**Rules of Inclusion, Listing and Cardinality**

For each of the following sets, a set is specified by the rules of inclusion method and listing method respectively. Also stated is the cardinality of that data set.

***Worked example 1***

* { x : x is an odd integer 5 ≤ x ≤ 17 }
* x = {5,7,9,11,13,15,17}
* The cardinality of set x is 7.

***Worked example 2***

* { y : y is an even integer 6 ≤ y < 18 }
* y = {6,8,10,12,14,16}
* The cardinality of set y is 6.

***Worked example 3***

A perfect square is a number that has a integer value as a square root. For example, 4 and 9 are perfect squares = 2, = 3

* { z : z is an perfect square 1 < z < 100 }
* z = {4,9,16,25,36,49,64,81}
* The cardinality of set z is 8.

**Exercises**

For each of the following sets, write out the set using the listing method.

Also write down the cardinality of each set.

1. { s : s is an negative integer , -10 ≤ s ≤ 0 }
2. { t : t is an even number , 1 ≤ t ≤ 20 }
3. { u : u is a prime number , 1 ≤ u ≤ 20 }
4. { v : v is a multiple of 3 , 1 ≤ v ≤ 20 }

**Power Sets**

***Worked Example***

Consider the set Z: ***Z = { a,b,c}***

Q1 How many sets are in the power set of Z?

Q2 Write out the power set of Z.

Q3 How many elements are in each element set?

***Solutions to Worked Example***

Q1 answer: There are 3 elements in Z. So there is 23 = 8 element sets contained in the power set.

Q2 answer: Write out the power set of Z.

***P(Z) = { {0}, {a}, {b}, {c}, {a,b}, {a,c}, {b,c}, {a,b,c} }***

Q3 answer: One element set is the null set - i.e. containing no elements

* Three element sets have only elements
* Three element sets have two elements
* One element set contains all three elements
* 1+3+3+1=8

***Exercise:*** For the set ***Y = {u,v,w,x}*** , answer the questions from the previous exercise

**Complement of a Set**

Consider the universal set ***U*** such that ***U={2,4,6,8,10,12,15}***

For each of the sets ***A***,***B***,**C** and ***D***, specify the complement sets.

|  |  |
| --- | --- |
| ***Set*** | ***Complement*** |
| A={4,6,12,15} | A’={2,8,10} |
| B={4,8,10,15} |  |
| C={2,6,12,15} |  |
| D={8,10,15} |  |

***Set Operations***

Consider the universal set U such that ***U={1,2,3,4,5,6,7,8,9}*** and the sets ***A={2,5,7,9}*** and ***B={2,4,6,8,9}***

Perform the following binary operations

(a) A-B

(b) A

(c)

(d)

(e)

(f)

***Venn Diagrams***

Draw a Venn Diagram to represent the universal set ***U = {0,1,2,3,4,5,6}*** with subsets

***A = {2,4,5}*** and  ***B = {1,4,5,6}***

Find each of the following:

(a)

(b)

(c)

(d)

(e) A