HET AMSTERDAMS LYCEUM

Naam: H11 : Kansverdelingen   Klas: V5   Cijfer:

Vak: wis A & wis C   Datum:

① a) $p(\text{hoogstens } 22) = 1 - p(\text{minstens } 23) = 1 - p(\overset{\text{som}}{23}) - p(\text{som } 24)$

$= 1 - \binom{4}{1} p(5666) - p(6666)$

$= 1 - 4 \cdot \left(\frac{1}{6}\right)^1 \left(\frac{1}{6}\right)^3 - \left(\frac{1}{6}\right)^4$

$= 1 - \frac{4}{1296} - \frac{1}{1296} = \frac{1291}{1296}$

b) $p(\text{minstens } 7) = 1 - p(\text{hoogstens } 6)$

$= 1 - p(\text{som } 4) - p(\text{som } 5) - p \text{ som}(6)$

$= 1 - p(1111) - \binom{4}{1} p(1112) - \binom{4}{1} p(1113) - \binom{4}{2} p(1122)$

$= 1 - \left(\frac{1}{6}\right)^4 - 4 \cdot \left(\frac{1}{6}\right)^3 \left(\frac{1}{6}\right)^1 - 4 \cdot \left(\frac{1}{6}\right)^3 \cdot \left(\frac{1}{6}\right)^1 - 6 \cdot \left(\frac{1}{6}\right)^2 \cdot \left(\frac{1}{6}\right)^2$

$= 1 - \frac{1}{1296} - \frac{4}{1296} - \frac{4}{1296} - \frac{6}{1296} = \frac{1281}{1296} = \frac{427}{432}$

②

~~7~~ 1 × 100
2 × 50
4 × 10
43 × 0

3 pakken (zonder terugleggen)

a) $p(\text{minstens 1 prijs}) = 1 - p(\text{geen prijs}) = 1 - \frac{\binom{7}{0}\binom{43}{3}}{\binom{50}{3}} \approx 0{,}370$

b) $p(100 \text{ euro}) = p(1 \times 100 \text{ en } 2 \times 0) + p(2 \times 50 \text{ en } 1 \times 0)$

$= \frac{\binom{1}{1}\binom{43}{2}\binom{6}{0}}{\binom{50}{3}} + \frac{\binom{2}{2}\binom{43}{1}\binom{5}{0}}{\binom{50}{3}} \approx 0{,}048$

c) $p(\text{minstens } 30 \text{ euro}) = 1 - p(\text{hoogstens } 20 \text{ euro})$

$= 1 - p(3 \times 0) - p(1 \times 10 \text{ en } 2 \times 0) - p(2 \times 10 \text{ en } 1 \times 0)$

$= 1 - \frac{\binom{43}{3}\binom{7}{0}}{\binom{50}{3}} - \frac{\binom{4}{1}\binom{43}{2}\binom{3}{0}}{\binom{50}{3}} - \frac{\binom{4}{2}\binom{43}{1}\binom{3}{0}}{\binom{50}{3}} \approx 0{,}173$

③

$\boxed{V}\ \square\ \square\ \square\ \square \leftarrow$ topsporters

$\frac{1}{5}$

a) $p(\text{geen enkele } v) = p(\bar{v}\bar{v}\bar{v}\bar{v}\bar{v}) = \binom{5}{0}\left(\frac{1}{5}\right)^0\left(\frac{4}{5}\right)^5 = \left(\frac{4}{5}\right)^5 \approx 0{,}328$

b) $p(\text{minstens } 1 \times v) = 1 - p(\text{geen enkele } v) = 1 - p(\bar{v}\bar{v}\bar{v}\bar{v}\bar{v}\bar{v}) = 1 - \binom{6}{0}\left(\frac{1}{5}\right)^0\left(\frac{4}{5}\right)^6$

$= 1 - \left(\frac{4}{5}\right)^6 \approx 0{,}738$

c) $p(\text{precies } 1\ v) = \binom{8}{1} p(v\bar{v}\bar{v}\bar{v}\bar{v}\bar{v}\bar{v}\bar{v}) = \binom{8}{1}\left(\frac{1}{5}\right)^1\left(\frac{4}{5}\right)^7 \approx 0{,}336$.

of

$= \text{binompdf}(8, \frac{1}{5}, 1) \approx 0{,}336$

④

p Rood

$(50-p)$ wit

2 pakken (zonder terugleggen)

