1)(a)(i) $\frac{60-15}{60}\times 100 = 75\%$

(ii) 23

(iii) $29-16=13$

(b) Since the three students' scores were all below the mean, removing their scores will **increase** the mean score.

2(a) $\mathbf{P}=\begin{pmatrix}2.5\\3\\4.5\end{pmatrix}$

2(b) $\mathbf{T}=\begin{pmatrix}105+84 & 98+75 & 71+12\\54+42 & 43+39 & 20+35\\161+93 & 102+51 & 68+24\end{pmatrix}\begin{pmatrix}2.5\\3\\4.5\end{pmatrix}$

$=\begin{pmatrix}189 & 173 & 83\\96 & 82 & 55\\254 & 153 & 92\end{pmatrix}\begin{pmatrix}2.5\\3\\4.5\end{pmatrix}$

$=\begin{pmatrix}1365\\651\\1508\end{pmatrix}$

2(c) It represent the total sale for the two weeks in the morning, afternoon and evening are \$1365, \$651 and \$1508 respectively.

2(d) $\mathbf{Q}=\begin{pmatrix}0.9 & 0 & 0\\0 & 0.95 & 0\\0 & 0 & 0.8\end{pmatrix}$

2(e) $\mathbf{S}=\mathbf{RAQP}$

$=\begin{pmatrix}1 & 1 & 1\end{pmatrix}\begin{pmatrix}105 & 98 & 71\\54 & 43 & 20\\161 & 102 & 68\end{pmatrix}\begin{pmatrix}0.9 & 0 & 0\\0 & 0.95 & 0\\0 & 0 & 0.8\end{pmatrix}\begin{pmatrix}2.5\\3\\4.5\end{pmatrix}$

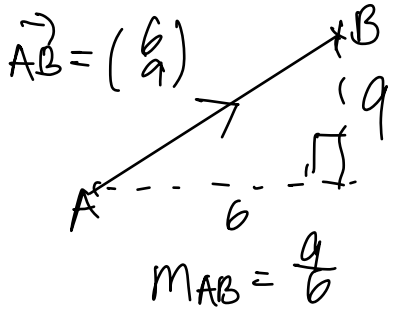
$=\begin{pmatrix}320 & 243 & 159\end{pmatrix}\begin{pmatrix}0.9 & 0 & 0\\0 & 0.95 & 0\\0 & 0 & 0.8\end{pmatrix}\begin{pmatrix}2.5\\3\\4.5\end{pmatrix}$

$$= \begin{pmatrix} 288 & 230.85 & 127.2 \end{pmatrix} \begin{pmatrix} 2.5 \\ 3 \\ 4.5 \end{pmatrix}$$

$$= \begin{pmatrix} 1984.95 \end{pmatrix}$$

It represent the total sale after the prices were lowered, based on the quantity sold in first week, is \$1984.95.

3)(a)(i) $m = \frac{9}{6} = \frac{3}{2}$



Substitute $(-2, 1)$ and $m = \frac{3}{2}$ into $y = mx + c$

$$1 = \left(\frac{3}{2}\right)(-2) + c$$

$$c = 4$$

Equation of line is $y = \frac{3}{2}x + 4$

(ii) $\overrightarrow{OB} = \overrightarrow{AB} + \overrightarrow{OA}$

$\vec{AB} = \vec{OB} - \vec{OA}$

$\vec{OB} = \vec{AB} + \vec{OA}$

$$= \begin{pmatrix} 6 \\ 9 \end{pmatrix} + \begin{pmatrix} -2 \\ 1 \end{pmatrix}$$

$$= \begin{pmatrix} 4 \\ 10 \end{pmatrix}$$

$$\left|\overrightarrow{OB}\right| = \sqrt{4^2 + 10^2}$$

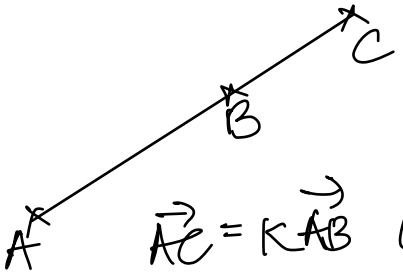
$= 10.8$ units (3 sf)

(iii) $\begin{pmatrix} u \\ 12 \end{pmatrix} = k \begin{pmatrix} 6 \\ 9 \end{pmatrix}$

$$\begin{pmatrix} u \\ 12 \end{pmatrix} = \begin{pmatrix} 6k \\ 9k \end{pmatrix}$$

$$k = \frac{12}{9}$$

$$u = 6\left(\frac{12}{9}\right) = 8$$



$\vec{AC} = k\vec{AB}$ (AC // AB)

or $\vec{AB} = k\vec{AC}$

$\begin{pmatrix} 6 \\ 9 \end{pmatrix} = k \begin{pmatrix} u \\ 12 \end{pmatrix}$

$6 = ku$, $9 = 12k$

$6 = \frac{3}{4} \times u$ $\therefore k = \frac{9}{12}$

$\therefore u = 6 \times \frac{4}{3}$ $= \frac{3}{4}$

$= 8$

$\overrightarrow{PS} + \overrightarrow{SQ} = \overrightarrow{PQ}$

(b)(i) $\overrightarrow{SQ} = \overrightarrow{PQ} - \overrightarrow{PS}$

$= \mathbf{p} - \frac{3}{2}\mathbf{q}$

(ii) $\overrightarrow{ST} = \frac{2}{3}\overrightarrow{SQ}$

$= \frac{2}{3}\mathbf{p} - \mathbf{q}$

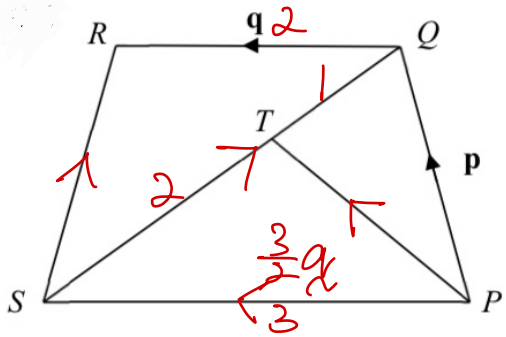
$\overrightarrow{PS} + \overrightarrow{ST} = \overrightarrow{PT} \Rightarrow \overrightarrow{PT} = \overrightarrow{PS} + \overrightarrow{ST}$

$= \frac{3}{2}\mathbf{q} + \frac{2}{3}\mathbf{p} - \mathbf{q} = \frac{1}{2}q + \frac{2}{3}q$

(iii) $\overrightarrow{SR} = \overrightarrow{SQ} + \overrightarrow{QR}$

$= \mathbf{p} - \frac{3}{2}\mathbf{q} + \mathbf{q}$

$= \mathbf{p} - \frac{1}{2}\mathbf{q}$



$3QR = 2PS$, $QT : QS = 1 : 3$

$\frac{QR}{PS} = \frac{2}{3}$

$\overrightarrow{PS} = \frac{3}{2}\overrightarrow{QR}$, $\overrightarrow{ST} = \frac{2}{3}\overrightarrow{SQ}$

4(a)(i) $p = 45$

4(a)(ii) SD = 5.38 kg

4(a)(iii) The median weight of the girls in dance academy B (57 kg) is higher than A ($50 \leqslant x < 55$ kg). Generally, the girls in dance academy B are heavier.