WEEK 3 PRACTICE QUESTIONS

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

   (a) Simplify $\dfrac{x^0 x^{-3}}{x^2 x^0}$.

   (b) Simplify $x^1 x^1 y^{-1} \div (x^{-1} y^0) \times y^2$.

   (c) Solve $3x + 2 < -3x - 1$ and write your answer in interval format.

   (d) Expand and simplify $\displaystyle\sum_{i=-2}^{1} 3ix$.

   (e) Expand and simplify $\displaystyle\sum_{i=2}^{5} (-1)^i i$.

2. Answer each of the following questions, showing all working.

   (a) For the following questions let
   $$A = \{x \mid x \in \mathbb{N},\ 1 \leq x < 4\},\ B = \{0, 1, 8, 10\}\ \text{and}\ C = \{-2, 0, 2, 4, 6, 8\}.$$

   (1) Write down the elements of the set A.

   (2) Write down the elements of the set $A \cup B$.

   (3) Write down the elements of the set $B \cap C$.

   (4) Write down the elements of the set $A \setminus C$.

   (5) Write down the elements of the set $A \setminus (B \cup C)$.

   (6) Write down the elements of the set $(A \cap B) \cap C$.

   (b) For the following questions let
   $$A = \{-1, 0, 4\}, B = \{-2, 0, 1\}\ \text{and}\ C = \{-1, 0, 5\}.$$

   (1) Write down the elements of the set $A \cap B$.

   (2) Write down the elements of the set $B \cup \emptyset$.

   (3) Write down the elements of the set $C \cap (B \setminus A)$.

   (4) Write down the elements of the set $(B \cup A) \cup C$.

   (5) Write down the elements of the set $(C \cup \emptyset) \cap B$.

   (6) Write down the elements of the set $(B \cap C) \cap (B \cup C)$.

   (7) Write down the elements of the set $(A \setminus \emptyset) \setminus (B \setminus \emptyset)$.

   (c) For the following questions let r_1 and r_2 be random natural numbers chosen independently, where r_1 is between 1 and 10 (inclusive), and r_2 is between 1 and 8 (inclusive). In each case, find the probability p that:

   (1) r_1 is even?

   (2) $r_1 \geq 5$?

   (3) r_1 is even and $r_1 \geq 5$?

   (4) r_1 is even or $r_1 \geq 5$?

   (5) r_1 is even given that $r_1 \geq 5$?

   (6) Both r_1 and r_2 are even?

   (7) At least one of r_1 and r_2 is even?

   (8) r_1 is even given that r_2 is even?