Øving 7 Sander Lindberg

Oppgave 5.25)

$P(z<0) = \underline{0,5}$

$P(z<1,22) = \underline{0,8888}$

$P(1,13 < z < 2,45) = P(z<2,45) - P(z<1,13) = 0,9929 - 0,8708$

$= \underline{0,1221}$

$P(-0,87 < z < 1,11) = P(z<1,11) - P(z<-0,87)$

$= 0,8665 - 0,1922 = \underline{0,6743}$

Oppgave 5.27)

$X \sim n(x; 180, 8)$

$P(X<167) = P\left(z<\frac{167-180}{8}\right)$

$= P(z<-1,625) = \underline{\underline{0,0526}}$ (antar $z<-1,62$)

$P(X>195) = 1 - P\left(z<\frac{195-180}{8}\right) = 1 - P(z<1,88)$

$= 1 - 0,9699 = \underline{\underline{0,0301}}$

$P(175<X<182) = P\left(z<\frac{182-180}{8}\right) - P\left(z<\frac{175-180}{8}\right)$

$= P(z<0,25) - P(z<-0,63)$

$= 0,5987 - 0,2643 = \cancel{0,2477}\ \underline{0,3344}$

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Oppgave 5.32)

$T \sim N(T; 24{,}8; 2.2)$

$$P\left(Z > \frac{x - 24{,}8}{2{,}2}\right) =$$

Må finne x slik at $\frac{x - 24{,}8}{2{,}2}$ gir en verdi slik at $P\left(Z > \frac{x-24{,}8}{2{,}2}\right) = 0{,}07$

Ser i tabellen at $\frac{x - 24{,}8}{2{,}2}$ må være $-3{,}09$

$$\frac{x - 24{,}8}{2{,}2} = -3{,}09$$

$$x - 24{,}8 = -6{,}798$$

$$x = 18{,}002 \approx \underline{18^\circ C}$$

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Oppgave 5.32)

y er normalfordelt.

Siden de er uavhengige er $E[y] = E[x_1] + E[x_2] + E[x_3] + E[x_4]$
$= 4 + 5 + 7 + 9 = \underline{\underline{25}}$

Samme med variansen:

$Var[y] = 1 + 1 + 1 + 1 = \underline{\underline{4}}$

$$P(y \leq 20) = P\left(z \leq \frac{20-25}{2}\right) = P\left(z \leq -\frac{5}{2}\right)$$
$$= P(z \leq -2{,}5) = \underline{\underline{0{,}0062}}$$

STO203 2015H 3)

a) $X \sim N(x; 9, 2)$
$y \sim N(y; 9, 2)$

$P(X > 10) = 1 - P(z \leq 0{,}5) =$ ~~[illegible]~~
$= 1 - 0{,}6915 = \underline{\underline{0{,}3085}}$

$P\left(\frac{1}{2}(X+y) > 10\right)$:

$\frac{1}{2}(X+y)$ er gjennomsnittet. Forventningen til denne er gitt ved $E\left(\frac{1}{2}(X+y)\right) = \frac{1}{2}E(X+y) = \frac{1}{2}\left(E[X] + E[y]\right)$

$= \frac{2 \cdot 9}{2} = \underline{\underline{9}}$

Variansen er $Var\left(\frac{1}{2}(X+y)\right) = \left(\frac{1}{2}\right)^2 Var(X+y)$

$$= \frac{1}{4} \cdot \left(Var(X) + Var(y)\right) = \frac{2^2 + 2^2}{4} = \underline{\underline{2}}$$

$$P\left(\frac{1}{2}(X+y) > \frac{10-9}{\sqrt{2}}\right) = P\left(\frac{1}{2}(X+y) > 0{,}707\right) = 1 - P(X \leq 0{,}707)$$
$$= 1 - 0{,}7611 = \underline{\underline{0{,}24}}$$

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b)

$P(10 < x < y)$

Siden x og y er uavhengige og har samme fordeling, har de også lik samme synlighet.
Derfor blir

$$P(10 < x < y) = \frac{1}{2} P(x > 10,\ y > 10) = \frac{1}{2} P(x > 10) \cdot P(y > 10)$$

$$= \frac{1}{2} P\left(z > \frac{10-9}{2}\right) \cdot P\left(z > \frac{10-9}{2}\right)$$

$$= \frac{1}{2}\left(\left(1 - P\left(z \leq \frac{1}{2}\right)\right)^2\right) = \frac{1}{2}(1 - 0,7611)^2$$

$$= \frac{1}{2} \cdot 0,3085^2 = \underline{\underline{0,048}}$$

ST0103 2016H 1)

