**A113 – Mathematics**

**Worksheet for Problem 02: Transport to RP**

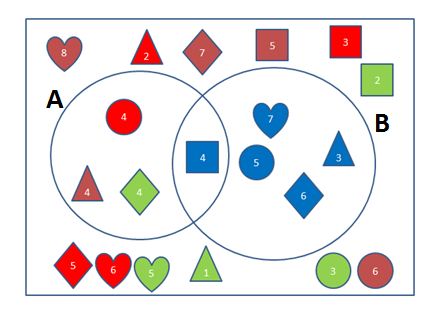
Understanding Set and Set Notation

Double click on the attachment below and complete activity 1. (Remember to **enable** macros)



Answer the following questions after completing Activity 1:

1. Discuss in your group, the concept of a set and its representation.
2. With reference to Figure 1:



*Ɛ*

Figure 1: Venn diagram

Describe the following sets using **set builder notation** and specify the **number of elements**:

* 1. Set *A*

*A* = { *x* : *x* is number 4}

*n*(*A*) = { *x* : *x* is 4}

* 1. Set *B*

*B* = { *x* : *x* is blue Objects}

*n*(*B*) = { *x* : *x* is 5}

* 1. *A* union B, *A* ∪ *B*

*A* ∪ *B* = { *x* : *x* is Blue Objects or Number 4}

*n*(*A* ∪ *B*) = { *x* : *x* is 8}

* 1. *A* intersect *B*, *A* ∩ *B*

*A* ∩ *B* = { *x* : *x* is Blue Objects and Number 4}

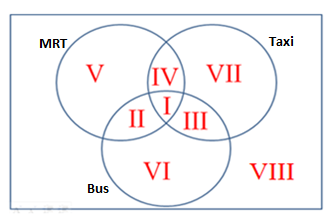
*n*(*A* ∩ *B*) = { *x* : *x* is 1}

* 1. Complement of set *B*, *B*′

*B*′ = { *x* : *x* is not blue objects}

*n*(*B*′) = { *x* : *x* is 12}

Venn diagram and Truth Table



*Ɛ*

Figure 2: Venn diagram

1. With reference to the Venn diagram in figure 2, identify the correct region(s) using the Roman numerals (I, II, III, …) and complete Table 1.

Table1: Identifying the correct region on the Venn diagram

|  |  |
| --- | --- |
| Description | Region in Venn diagram. |
| Students travelling by MRT only | V |
| Students travelling by Taxi only | VII |
| Students travelling by Bus only | VI |
| Students travelling by MRT and Taxi only | *IV* |
| Students travelling by MRT and Bus only | II |
| Students travelling by Taxi and Bus only | III |
| Students travelling using all three modes of transport | I |
| Students who do not travel by these three modes of transport | VIII |
|  | |

Putting it together

1. With reference to the attached data for transport to RP, answer the following questions. You may view the following videos on how to sort/filter in MS Excel [(Video 1: Sorting)](http://youtu.be/R3B6HJQLXA0) [(Video 2: filtering)](http://youtu.be/ckCvwaY0DGU)

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1. How many students were surveyed?
2. How many students travel by MRT?
3. How many students travel by MRT only?
4. How many students travel by MRT and Bus only?
5. It is given that *M* = {students who travel by MRT}, *T* = {students who travel by Taxi} and *B* = {students who travel by Bus}. Complete Table 2:

Table 2: Tabulating data from spread sheet

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Descriptions | MRT | Taxi | Bus | Set Notation | No. of Students |
| Students travelling by MRT only | True | False | False | *M* ∩ *T*’ ∩ *B*’ | 58 |
| Students travelling by Taxi only | False | True | False | *M’* ∩ *T* ∩ *B*’ | 41 |
| Students travelling by Bus only | False | False | True | *M’* ∩ *T*’ ∩ *B* | 35 |
| Students travelling by MRT and Taxi only | True | True | False | *M* ∩ *T* ∩ *B*’ | 6 |
| Students travelling by MRT and Bus only | True | False | True | *M* ∩ *T*’ ∩ *B* | 15 |
| Students travelling by Taxi and Bus only | False | True | True | *M*’∩ *T* ∩ *B* | 18 |
| Students travelling using all three modes of transport | True | True | True | *M* ∩ *T* ∩ *B* | 5 |
| Students who do not travel by all these three modes of transport | False | False | False | *M’* ∩T’ ∩ *B*’ | 3 |
| Total: | | | | | 181 |
|  | | | | | |

* 1. Is the total in Table 2 the same as the total number of students surveyed? Why is that so?
  2. For students who do not travel by the three modes of transport, suggest another mode of transport that they could have taken.

1. Construct/draw a Venn diagram based on Table 2. You may consider using this Venn diagram and table 2 in your presentation.

|  |
| --- |
|  |

* 1. How many students travel by at least one mode of transport?

178

* 1. How many students travel by all three modes of transport?

5

* 1. How many students travel by only one mode of transport?

