Q1. (a)

<table>
<thead>
<tr>
<th>Class Mark (x)</th>
<th>Frequency (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>5</td>
</tr>
<tr>
<td>750</td>
<td>10</td>
</tr>
<tr>
<td>1500</td>
<td>18</td>
</tr>
<tr>
<td>3000</td>
<td>32</td>
</tr>
<tr>
<td>5500</td>
<td>14</td>
</tr>
<tr>
<td>8500</td>
<td>1</td>
</tr>
</tbody>
</table>

\[ \sum f = 80 \quad \sum f x = 217250 \quad \sum f x^2 = 830187500 \]

\[ \overline{x} = \frac{217250}{80} = \$2715.625 \]

\[ \text{mode} = 2000 + \frac{32 - 18}{(32 - 18) + (32 - 14)} \times (4000 - 2000) = \$2875 \]

\[ s = \sqrt{\frac{80(830187500) - 217250^2}{80(80 - 1)}} = \$1743.7700 \]

(b) \[ SK_1 = \frac{2715.625 - 2875}{1743.770} = -0.0914 \]

(c)

<table>
<thead>
<tr>
<th>Monthly income less than ($)</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>500</td>
<td>5</td>
</tr>
<tr>
<td>1000</td>
<td>15</td>
</tr>
<tr>
<td>2000</td>
<td>33</td>
</tr>
<tr>
<td>4000</td>
<td>65</td>
</tr>
<tr>
<td>7000</td>
<td>79</td>
</tr>
<tr>
<td>10000</td>
<td>80</td>
</tr>
</tbody>
</table>

\[ P_{65} = 2000 + \frac{52 - 33}{32} (2000) = \$3187.5 \]
Q2. (a) $X$ – number of mobile phones in black

\[
\Pr(X \geq 2) = 1 - \Pr(X \leq 1) = 1 - \left( \frac{\binom{200}{0} \times C_4^0 + \binom{200}{1} \times C_4^1}{\binom{200}{0} \times C_4} \right) = \frac{1}{3}
\]

(b) $A$ – win project A
$B$ – win project B

\[
\Pr(A) = 0.6 \quad \Pr(B) = 0.4 \quad \Pr(A|B) = 0.8
\]

(i) \[\Pr(A \cap B) = 0.4 \times 0.8 = 0.32\]

(ii) \[\Pr(A \cap \overline{B}) = 1 - (0.6 + 0.4 - 0.32) = 0.32\]

(iii) \[\Pr(B|\overline{A}) = \frac{0.4 - 0.32}{1 - 0.6} = 0.2\]

(c) $G$ – a seed will germinate
$A$ – a seed is from supplier A
$B$ – a seed is from supplier B

\[
\Pr(A) = 0.4 \quad \Pr(B) = 0.6 \quad \Pr(G|A) = 0.85 \quad \Pr(G|B) = 0.75
\]

\[
\Pr(B|G) = \frac{0.6 \times 0.75}{0.4 \times 0.85 + 0.6 \times 0.75} = 0.5696
\]

Q3. (a) $X$ – total sales ($\text{million}$)

$X \sim N(25, 4^2)$

(i) \[\Pr(X > 30) = \Pr(Z > 1.25) = 0.1056\]

(ii) \[\Pr(X > a) = 0.05 \Rightarrow \frac{a - 25}{4} = 1.645 \Rightarrow a = 31.58 \text{ million}\]
(b) X – number of customers will buy something

(i) \( X \sim B(15, 0.3) \)

\[
\Pr(X = 5) = \binom{15}{5} (0.3)^5 (0.7)^{10} = 0.2061
\]

(ii) \( X \sim B(120, 0.3) \)

Since \( np = 36 > 5 \) and \( nq = 84 > 5 \), normal approximation is used.

\[
\mu = 120 \times 0.3 = 36 \quad \text{and} \quad \sigma^2 = 120 \times 0.3 \times 0.7 = 25.2
\]

\[
\Pr(40 \leq X \leq 80) \approx \Pr\left(\frac{39.5 - 36}{\sqrt{25.2}} < Z < \frac{80.5 - 36}{\sqrt{25.2}}\right) \approx \Pr(0.70 < Z < 8.86) = 0.2420
\]

(c) X – number of incoming planes in a 5-minute period

\( X \sim \text{Po}(4.5) \)

\[
\Pr(X \leq 1) = e^{-4.5} \frac{4.5^0}{0!} + e^{-4.5} \frac{4.5^1}{1!} = 0.0611
\]

Y – number of 5-minute period having at most 1 incoming plane, \( Y \sim B(6, 0.0611) \)

\[
\Pr(Y = 2) = \binom{6}{2} (0.0611)^2 (1 - 0.0611)^4 = 0.0435
\]

Q4. (a) \( \bar{X} \) - sample mean of sales ($)

\[
\bar{X} \sim N\left(6500, \frac{700^2}{50}\right) \quad \text{by central limit theorem}
\]

\[
\Pr\left(\bar{X} < \frac{33000}{50}\right) \approx \Pr(Z < 1.01) = 0.8438
\]

(b) \( n \geq \left(\frac{1.645 \times 3.6}{0.25}\right)^2 = 561.1213 \quad \therefore n = 562
\]

(c) \( n = 18 \quad \sum x = 1800 \quad \sum x^2 = 207200
\)

\[
\bar{x} = \frac{1800}{18} = \$100 \quad s = \sqrt{\frac{18(207200) - 1800^2}{18(18-1)}} = \$40
\]

X – price ($) 

Assume that \( X \sim N(\mu, \sigma^2) \)

A 95% confidence interval for \( \mu \) is \( 100 \pm 2.11 \times 40 / \sqrt{18} = (\$80.1067, \$119.8933) \)