**MATH1040/7040 Assignment 3**

All questions should be submitted by 4pm on Friday, 30 April. Assignments can be submitted at your tutorial, or to the MATH1040/7040 assignment boxes (4th floor Priestley Building #67). **Make sure that your name, student number, tutorial group and your tutor's name are on each sheet of your answers**. You do not need a cover sheet nor do you need to include this question sheet. Solutions will be distributed in class later.

**1.** Answer each of the following questions, showing all working.

**(a)** Find $y$ if $y = \sum_{i=3}^{6} -2i^1$

**(b)** Evaluate $\sum_{k=0}^{2} (-1)^k k$

**(c)** Expand and simplify $\sum_{i=-6}^{-5} ix$

**(d)** Find $z$ if $\sum_{i=-4}^{-2} zi = 36$

**(e)** Find $x$ if $\sum_{i=-3}^{1} -2x = 40$

**2.** Simplify the following:

**(a)** Write in summation notation: $4 + 8 + 12 + 16 + 20 + 24$

**(b)** Write in summation notation: $2x + 1 + 3x + 4 + 4x + 9 + 5x + 16 + ...$

**3.** For the following questions let $t_1$ and $t_2$ be random natural numbers chosen independently, where $t_1$ is between 1 and 4 (inclusive), and $t_2$ is between 4 and 5 (inclusive). In each case, find the probability $p$ that:

1. $t_1$ is odd?
2. $t_1 = 5$ ?
3. $t_1 < 2$ ?
4. $t_1$ is odd and $t_1 < 2$ ?
5. $t_1$ is odd or $t_1 < 2$ ?
6. $t_1$ is odd given that $t_1 < 2$ ?
7. Both $t_1$ and $t_2$ are odd ?
8. At least one of $t_1$ and $t_2$ is odd ?
9. $t_1$ is odd given that $t_2$ is odd ?

**4.** For the following questions let $D=\{3,2,0,-2\}$, $A=\{3,2,1,7,-1,4\}$ , $B=\{2,7,6,5,-3\}$

1. Write down the elements of set $B$ .
2. Write down the elements of the set $D \cup A$ .
3. Write down the elements of the set $A \cap B$ .
4. Write down the elements of the set $A \backslash D$ .
5. Write down the elements of the set $B \backslash (A \cup D)$ .
6. Write down the elements of the set $(A \cup B) \cup D$ .
7. Write down the elements of the set $B \cup (D \backslash A)$ .
8. Write down the elements of the set $\emptyset \backslash A$ .
9. Write down the elements of the set $(A \cap D) \setminus (B \backslash A)$ .
10. Illustrate the sets using a Venn diagram.

**5.** The Ebola virus has affected an area where $125,000$ people live. $18,750$ persons are thought to be contaminated by the virus.

The people are tested for the virus and the following results are observed:
When a person is contaminated by the Ebola virus, the test is positive in 99.6 % of the cases.
When a person is not contaminated by the virus, the test is negative in 97.6 % of the cases.

**a.** Draw the table below and insert the **number of people** in each category.

| - | Contaminated | Non Contaminated | Total |
|---|---|---|---|
| Positive Test | | | |
| Negative Test | | | |

**b.** What is the probability that a person randomly selected from the population:

**(1)** is contaminated by the Ebola virus?

**(2)** tests positive?

**(3)** tests positive and is contaminated by the Ebola virus?

**(4)** tests positive or is contaminated by the Ebola virus?

**(5)** tests positive and is not contaminated by the Ebola virus?

**(6)** tests negative and is contaminated by the Ebola virus?

**c.** What is the probability that the test gives a false result?

**d.** What is the probability that a person randomly selected from the population of people who tested negative is contaminated by the Ebola virus?

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