), 15 like mathematics (M), 11 like science (S), y like all the three subjects while 3 like English only.
   a) Draw a Venn diagram to represent the above information.
   b) Find the value of y
   c) Find the number of pupils who like all the three subjects.

2. At a birthday party attended by 34 guests, all guests were served with greens (G), 20 were served with chicken (C), 15 were served with beef (B) and y ate all the three dishes.

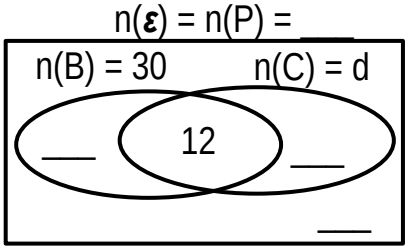
   a) If 5 guests were served with greens only, complete the Venn diagram below.



   b) Find the value of y.

3. In a class of 70 pupils, all of them ate posho (P), 30 ate posho with beans (B), d pupils ate posho with with cabbage (C), 12 ate all the three dishes while 6 ate posho without beans or cabbage.

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

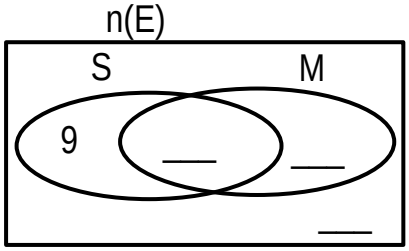


   b) Find the value of d.

   c) How many pupils ate posho with cabbage only?

4. In a P.7 class, all pupils like English (E). 14 like science (S), t like mathematics (M), 9 like both science and English only while t – 11 like English only.

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



   b) Find the value of t if 15 pupils like both mathematics and English but not science

   c) Work out the number of pupils who like;

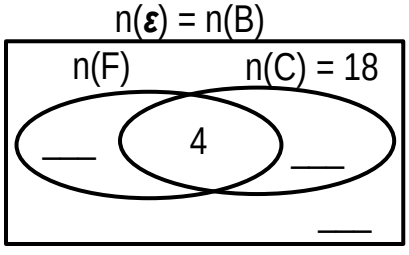
      i) English only.

      ii) two subjects only.

      iii) at least one subject.

5. In a group, all pupils like beef (B), 18 like chicken (C), 2y – 10 like both beef and fish (F) only, 4 like all the three dishes while 6 like beef only.

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



   b) If 22 pupils like two dishes only, find the value of y.

   c) Find the number of pupils who like beef.

6. At noon on Tuesday, a group of newspaper vendors were asked whether they still had newspapers from the monitor (M), the new vision (N) and the red paper (R). All the vendors had the monitor. 80 had the monitor, 43 had the new vision, 59 had the red paper, 8 had only the monitor and g had all the three types of newspapers.
   a) Draw a complete Venn diagram to represent the above information.
   b) Find the number of vendors with all the three types of newspapers.

Probability of Events

The probability of an event(E), donated by Pr(E) is a measure of the possibility of the event occurring as a result of an experiment.

Note;

For any event(E), $0 \leq Pr(E) \geq 1$. This means that probability starts from zero to one.

- If an event(E) never occurs, then the probability is 0; Pr(E) = 0.
- If an event(E) always occurs, then the probability is 1; Pr(E) = 1
- If the sample space(S) is finite and possible outcomes are all equally likely, then the probability of the event(E) is equal to $\frac{n(E)}{n(S)}$
- So, $Pr(E) = \frac{n(E)}{n(S)}$

Examples

1. A bag contains 3 rotten eggs and 6 good ones. If the eggs in the bag are mixed. What is the probability of picking a rotten egg from the bag?

   Total number of eggs
   6 + 3 = 9 eggs

   $Pr(E) = \frac{n(E)}{n(S)}$
   $= \frac{3}{9}$

2. A box contains 20 pens. 10 are blue, 7 are red and the rest are black. A pen is picked at random from the box, find the probability that it is a black pen.