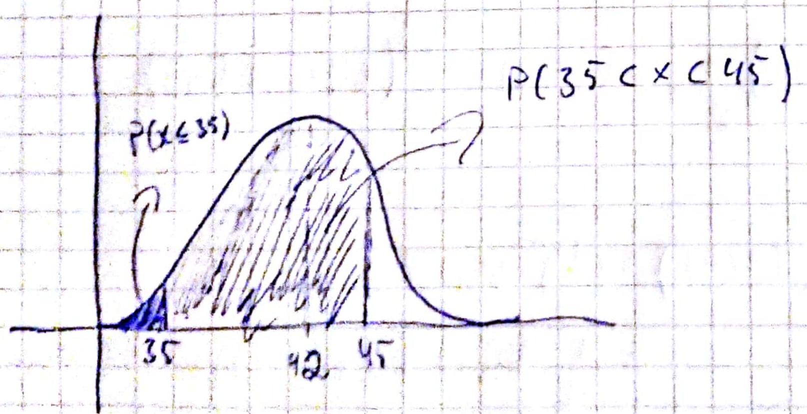
a) $X \sim N(x; 42, 4)$

$$P(X < 35) = P\left(z \leq \frac{35-42}{4}\right) = P(z \leq -1,75) = 0,0401$$

$$P(35 < x < 45) = P\left(z \leq \frac{45-42}{4}\right) - P(z \leq -1,75)$$

$$= P(z \leq 0,75) - 0,0401$$

$$= 0,7734 - 0,0401 = \underline{\underline{0,7333}}$$



5) $\overline{X} \sim N(42, \sigma)$

$$\sigma = \frac{\sqrt{Var(X_1)+Var(X_2)+Var(X_3)+Var(X_4)}}{4}$$

$$\sigma = \frac{\sqrt{4 \cdot 4^2}}{4} = \frac{\sqrt{64}}{4} = \frac{8}{4} = \underline{\underline{2}}$$

$\overline{X} \sim N(42, 2)$

$$P(\overline{X} < 35) = P\left(Z \leq \frac{35-42}{2}\right) = P(Z \leq -3{,}5) = \underline{\underline{0{,}0002}}$$

Hver av de fire prøvene har en suksess sannsynlighet på $P(X<35) = 0{,}7333$ (fra a)).

Jeg skal velge X ut av N med suksess P,

Jeg bruker da binomisk fordeling:

$$P(X \geq 3) = P(X=3) + P(X=4)$$
$$= \binom{4}{3} \cdot 0{,}7333^3 \cdot (1-0{,}7333)^1 + \binom{4}{4} \cdot 0{,}7833^4$$
$$= \underline{\underline{0{,}710}}$$

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STO103 2017H 2)

a) $P(\mu - 2\sigma < y < \mu + 2\sigma)$

$= P(y < \mu + 2\sigma) - P(y < \mu - 2\sigma)$

$= P\left(z < \frac{(\mu + 2\sigma) - \mu}{\sigma}\right) - P\left(z < \frac{(\mu - 2\sigma) - \mu}{\sigma}\right)$

$= P(z < 2) - P(z < -2) = 0{,}9772 - 0{,}0228 = \underline{\underline{0{,}9544}}$

b) $P(y < 0) = 0{,}5$, $P(y < 1) = 0{,}6915$

$\frac{0 - \mu}{\sigma} = 0$ $\qquad$ $\frac{1 - \mu}{\sigma} = 0{,}5$

$\downarrow$ $\qquad$ $\downarrow$

$\mu = \underline{\underline{0}} \rightarrow \frac{1 - 0}{\sigma} = 0{,}5$

$\downarrow$

$\frac{1 = \frac{1}{2}\sigma}{\frac{1}{2}} \rightarrow \sigma = 2 \Rightarrow \sigma^2 = \underline{\underline{4}}$

$\underline{\underline{\mu = 0 \text{ og } \sigma^2 = 4}}$

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