1. (a) $\sum_{i=3}^{6} -2i^1 = -2 \times 3^1 - 2 \times 4^1 - 2 \times 5^1 - 2 \times 6^1 = -6 - 8 - 10 - 12 = -36$

Hence y=-36

(b) $\sum_{k=0}^{2} (-1)^k k = (-1)^0 \times 0 + (-1)^1 \times 1 + (-1)^2 \times 2 = 0 - 1 + 2 = 1$

(c) $\sum_{i=-6}^{-5} ix = -6x - 5x = -11x$

(d) $\sum_{i=-4}^{-2} zi = 36,$ so $-4z - 3z - 2z = 36,$ so $-9z = 36$

Hence $z = -4$

(e) $\sum_{i=-3}^{1} -2x = 40,$ so $-2x - 2x - 2x - 2x - 2x = 40,$ so $-10x = 40$

Hence $x = -4$

2. (a) $4 + 8 + 12 + 16 + 20 + 24$

$= 4 \times 1 + 4 \times 2 + 4 \times 3 + 4 \times 4 + 4 \times 5 + 4 \times 6$

$= \sum_{j=1}^{6} 4j$

(b) $2x + 1 + 3x + 4 + 4x + 9 + 5x + 16 + ...$

$= 2x + 1^2 + 3x + 2^2 + 4x + 3^2 + 4x + 4^2 + ...$

$= \sum_{i=1}^{\infty} (i+1)x + i^2$ OR $\sum_{i=2}^{\infty} ix + (i-1)^2$

3.

1. $Prob\,(t_1 \text{ is odd}) = \frac{2}{4} = \frac{1}{2}$

2. $Prob\,(t_1 = 5) = 0$

3. $Prob\,(t_1 < 2) = \frac{1}{4}$

4. $Prob\,(t_1 \text{ is odd and } t_1 < 2) = \frac{1}{4}$

5. $Prob\,(t_1 \text{ is odd or } t_1 < 2) = \frac{2}{4} = \frac{1}{2}$

6. $Prob\,(t_1 \text{ is odd given that } t_1 < 2) = \frac{1}{1} = 1$

7. $Prob\,(t_1 \text{ is odd}) = \frac{1}{2}$, and $Prob\,(t_2 \text{ is odd}) = \frac{1}{2}$.

   Now t_1 and t_2 are chosen independently,

   so $Prob\,(\text{both } t_1 \text{ and } t_2 \text{ are odd}) = Prob\,(t_1 \text{ is odd}) \times Prob\,(t_2 \text{ is odd})$.

   Hence $Prob\,(\text{both } t_1 \text{ and } t_2 \text{ are odd}) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

8. By the principle of inclusion\exclusion,
$Prob\,(t_1 \text{ is odd } \textbf{or } t_2 \text{ is odd}) = Prob\,(t_1 \text{ is odd}) + Prob\,(t_2 \text{ is odd}) - Prob\,(\text{both } t_1 \text{ and } t_2 \text{ are odd })$.
Hence $Prob\,(t_1 \text{ is odd } \textbf{or } t_2 \text{ is odd}) = \frac{1}{2} + \frac{1}{2} - \frac{1}{4} = \frac{3}{4}$

9. Now t_1 and t_2 are chosen independently, so
$Prob\,(t_1 \text{ is odd } \textbf{given that } t_2 \text{ is odd }) = Prob\,(t_1 \text{ is odd})$.
Hence $Prob\,(t_1 \text{ is odd } \textbf{given that } t_2 \text{ is odd }) = \frac{1}{2}$

4. 1. $B = \{2, 7, 6, 5, -3\}$

2. $D \cup A = \{3, 2, 0, -2\} \cup \{3, 2, 1, 7, -1, 4\} = \{3, 2, 1, 0, -2, 7, -1, 4\}$

3. $A \cap B = \{3, 2, 1, 7, -1, 4\} \cap \{2, 7, 6, 5, -3\} = \{2, 7\}$

4. $A \backslash D = \{3, 2, 1, 7, -1, 4\} \backslash \{3, 2, 0, -2\} = \{1, 7, -1, 4\}$

5.

$$\begin{aligned} B \backslash (A \cup D) &= \{2, 7, 6, 5, -3\} \backslash (\{3, 2, 1, 7, -1, 4\} \cup \{3, 2, 0, -2\}) \\ &= \{2, 7, 6, 5, -3\} \backslash \{3, 2, 1, 0, 7, -2, -1, 4\} \\ &= \{6, 5, -3\} \end{aligned}$$

6.

$$\begin{aligned} (A \cup B) \cup D &= (\{3, 2, 1, 7, -1, 4\} \cup \{2, 7, 6, 5, -3\}) \cup \{3, 2, 0, -2\} \\ &= \{3, 2, 1, 7, -1, 6, 5, 4, -3\} \cup \{3, 2, 0, -2\} \\ &= \{3, 2, 1, 0, 7, -2, -1, 6, 5, 4, -3\} \end{aligned}$$

7.

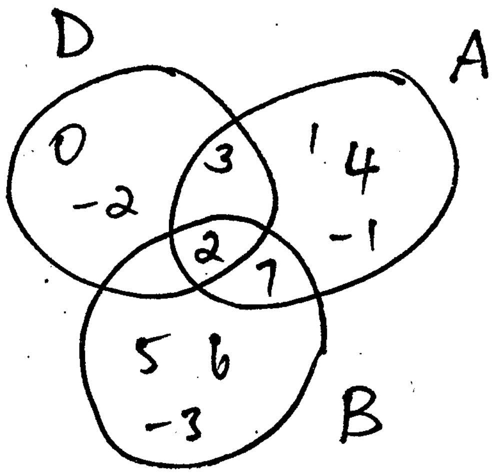
$$\begin{aligned} B \cup (D \backslash A) &= \{2, 7, 6, 5, -3\} \cup (\{3, 2, 0, -2\} \backslash \{3, 2, 1, 7, -1, 4\}) \\ &= \{2, 7, 6, 5, -3\} \cup \{0, -2\} \\ &= \{2, 0, 7, -2, 6, 5, -3\} \end{aligned}$$

8. $\emptyset \backslash A = \emptyset \backslash \{3, 2, 1, 7, -1, 4\} = \emptyset$

9.

$$\begin{aligned} (A \cap D) \backslash (B \backslash A) &= (\{3, 2, 1, 7, -1, 4\} \cap \{3, 2, 0, -2\}) \backslash (\{2, 7, 6, 5, -3\} \backslash \{3, 2, 1, 7, -1, 4\}) \\ &= \{3, 2\} \backslash \{6, 5, -3\} \\ &= \{3, 2\} \end{aligned}$$

10.



5. **a.** Complete the following table:

-	Contaminated	Non Contaminated	Total
Positive Test	18,675	2,550	21,225
Negative Test	75	103,700	103,775
Total	18,750	106,250	125,000

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

(1) $P(A) = \dfrac{18,750}{125,000} = 0.15$

(2) $P(B) = \dfrac{21,225}{125,000} = 0.1698$

(3) $P(A \cap B) = \dfrac{18,675}{125,000} = 0.1494$

(4) $P(A \cup B) = 0.15 + 0.1698 - 0.1494 = 0.1704$

(5) $P(C) = \dfrac{2,550}{125,000} = 0.0204$

(6) $P(D) = \dfrac{75}{125,000} = 0.0006$

c. $P(E) = 0.0204 + 0.0006 = 0.0210$

d. $P(F) = \dfrac{75}{103,775} = 0.0007$