   Number of black pens

   20 – (10+7)
   20 – 17
   3 black pens

   Probability

   $Pr(E) = \frac{n(E)}{n(S)}$
   $= \frac{3}{20}$

3. Cards labeled 1 to 5 are folded, put in a bucket and mixed up. What is the probability of picking a card having a prime number?

Sample space = {1,2,3,4,5}

n(s) = 5

Prime numbers = {2,3,5}

n(E) = 3

Probability

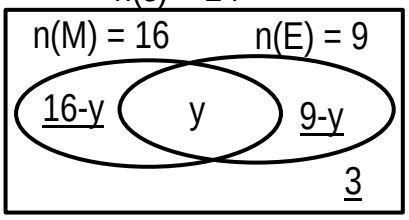
$Pr(E) = \frac{n(E)}{n(S)}$

$Pr(E) = \frac{3}{5}$

4. In a class of 24 pupils, 16 like mathematics(M), 9 like English(E), y like both subjects while 3 like neither of the two subjects.

a) Complete the Venn diagram below.

$n(\varepsilon) = 24$



b) Find the value of y.

$y + 16 - y + 9 - y + 3 = 24$

$y - y - y + 16 + 9 + 3 = 24$

$-y + 28 = 24$

$-y + 28 - 28 = 24 - 28$

$\frac{-y}{-1} = \frac{-4}{-1}$

$y = 4$

c) If a pupil is picked at random, what is the probability that the pupil likes one subject only?

Pupils who like only one subject

$(16 - y) + (9 - y)$

$(16 - 4) + (9 - 4)$

$12 + 5$

17 pupils

Probability

$Pr(E) = \frac{n(E)}{n(S)}$

$= \frac{17}{24}$

Exercise 1:27

1. A dice was tossed once, what is the probability that a triangular number will show up?

2. Tr. Mike formed all possible 3-digit numerals using the digits on the cards below.

6	1	7

What is the probability that the number formed is an odd number.

3. Mbonabukya put 31 fruits in a bag. Of these, 9 were oranges, 8 were mangoes and the rest were apples. Find the probability of picking an apple randomly from the bag?

4. Namirenzo had 8 blue pens, 4 red pens and 12 black pens. If the pens are mixed up, find the probability of picking a red pen at random.

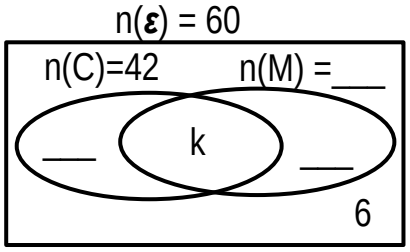
5. Given the word SENTAMU, what is the probability that a baby will point at a vowel letter?

6. Turyasingura went to Mbarara last week. What is the probability that he travelled on the day starting with letter 'T'?

7. The probability that Ainembabazi will visit her friend is $\frac{2}{7}$. Find the probability that she will not visit her friend.

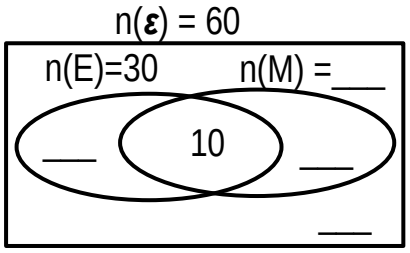
8. The probability of eating fish on a birthday party is 0.25. Find the probability of not eating fish.

9. At a 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 above information to complete the Venn diagram below.



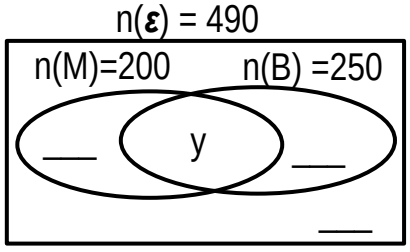
   b) Find the value of k
   c) Find the probability of selecting a pupil who ate meat.

10. In a class of 60 pupils, 30 like English(E), y like mathematics(M)only, 10 like both subjects and 5 do not like any of the two subjects
    a) Complete the Venn diagram below.



    b) Find the value of y.
    c) Find the probability of selecting a pupil who likes mathematics.

