p159 Ex 8C. No. 1

$X \sim N(200, 25^2)$ {note how 625 is written as 25^2}

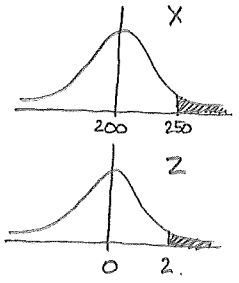
a) $P(X > 250) = P\left(Z > \frac{250-200}{25}\right)$

$= P\left(Z > \frac{50}{25}\right)$

$= P(Z > 2)$

$= 0.02275...$

≈ 0.0228 (4dp)

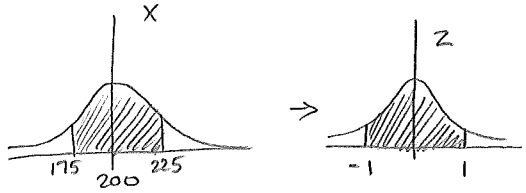


b) $P(175 < X < 225) = P\left(\frac{175-200}{25} < Z < \frac{225-200}{25}\right)$

$= P(-1 < Z < 1)$

$= 0.682689...$

≈ 0.6827 (4dp)

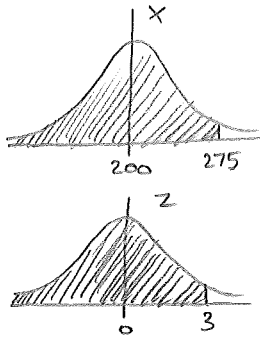


c) $P(X < 275) = P\left(Z < \frac{275-200}{25}\right)$

$= P(Z < 3)$

$= 0.99865...$ from normCdf(-9E99, 3)

≈ 0.9987 (4dp)



Ex 8C no. 2

$X \sim N(6, 2^2)$

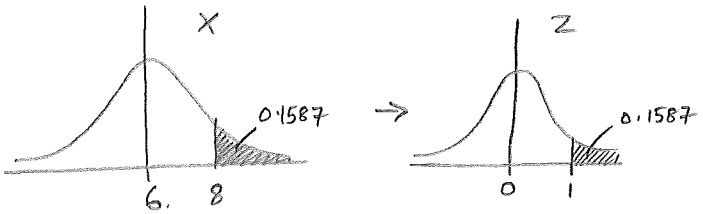
a) $P(X > 8) = P\left(Z > \frac{8-6}{2}\right)$

$= P\left(Z > \frac{2}{2}\right)$

$= P(Z > 1)$

$\approx 0.158655...$

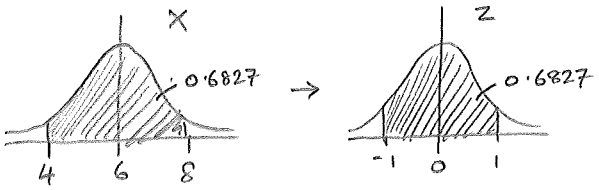
≈ 0.1587 (4dp)



b) $P(4 < X < 8) = P\left(\frac{4-6}{2} < Z < \frac{8-6}{2}\right)$

$= P(-1 < Z < 1)$

≈ 0.6827 (4dp)

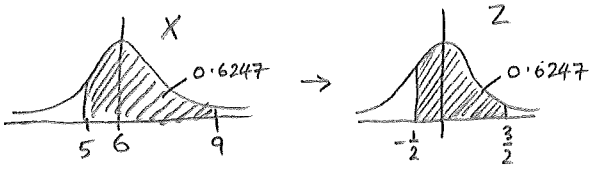


c) $P(5 < X < 9) = P\left(\frac{5-6}{2} < Z < \frac{9-6}{2}\right)$

$= P\left(-\frac{1}{2} < Z < \frac{3}{2}\right)$

$\approx 0.624655...$

≈ 0.6247 (4dp)



from normCdf$\left(-\frac{1}{2}, \frac{3}{2}\right)$.

Ex 8C no. 3.

