

Ex 4.3

Q1 (i) 68%

(ii) 95%

(iii) $-\sigma$ to $\sigma = 68\%$ $\frac{1}{2}(68\%) = 34\%$ (Left HS)

-2σ to $2\sigma = 95\%$ $\frac{1}{2}(95\%) = 47\frac{1}{2}\%$ (Right HS)

$\Rightarrow 34\% + 47\frac{1}{2}\% = 81\frac{1}{2}\%$

(iv)

$\mu = 60$ $\sigma = 4$

$\mu - \sigma = 56$

$\mu + \sigma = 64$] \Rightarrow shaded area is between

$-\sigma$ to $+\sigma \Rightarrow 68\%$

Q2

$\mu = 72$ $\sigma = 6$

$\mu + \sigma = \underline{78}$

$\mu - \sigma = 66$

$\mu - 2\sigma = \underline{60}$

(i) $72 \rightarrow 78 = \frac{1}{2}(68\%) = 34\%$

(ii) Taller than 78, RHS = 50%

$50\% - 34\% = 16\%$

(iii) RHS = $\frac{1}{2}(68\%) = 34\%$

LHS = $\frac{1}{2}(95\%) = 47\frac{1}{2}\%$

Total = $34\% + 47\frac{1}{2}\% = 81\frac{1}{2}\%$

Q3 $\mu = 55$ $\sigma = 9$

(i) $55 - 9 = 46 \text{ km/hr}$ [z score = -1]

(ii) $55 + 18 = 73 \text{ km/hr}$ [z score = 2]

(iii) $55 + 27 = 82 \text{ km/hr}$ [z score = 3]

Q5 $\mu = 170$ $\sigma = 8$

(i) 68% $\Rightarrow \mu \pm \sigma$

\therefore 68% lies between 162 and 178

(ii) 99.7% $\Rightarrow \mu \pm 3\sigma$

\therefore 99.7% lies between $170 - 24$ and $170 + 24$
146 and 194

Q7 $\mu = 620$ $\sigma = 12$

(i) $\pm \sigma = 68\%$

68% of 12000 = 8160 bulbs

(ii) 620 = mean $644 = \mu + 2\sigma$

$\Rightarrow \frac{1}{2}(95\%) = 47\frac{1}{2}\%$

$47\frac{1}{2}\%$ of 12000 = 5700 bulbs

(iii) $50\% - 47\frac{1}{2}\% = 2.5\%$

$2\frac{1}{2}\%$ of 12000 = 300 bulbs.

Q8 $\mu = 134$ $\sigma = 3$

$$128 = 134 - 6 \Rightarrow \mu - 2\sigma.$$

$$\Rightarrow \frac{1}{2}(95\%) = 47\frac{1}{2}\%$$

$$50\% - 47\frac{1}{2}\% = 2\frac{1}{2}\%$$

$2\frac{1}{2}\%$ of 1000 = 25 bulbs rejected.

Q10 $\mu = 80$ $\sigma = 4$.

$$(i) \quad z = \frac{84 - 80}{4} = 1$$

$$(ii) \quad z = \frac{72 - 80}{4} = -2$$

$$(iii) \quad z = \frac{86 - 80}{4} = 1.5$$

$$(iv) \quad z = \frac{70 - 80}{4} = -2.5.$$

Q11 (i) A value that lies 2 standard deviations above the mean.

(ii) A value that lies 1.5 standard deviations below the mean.

Q12 $\mu = 70$ $\sigma = 15$.

(i) Karl's score is 1.8 standard deviations above the mean of 70.

Tanya's score is 0.6 standard deviations below the mean of 70.

(ii) Karl: $1.8 \times 15 = 27$ marks above 70
 $\Rightarrow 70 + 27 = 97$ marks.

$$\boxed{\text{or}} \quad z = 1.8 \Rightarrow 1.8 = \frac{x - 70}{15}$$
$$(1.8 \times 15) + 70 = x$$
$$97 = x$$

Tanya $0.6 \times 15 = 9$ marks below 70
 $70 - 9 = 61$ marks

$$\boxed{\text{or}} \quad z = -0.6 \Rightarrow -0.6 = \frac{x - 70}{15}$$
$$(-0.6)(15) + 70 = x$$
$$61 = x$$

Q14

(i) Maths: $z = \frac{80 - 75}{12} = 0.417$

History: $z = \frac{70 - 78}{10} = -0.8$

(ii) In Maths as she got a higher z score

(iii) $z = 0.5 \Rightarrow 0.5$ standard deviation above
the mean of 78.

0.5 of $10 = 5 \Rightarrow 78 + 5 = 83$ marks.

or $0.5 = \frac{x - 78}{10}$
 $(0.5)(10) + 78 = x$
 $83 = x$

Q15

(i) Her score is 1.8 standard deviations above the
mean.

(ii) $x = 80 \quad \sigma = 12$

$1.8 = \frac{80 - \mu}{12}$

$(1.8)(12) = 80 - \mu$

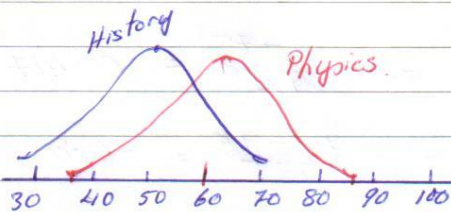
$21.6 = 80 - \mu$

$\mu = 80 - 21.6 = 58.4$ is ~~the~~ ^{mean} score.

(iii) $z = \frac{50 - 58.4}{12}$

$z = -0.7$

Q17 (i)



History: 34 \rightarrow 70
Physics: 36 \rightarrow 84

(ii) History: $z = \frac{64 - 52}{6} = 2$

Physics: $z = \frac{72 - 60}{8} = 1.5$

\Rightarrow Yes Kelly did better in History.