MDM 4U

ORGANIZED COUNTING & VENN DIAGRAMS

① A collection of items or a ***SET*** of objects is often denoted by an uppercase letter and listed between braces.

Eg. A = {1, 2, 3, 4, 5}, B = {-2, 0, 2, 4, 6, 8}

② A ***SUBSET*** of a set is a set of objects equal to or smaller than a given set.
SYMBOL - $\subset$ or $\subseteq$

Eg. $\{2, 5\} \subset A$, $\{1, 2, 3, 4, 5\} \subset A$, $\{6\} \not\subset A$

③ The ***UNIVERSAL SET*** is the set containing all elements or objects involved in a particular situation.
SYMBOL - S

Eg. S = {integers}
note: $A \subset S$

④ The ***NULL SET*** or ***EMPTY SET*** is the set containing no elements or objects.
SYMBOL - $\varnothing$ or { }

Eg. $\varnothing \subset A$

⑤ The ***UNION*** of sets is the set containing the combination of all elements or objects of the given sets.
SYMBOL - $\cup$

Eg. $A \cup B = \{-2, 0, 1, 2, 3, 4, 5, 6, 8\}$

⑥ The ***INTERSECTION*** of sets is the set of all elements or objects that are common to the given sets.
SYMBOLS - $\cap$

Eg. $A \cap B = \{2, 4\}$

⑦ The ***NUMBER OF ELEMENTS*** in a set or a subset is denoted by the symbol "n".
SYMBOL - n(A) = number of elements in set A.

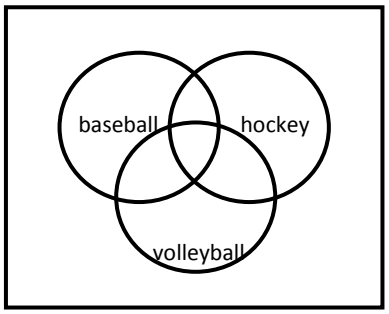
Eg. $n(A \cup B) = 9$

⑧ The ***COMPLEMENT*** of a set is the set of elements or objects not in an indicated set, but are in the universal set.

SYMBOL - A' = {all elements in S, but not in A}

Eg. If S = {whole numbers from 0 – 10}, then A' = {6, 7, 8, 9, 10}

⑨ A ***VENN DIAGRAM*** is a pictorial representation of one or more sets, in which each set is represented by a closed curve.



EXERCISE:

1. For each set X, give the value of n(X).
   - A) X is the set of perfect squares less than 25
   - B) X is the set of prime numbers less than 20.

2. List all subsets of each set.
   - A) {green}
   - B) {H, T}
   - C) {yes, no, maybe}
   - D) {3, 5, 7, 9}
   - E) How many subsets are there of a set containing...
     - i) 1 element
     - ii) 2 elements
     - iii) 3 elements
     - iv) 105 elements
     - v) n elements

3. Given S = {the 7 colours of the spectrum}
   D = {red, green}
   E = {blue, orange, red}

   Determine each of the following:

A)	n(S)	C)	n(E')	E)	(D∩E)'	G)	n(S')
B)	n(D)	D)	D∩E	F)	n(D∩E)'	H)	(S∩E)'

4. 100 graduating students were surveyed on what factors they consider important in choosing a particular university to attend next year. Of the various factors listed, 45 students indicated that the academic program of the university was important, 31 students indicated the athletic program, and 23 students indicated both programs were important to them.
   - A) Sketch a Venn Diagram to illustrate the data collected in the survey.
   - B) How many students listed factors that were neither academic nor athletic in nature?

5. Sketch a Venn Diagram, then answer the questions that follow:

OCI has a grade 12 population of 200 students. Of these students, 120 are enrolled in Calculus, 70 are enrolled in Data Management, 130 are enrolled in Advanced Functions, 28 are taking both Calculus and Data Management, 45 are taking Data Management and Advanced Functions, 95 are taking both Advanced Functions and Calculus, and 12 are taking all 3 courses.

How many students are enrolled in...

A) Advanced Functions or Data Management, but not Calculus?

B) at least 2 math classes?

C) 1 or 2 math classes?

D) at least 1 math class?

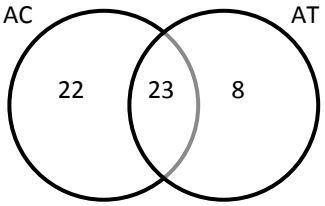
E) no math classes?

ANSWERS:

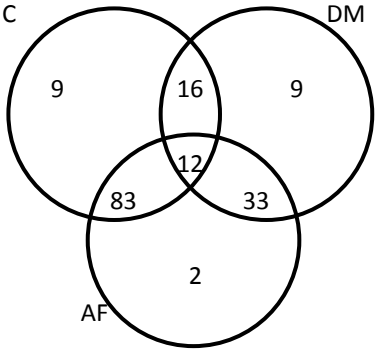
1. A) X={1, 4, 9, 16}; n(X)=4
   B) X={2, 3, 5, 7, 11, 13, 17, 19}; n(X)=8

2. A) {}, (green}
   B) {}, {H}, {T}, {H, T}
   C) {}, {yes}, {no}, {maybe}, {yes, no}, {yes, maybe}, {no, maybe}, {yes, no, maybe}
   D) {}, {3}, {5}, {7}, {9}, {3, 5}, {3, 7}, {3, 9}, {5, 7}, {5, 9}, {7, 9}, {3, 5, 7}, {3, 5, 9}, {5, 7, 9}, {3, 5, 7, 9}
   E) i) 2; ii) 4; iii) 8; iv) 2^{105}; v) 2^{n}

3. A) 7; B) 2; C) 4; D) {red};
   E) {orange, yellow, green, blue, indigo, violet} F) 6; G) 0
   H) {yellow, green, indigo, violet}

4. 

100-(22+23+8) = 47 students

5. 

A) 2+33+9 = 44
B) 16+83+12+33 = 144
C) 9+16+9+83+33+2 = 152
D) 152+12 = 164
E) 200-164 = 36