**Number 1** Given $n(\mathbb{U}) = 20$, $n(A) = 12$, $n(B) = 9$, $n(A \cap B) = 4$. Find:
(a) $n(A \cup B)$,      (b) $n(A^{\complement})$,      (c) $n(B^{\complement})$,      (d) $n(A \setminus B)$,      (e) $n(\emptyset)$

**Number 2** A survey of a newly refurbished 250-room BUK hostel complex to see which of the rooms have air-conditioning $(A)$, Ceiling Fan $(F)$, television $(T)$ installed. The survey found:

     150 had ceiling fan $(A)$,      50 had $A$ and $F$      120 had Ceiling Fan $(F)$

     90 had $A$ and $R$      30 had all three options      110 had Television $(T)$

     40 had $F$ and $T$

find the number of rooms that had

     (a) only $T$;      (b) only $A$;      (c) only $F$;

     (d) $F$ and $T$ but not $A$;      (e) $A$ and $F$ but not $T$;      (f) only one of $A$, $F$, $T$;

     (g) at least one of $A$, $F$, $T$;      (h) none of $A$, $F$, $T$;

**Number 3** Given $\sum_{i=1}^{n} f(x) = f(1) + f(2) + f(3) + \cdots f(n)$ and

$\sum_{i=1}^{n} g(x) = g(1) + g(2) + g(3) + \cdots g(n)$, show that

$$\sum_{i=1}^{n} \Big( f(x) + g(x) \Big) = \sum_{i=1}^{n} f(x) + \sum_{i=1}^{n} g(x)$$

**Number 4** Show that the set of Complex numbers is closed under addition, subtraction, division and multiplication.

**Number 5** The fourth term of an arithmetic sequence is 38 and the seventh term is 17. What is the first term?

**Number 6** Discuss methods for calculating sums where the index does not start at 1. For example,
$$\sum_{k=15}^{35} (3k + 4) = 1659$$

**Number 7** A stone is projected vertically upwards. Its height h meters after time t seconds is given by the equation:
$$h = 60t - 5t^2$$
After how many seconds is its height equal to 135 meters?

**Number 8** What is the Binomial expansion of $(3x - 4)^9$?

**Number 9** Plot the point $\left( 2, \dfrac{\pi}{6} \right)$ on the polar plane.

**Number 10** Write the complex number $z = 2 \left( \cos \left( \dfrac{\pi}{3} \right) + i \sin \left( \dfrac{\pi}{3} \right) \right)$ in standard form.