134

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Practice Questions***  *(It is essential to complete these practice questions so that you can understand the concepts of this lesson better and be more confident and competent in handling related questions.)*  The following slides contain a summary of set notation. Ensure that you know the various notations.    Note\* In all the questions below, the symbol *ε* represents the universal set.  Set Notations  [You may want to watch the following [video](https://drive.google.com/file/d/0Bzod2ecBsQw1M01KY1ZieGVOS0E/edit?usp=sharing) which would help to recap some of the key concepts learnt before attempting the following question.]   1. Given that the set *E* contains all the letters from the word “engineering”.    1. List the elements of set *E*.   *E* =   * 1. Is the letter ‘s’ an element of *E*?   2. What is the value of *n*(*E*)?   *n*(*E*) =   1. Using the symbols ‘⊂’ or ‘=’, describe the relationship between the following sets.    1. *A* = {red, green}   *B* = {red, green, blue}   * 1. *C* = {1,4,9,…,100}   *D* = {12 , 22 , 32 , … , 102 }   * 1. *E* = {all letters in the English alphabet}   *F* = {a, b, c, …, j }   1. Given *ε* = { *x* : *x* is an integer and 1 ≤ *x* ≤ 10 }   *P* = { *x* : *x* <8}  *Q* = { *x* : *x* ≥3}   * 1. List all the elements contained in the set *P* ∩ *Q*.   *P* ∩ *Q* =   * 1. Find *n*(*P* ∪ *Q*).   *n*(*P* ∪ *Q*)=   * 1. List all the elements in *Q*′.   *Q*′ =  Venn diagrams  [You may want to watch the following [video](https://drive.google.com/file/d/0Bzod2ecBsQw1RzlSbl9Bc2s1X0E/edit?usp=sharing) which would help to recap some of the key concepts learnt before attempting the following question.]   1. Let *ε* = { *x* : *x* is a positive integer and 1 ≤ *x* < 20 }, *A* = { *x* : *x* is an even number} and *B* = { *x* : *x* is prime number}. Represent the sets using a Venn diagram.   *Ɛ*        *A*  *B*   1. Given the following Venn diagram, shade the following:   a) *A*′ ∪ *B*′    *Ɛ*  b) *A*′ ∩ *B*′    *Ɛ*   1. Refer to the following Venn diagram.   *Ɛ*   6, 12, 20   1, 5, 7, 9, 11, 13, 15, 17, 19   3  *A*  *B*  2, 4, 8, 10, 14, 16, 18   * 1. List all the elements in the sets *A*, *B*′, *A*′ ∪ *B*′ and *A*′ ∩ *B*′.   *A* =  *B*’ =  *A*’ ∪ *B*’ =  *A*’ ∩ *B*’ =   * 1. Describe sets *ε* and *B* using set builder notation.   *ε* =  *B* =   * 1. Find *n*(*A*′ ∪ *B*)   *n*(*A’* ∪ *B*) =  Truth Table  The following slides contain some examples on Truth Tables and Venn diagrams.     1. The following show the incomplete truth tables for *A*′ ∩ *B*′and *A*′ ∪ *B*′*.* Complete the tables by working out the truth values, indicating your answer using “T”, “F”, “1” and “0”. (“T” is true , “F” is false, “1” is true, “0” is false)      |  |  |  |  |  | | --- | --- | --- | --- | --- | | *A* | *B* | *A*′ | *B*′ | *A*′ ∪ *B*′ | | F | F |  |  |  | | F | T |  |  |  | | T | F |  |  |  | | T | T |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | | *A* | *B* | *A*′ | *B*′ | *A*′ ∩ *B*′ | | 0 | 0 |  |  |  | | 0 | 1 |  |  |  | | 1 | 0 |  |  |  | | 1 | 1 |  |  |  |  1. A survey on ice-cream flavor preference was conducted. Out of the 100 students surveyed, 12 prefer Mango and Banana flavor, 40 prefer Mango flavor, 27 prefer Banana flavor, 10 prefer Coconut flavor, the rest prefer other flavors. Those who prefer Coconut do not prefer other flavors.   Set *B* = {students who prefer Banana flavor},  Set *M* = {students who prefer Mango flavor}.  Set *C* = {students who prefer Coconut flavor}.   * 1. Represent the above using a Venn diagram. Indicate the number of students in each region.   *Ɛ*  *M*    *C*  *B*             * 1. Construct a truth table for all possible scenarios.  |  |  |  |  | | --- | --- | --- | --- | | *B* | *M* | *C* | No. of students | | False | False | False |  | | False | False | True |  | | False | True | False |  | | False | True | True |  | | True | False | False |  | | True | False | True |  | | True | True | False |  | | True | True | True |  |  * 1. Express in set notation, students who prefer other flavors. |

**cExploring Further:**

1. Verify whether the following relationships are correct by shading the Venn diagram.

*A*

*B*

*C*

*Ɛ*

1. *(A* ∪ *B) ′ = A′* ∩ *B′*
2. *(A* ∩ *B) ′ = A′* ∪ *B′*
3. *(A* ∪ *B)* ∪ *C = A* ∪ *(B* ∪ *C)*
4. (*A* ∩ *B*) ∩ *C* = *A* ∩ (*B* ∩ *C*)
5. *A* ∪ (*B* ∩ *C*) = (*A* ∪ *B*) ∩ (*A* ∪ *C* )
6. *A* ∩ (*B* ∪ *C*) = (*A* ∩ *B*) ∪ (*A* ∩ *C* )