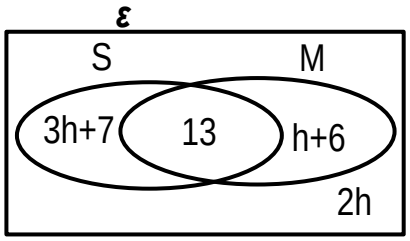
11. In a village of 490 farmers, 200 grow millet(M), 250 grow beans(B) and y grow both millet and beans. 3y farmers grow neither of the two food crops.
    a) Complete the Venn diagram below.



    b) Find the value of y
    c) If a farmer is picked at random, what is the chance that the farmer grows neither millet nor beans?

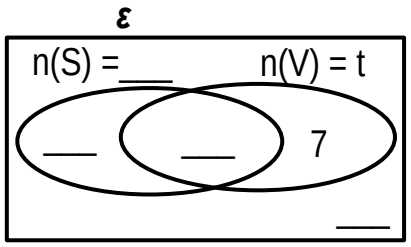
12. The probability that Apese will pass the Examination is $\frac{5}{9}$. Find the probability that she will fail.

13. At a party, guests were served with soda(S) and mineral water(M) as shown in the Venn diagram below.



a) Given that 32 guests were served with soda, find the total number of guests who attended the party.
b) Find the probability that a guest picked a random did not take any drink.

14. In a club, 8 members play soccer(S) only, t play volleyball(V), 7 play volleyball only and t – 10 play neither of the two.
a) Use the above information to complete the Venn diagram below.



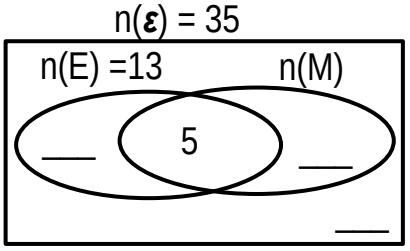
b) Given that 17 members play soccer altogether, how many members play neither of the two games?
c) Find the probability of picking a member who plays both soccer and volleyball to be a team captain.

15. In a class of 23 students, 2m+1 students offer biology(B), 4 offer both biology and chemistry(C), m-2 offer chemistry only and all pupils offer at least one of the two subjects. If a student is picked at random, what is the probability that the selected student offers biology only?

16. In a group of 90 members, all of them went to Kampala(K), 60 went to Entebbe(E), 39 went to Jinja(J), m went to all the three places while 6 went to neither Entebbe nor Jinja.
a) Draw a complete Venn diagram to represent the above information.
b) Find the value of m
c) Find the probability that a member went to only two places is picked a random from the group.

17. In a bag, there are 8 blue pens, 7 black pens and the rest are green pens. The probability of picking a green pen from the bag is $\frac{2}{5}$. Find the probability of picking a black pen.

18. In a class of 35 pupils, 13 like English (E), 5 like both English and mathematics (M), y like neither of the two subjects while 2y like one subject only.



a) Use the given information to complete the Venn diagram.
b) If the probability of picking a pupil at random who likes mathematics is $\frac{17}{35}$. Find the number of pupils who like neither of the two subjects.

TOPIC 1: SET CONCEPTS

"Think as a mathematician"

1. Name the following sets.
   i) A = {4,6,8,9,10 …} ii) D = {8,27,64,125} iii) Y = {5,10,15,20,25, …}

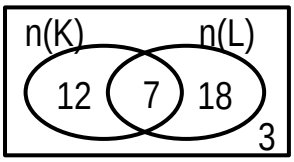
2. Draw a set of 3 girls with two heads each.