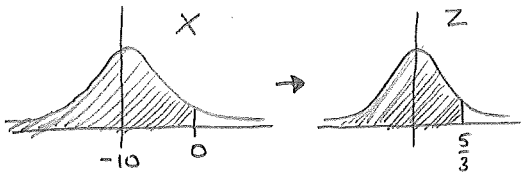
$X \sim N(-10, 6^2)$

a) $P(X<0) = P\left(Z < \frac{0-(-10)}{6}\right)$

$= P\left(Z < \frac{5}{3}\right)$

$\approx 0.95221...$ from nomCdf $(-9E99, \frac{5}{3})$

$\approx \underline{0.9522}$ (4dp)



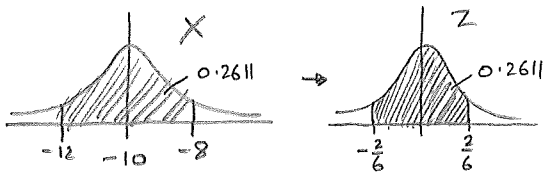
b) $P(-12 < X < -8) = P\left(\frac{-12-(-10)}{6} < Z < \frac{-8-(-10)}{6}\right)$

$= P\left(-\frac{2}{6} < Z < \frac{2}{6}\right)$

$\approx 0.261117...$

$\approx \underline{0.2611}$ (4dp)

[answers at back are incorrect]

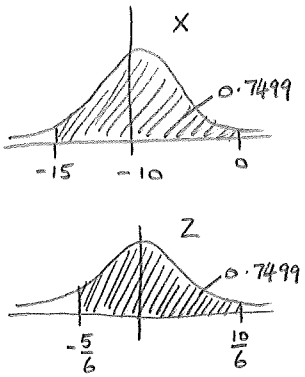


c) $P(-15 < X < 0) = P\left(\frac{-15-(-10)}{6} < Z < \frac{0-(-10)}{6}\right)$

$= P\left(-\frac{5}{6} < Z < \frac{10}{6}\right)$

$= 0.749881...$

$\approx \underline{0.7499}$ (4dp)



Ex 8C no. 4

X = life of components in hours.

$X \sim N(2400, 300^2)$

$$P(X > 3000) = P\left(z > \frac{3000 - 2400}{300}\right)$$

$$= P(z > 2)$$

$$= 0.02275...$$ from normCdf(2,9E99)

$$\approx 0.0228 \quad (4dp)$$

(i.e. it is unlikely that the personal stereo will still be working in 3 years' time, if you listen to it for 2h45m every day!)

Ex 8C no. 5.

X = maximum flow of river in Africa, in m^3/s.

$X \sim N(6300, 1900^2)$

$$P(\text{banks burst}) = P(X > 8700)$$

$$= P\left(Z > \frac{8700 - 6300}{1900}\right)$$

$$= P\left(Z > \frac{2400}{1900}\right)$$

$$= P\left(Z > \frac{24}{19}\right)$$

$$= 0.103266\ldots$$

$$\approx 0.1033 \text{ (4dp)}$$

Ex 8C no. 6

X = IQ score

$X \sim N(100, 15^2)$

$P(\text{join Mensa}) = P(X > 138)$

$= P\left(Z > \frac{138-100}{15}\right)$

$= P\left(Z > \frac{38}{15}\right)$

$= 0.005649...$

$\approx 0.56\%$ of the population

$P(\text{gifted}) = P(X > 150)$

$= P\left(Z > \frac{150-100}{15}\right)$

$= P\left(Z > \frac{50}{15}\right)$

$= 0.000429...$

let G = no. gifted students in a school of 1800

$G \sim B(1800, 0.000429)$

$E(G) = 1800 \times 0.000429$

≈ 0.77241

So we would expect either 0 or 1 students in the school to be gifted.

Ex 8C no. 7

X = rainfall, in mm

$X \sim N(850, 100^2)$

$$P(X > 1000) = P\left(Z > \frac{1000 - 850}{100}\right)$$

$$= P\left(Z > \frac{150}{100}\right)$$

$$= P(Z > 1.5)$$

$$= 0.066807...$$

$$\doteq 0.0668 \quad (4\text{dp})$$

Ex 8C no. 8.

X = verbal reasoning scores

$X \sim N(98.42, 15.31^2)$

$P(\text{need help}) = P(X < 80)$

$= P\left(Z < \frac{80 - 98.42}{15.31}\right)$

$= P(Z < -1.20314)$

$\approx 0.114462\ldots$

$\approx 11.4\%$ (3sf)