Assignment 1

Question 1. [2 marks]

State the definition of the intersection and the union of two sets A and B.

Question 2. [2 marks]

For each pair of sets A and B below, find the union and the intersection. Sketch the Venn diagrams that show the intersection and the union.

(a) $A = \{1, 3, 5, 7, 9\}$, $B = \{3, 6, 9, 12\}$

(b) $A = \{1, 3, 5, 7, 9\}$, $B = \{2, 4, 6, 8, 10\}$.

Question 3. [3 marks]

True or false? Justify your answer. Give a counter-example to the false statements.

(a) The intersection of two straight lines is never the empty set

(b) The empty set $\varnothing$ is a subset of any set.

(c) $A \cap B = B \cap A$.

(d) If $A \subseteq B$, and $B \subseteq C$ then $A \subseteq C$.

(e) $\varnothing = \{\varnothing\}$.

(f) If A contains 10 elements and B contains 2 elements, then $A \cap B$ contains 2 elements.

Question 4. [2 marks]

Find the difference of sets A and B, i.e. $A \setminus B$ for

(a) $A = \{-2, 0, 2\}$, $B = \varnothing$

(b) $A = \{1, 2, 3, 4, 5, 6, 7\}$, $B = \{7, 8, 9, 10\}$.

Question 5. [2 marks]

Let S be the set of all students in a class, and Z be the set of the students from that class who attended all 20 Zoom tutorials. Decide for each student if they belong to the set Z or to the set $S \setminus Z$. Anna, Bob, Celia, and Dorian are four students from the class.

(a) Anna has missed one Zoom tutorial.

(b) Bob attended only the first Zoom tutorial.

(c) Celia solved tutorial questions independently and has never attended Zoom tutorials.

(d) Dorian never missed a Zoom tutorial.

(e) Describe verbally what is the set $S \setminus Z$.

Question 6. [2 marks]

Sketch the number line and mark the set of four points $A = \{-4, -3, -2, -1\}$ by small circles. Mark the set of two points $B = \{-3, 2\}$ by crosses. Find $A \cap B$, $A \cup B$, $A \setminus B$, and $B \setminus A$.

Question 7. [2 marks]

How many integers n satisfy $-2 < n < -1$? $-2 \leq n < -1$? $-2 \leq n \leq -1$?

Question 8. [2 mark]

Write out the prime factorisation for the numbers 70 and 45. Show your working.

Question 9. [3 marks]

Find the lowest common multiple for 70 and 45. Show your working.