Ex 3.6

Q1 (i) $P(z \leq 1.2) = 0.8849$

(ii) $P(z \geq 1) = 1 - P(z \leq 1)$
$= 1 - 0.8413$
$= 0.1587$

(iii) $P(z \leq -1.92) = 1 - P(z \geq 1.92)$
$= 1 - 0.9726$
$= 0.0274$

(iv) $P(-1.8 \leq z \leq 1.8)$

$P(z < 1.8) = 0.9641$

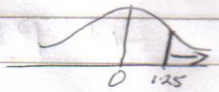
$P(z \geq -1.8) = 1 - P(z \leq 1.8)$
$= 1 - 0.9641$
$= 0.0359$

$\Rightarrow$ Shaded $= 0.9041 - 0.0359$
$= 0.9282.$

Q3 $P(z \leq 0.89) = 0.8133$

Q6 $P(z \geq 1.25) = 1 - 0.8944$

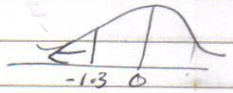
$= 0.1056$



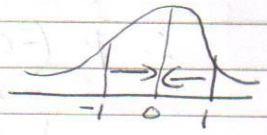
Q9 $P(z \leq -1.3)$

$= 1 - 0.9032$

$= 0.0968$



Q12 $P(-1 \leq z \leq 1) =$



$P(z \leq 1) = 0.8413$

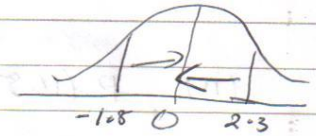
$P(z \geq -1) = 1 - 0.8413 = 0.1587$

$\Rightarrow P(-1 \leq z \leq 1) = 0.8413 - 0.1587$

$= 0.6826$

Q15

$P(-1.8 \leq z \leq 2.3)$



$P(z \leq 2.3) = 0.9893$

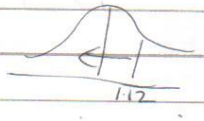
$P(z \geq -1.8) = 1 - 0.9641 = 0.0359$

$\Rightarrow P(-1.8 \leq z \leq 2.3) = 0.9893 - 0.0359$

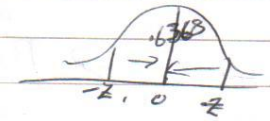
$= 0.9534$

Q17 $P(z \leq z_1) = 0.8686$

$\Rightarrow z_1 = 1.12$



Q19 $P(-z_1 \leq z \leq z_1) = 0.6368$



$1 - 0.6368 = 0.3632$ [2 outside parts]

$\div 2 = 0.1816$ = 1 outside part.