3. Given that X={even triangular numbers less than 100}. Find n(X)

4. Given that Q={factors of 12} and P = {multiples of 3 less than 18}. Find n(Q∩P)

5. Draw a Venn diagram to satisfy G = H∪G

6. Study the Venn diagram below and use it to find n(K∩L)$^{/}$



7. If set K = {a, b, c, d}. List all possible subsets in set K

8. Given that set W has 4095 proper subsets. Find n(W)

9. Given that n(B)=16, n(A∪B)=23 and n(A∩B) = 5 and n(A∪B)$^{/}$ = 2. Find n(B)$^{/}$

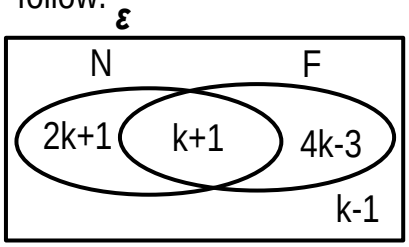
10. At noon on Wednesday, a group of newspaper vendors were asked whether they still had newspapers from the monitor(M) the New vision(N) and the Red paper(R). All the vendors had the monitor. 120 had the monitor, 50 had the New vision, 73 had the Red paper, 13 had only monitor and n had all the three types of papers.
    a) Draw a complete Venn diagram to represent the above information.
    b) Find the number of vendors with;
       i) all the three types of papers.
       ii) only two types of papers.
    c) Find the probability that a vendor picked at random from the group still had the monitor and the Red paper newspapers only.

11. In a class, 8 pupils play both football (F) and volleyball (V). 5 pupils play neither of the two games. The number of pupils who play football and Volleyball is in the ratio of 7:3 respectively.
    a) Draw a Venn diagram to represent the given information.
    b) If 14 pupils play only one game, find the total number of pupils in the class.

12. In a class of 54 pupils, 12 pupils like both mathematics(M) and Social studies (S), the number of pupils who like social studies(S) is half of number of pupils who like mathematics and 6 pupils like neither of the two subject.
    a) Draw a Venn diagram to represent the above information.
    b) How many pupils like only one subject?

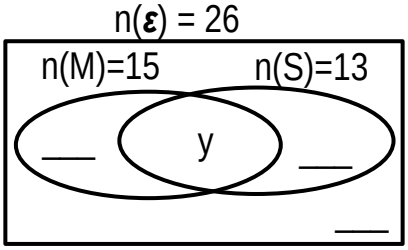
13. In a class, pupils like music (M), art(A) and other subjects. 12 like art, 13 pupils do not like music, 15 like only one subject and 6 like neither of the two subjects. How many pupils like Art only?

14. The Venn diagram below represents the number of pupils who play netball (N), football(F) and neither of the two. Study it carefully and use it to answer questions that follow.



a) If 11 pupils do not play netball, how many pupils play football?
b) Find the probability that a pupil who plays both games is selected to be a team leader.

15. In a class of 26pupils, all of them like English (E). 15 like mathematics (M), 13 like science(S), y like English only while 9 like English and mathematics only.
a) Use the above information to complete the Venn diagram below.



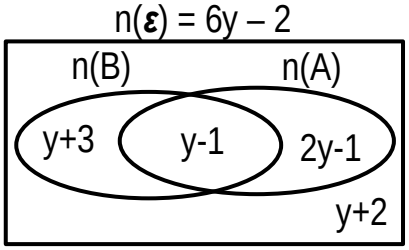
b) How many pupils do not like mathematics?

16. In a class of 41 pupils, 3y – 4 pupils eat beans (B), 3y – 5 pupils do not eat meat (M), y – 2 pupils eat neither of the two food stuffs and 8 more pupils eat meat than beans only. With the help of a Venn diagram, find the number of pupils who eat meat only.

17. In a sports club, members play football (F) and volleyball (V). 15 members play volleyball, 13 members do not play volleyball. The number of members who play neither football nor volley ball is three fifths of the number of members who play volleyball only.
a) Draw a Venn diagram to represent the above information and complete it.
b) If 17 members play only one game, find the probability of selecting a member who plays both games to be a team captain.

18. Given that $n(\varepsilon) = 9p+2$, $n(D)' = 3p+4$, $n(C \cap D)' = 4p+2$ and $n(C)$ only $= 2p+1$.
Given that $n(D) = n(D)'$. Find the value of p and find $n(C \cup D)$.

19. Study the Venn diagram below and use it to answer questions that follow.



Find;
i) $n(A \cap B)'$
ii) $n(B)$
iii) $n(C)'$
iv) $n(A \cup B)$