$1 - 0.1816 = 0.8181 \Rightarrow z_1 = 0.91$

Q25 $\mu = 100 \quad \sigma = 80.$

(i) $P(85 < x < 112)$

$$z = \frac{85-100}{80} = -0.1875$$

$$z = \frac{112-100}{80} = 0.15$$

$\therefore P(-0.1875 \leq z \leq 0.15)$

$P(z < 0.15) = 0.5596$

$P(z \geq -0.1875) = 1 - 0.5753 = 0.4247.$

$[\approx -0.19]$

$\Rightarrow P(85 < x < 112) = 0.5596 - 0.4247$

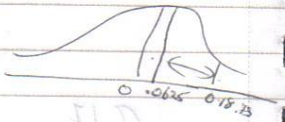
$= 0.1349.$

(ii) $P(105 \leq x \leq 115)$

$$z = \frac{105-100}{80} = 0.0625$$

$$z = \frac{115-100}{80} = 0.1875$$

$\therefore P(0.0625 \leq z \leq 0.1875)$



$\Rightarrow P(z < 0.1875) = 0.5753$

$P(z < 0.0625) = 0.5239$

$\Rightarrow P(105 \leq x \leq 115) = 0.5753 - 0.5239$

$= 0.0514.$

Q26 $\mu = 200 \quad \sigma = 20$

(i) $P(190 \leq x \leq 210)$

$$Z = \frac{190-200}{20} = -0.5$$

$$Z = \frac{210-200}{20} = 0.5$$

$\therefore P(-0.5 \leq Z \leq 0.5)$

$P(Z \leq 0.5) = 0.6915$

$P(Z \geq -0.5) = 1 - 0.6915 = 0.3085.$

$\Rightarrow P(190 < x \leq 210) = 0.6915 - 0.3085$

$= 0.383$

(ii) $P(185 \leq x \leq 205)$

$$Z = \frac{185-200}{20} = -0.75$$

$$Z = \frac{205-200}{20} = 0.25$$

$\therefore P(-0.75 \leq Z \leq 0.25)$

$P(Z \leq 0.25) = 0.5987$

$P(Z \geq -0.75) = 1 - 0.7734 = 0.2266$

$\Rightarrow P(185 \leq x \leq 205) = 0.5987 - 0.2266$

$= 0.3721.$

Q27 $\mu = 210$ $\sigma = 20$

(i) $P(x > 240)$ $\quad z = \frac{240 - 210}{20} = 1.5$

$\therefore P(z > 1.5) = 1 - 0.9332$
$= 0.0668$

(ii) $P(x \leq 200)$ $\quad z = \frac{200 - 210}{20} = -0.5$

$P(z \leq -0.5) = 1 - 0.6915$
$= 0.3085.$

Q24 $\mu = 12$ $\sigma = 2$

(i) $P(x \geq 17)$ $\quad z = \frac{17 - 12}{2} = 2.5$

$P(z \geq 2.5) = 1 - 0.9938$
$= 0.0062.$

(ii) $P(x < 10)$ $\quad z = \frac{10 - 12}{2} = -1$

$P(z < -1) = 1 - 0.8413$
$= 0.1587$

(iii) $P(9 < x < 13)$ $\quad z = \frac{9 - 12}{2} = -1.5$

$z = \frac{13 - 12}{2} = 0.5$

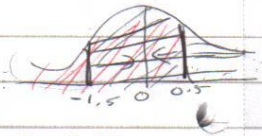
$P(-1.5 < z < 0.5)$

$P(z < 0.5) = 0.6915$

$P(z \geq -1.5) = 0.9332$

$1 - 0.6915 = 0.3085$

$\Rightarrow P(9 < x < 13) = 0.9332 - 0.3085$
$= 0.6247$



$P(x < 0.5) = 0.6915$
$P(z < 1.5)$
$1 - 0.9332$
$= 0.0668$
$0.6915 - 0.0668$
$= 0.6247$

Q31 $\mu = 165 \quad \sigma = 3.5$.

(i) $P(x < 160) \qquad z = \frac{160 - 165}{3.5} = -1.428$

$P(z < -1.428) = 1 - 0.9236$

$= 0.0764$.

(ii) $P(168 < x < 174)$

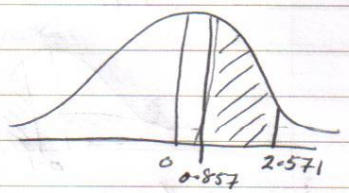
$z = \frac{168 - 165}{3.5} = 0.857$

$z = \frac{174 - 165}{3.5} = 2.571$.

$P(0.857 \leq z \leq 2.571)$

$P(z < 2.571) = 0.9949$

$P(z < 0.857) = 0.8051$



$P(168 < x < 174) = 0.9949 - 0.8051$

$= 0.1898$

$= 18.98\%$

approx 19%.

Q33 $\mu = 300$ $\sigma = 6$.

(i) $P(x < 295)$ $\quad z = \frac{295 - 300}{6} = -0.833$

$P(z \leq -0.833) = 1 - 0.7967$

$= 0.2033$

out of 1000 packs

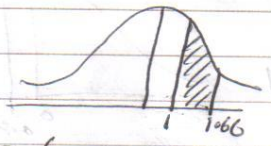
$\Rightarrow 1000 \times 0.2033$

$= 203.3$ packs

(ii) $P(306 < x < 310)$

$z = \frac{306 - 300}{6} = 1$

$z = \frac{310 - 300}{6} = 1.66$.



$P(0.1 \leq z \leq 1.66)$

$P(z \leq 1.66) = 0.9515$

$P(z < 1) = 0.8413$

$\Rightarrow P(0.1 \leq z \leq 1.66) = 0.9515 - 0.8413$

$= 0.1102$

from 1000 packs

$1000 \times .1102 = 110.2$ packs

Q34 $\mu = 60\%$ $\sigma = 10\%$

(i)(a) $P(x < 45\%)$ $\quad z = \frac{45-60}{10} = -1.5$

$P(z < -1.5) = 1 - 0.9332 = 0.0668$

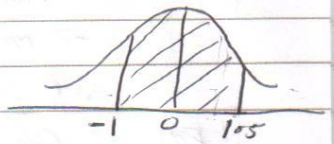
(b) $P(50 < x < 75)$ $\quad z = \frac{50-60}{10} = -1$

$z = \frac{75-60}{10} = 1.5$

$P(-1 < z < 1.5)$

$P(z < 1.5) = 0.9332$

$P(z < -1) = (1 - 0.8413) = 0.1587$



$P(-1 < z < 1.5) = .9332 - 0.1587 = 0.7745$

$= 77.45\%$ of students

(ii) Greater than 90% of other students.

$90\% = 0.9$

a z score of 0.9 got from 1.28.

$\Rightarrow \frac{x - 60}{10} = 1.28$

$x = 72.8\%$

$\Rightarrow$ a student needs to get 73% or above to get award.