$p(\text{Rode en witte}) = \binom{2}{1} \cdot p(RW) = \binom{2}{1} \cdot \frac{p}{50} \cdot \frac{50-p}{49} = \frac{100p - 2p^2}{2450} = \frac{50p - p^2}{1225}$

$p(\text{Rode en Witte}) > 0{,}5$

$y_1 = \frac{50p - p^2}{1225}$ optie table geeft $p = 22$ t/m $p = 28$ rode knikkers

Hier: $50 - 22 = 28$ t/m $50 - 28 = 22$ witte knikkers

⑤

60 % brandbaar

15 % bijtend

25 % anders

10 pakken (met terugleggen)

a) $p(\text{geen bijtende stoffen}) = \binom{10}{0}(0{,}15)^0(0{,}85)^{10} \overset{\text{of}}{=} \text{binompdf}(10, 0.15, 0) \approx 0{,}197$

b) $p(8 \text{ brandbaar en } 2 \text{ bijtend}) = \binom{10}{8}(0{,}60)^8 \cdot (0{,}15)^2 \approx 0{,}017$ (binom niet mogelijk!)

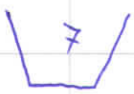
c) $p(\text{minstens } 9 \text{ brandbaar}) = \binom{10}{9} p(9 \text{ brandbaar}) + \binom{10}{10} p(10 \text{ brandbaar})$

$= \binom{10}{9} \cdot (0{,}60)^9 (0{,}40)^1 + \binom{10}{10} \cdot (0{,}60)^{10} \cdot (0{,}40)^0 \approx 0{,}046$

of

$= \text{binompdf}(10, 0.60, 9) + \text{binompdf}(10, 0.60, 10) \approx 0{,}046$

⑥ a)



3 R

4 W

pakken totdat witte

X = aantal keer pakken

x	1	2	3	4	$\leftarrow L_1$
$p(X=x)$	$\frac{4}{7}$	$\frac{2}{7}$	$\frac{4}{35}$	$\frac{1}{35}$	$\leftarrow L_2$

$p(X=1) = p(W) = \frac{4}{7}$

$p(X=2) = p(RW) = \frac{3}{7} \cdot \frac{4}{6} = \frac{2}{7}$

$p(X=3) = p(RRW) = \frac{3}{7} \cdot \frac{2}{6} \cdot \frac{4}{5} = \frac{4}{35}$

$p(X=4) = p(RRRW) = \frac{3}{7} \cdot \frac{2}{6} \cdot \frac{1}{5} \cdot \frac{4}{4} = \frac{1}{35}$

b) 1-Var Stats L_1, L_2 geeft $E(X) = 1{,}6$

$\sigma_X = 0{,}8$

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(7) Vaas: 25 — 12 R, 8 Z, 5 W

2 pakken (zonder terugleggen)

15 x pakken (met terugleggen)

X = aantal keer 2 rode

a) $p(\underbrace{\text{drie keer}}_{X}, \underbrace{\text{twee rode}}_{p}) = p(X=3) = \binom{15}{3}\left(\frac{11}{50}\right)^3\left(\frac{39}{50}\right)^{12}$ of $= \text{binompdf}(15, \frac{11}{50}, 3)$

$\approx 0,246$

$p = p(\text{twee rode}) = p(RR) = \dfrac{\binom{12}{2}\binom{13}{0}}{\binom{25}{2}} = \dfrac{11}{50}$ of $p(RR) = \dfrac{12}{25} \cdot \dfrac{11}{24} = \dfrac{11}{50}$

X = aantal keer precies 1 zwarte

b) $p(\underbrace{\text{minstens 10 x}}_{X}, \underbrace{\text{precies 1 zwarte}}_{p}) = p(X \geq 10)$

$= 1 - p(X \leq 9)$

$= 1 - \text{binomcdf}(15, \frac{34}{75}, 9) \approx 0,081$

$p = p(\text{precies 1 Z}) = \dfrac{\binom{8}{1}\binom{17}{1}}{\binom{25}{2}} = \dfrac{34}{75}$ of $\binom{2}{1}p(Z\bar{Z}) = \binom{2}{1} \cdot \dfrac{8}{25} \cdot \dfrac{17}{24} = \dfrac{34}{75}$

X = aantal keer munt

(8) a) $p(10 < X < 15) = p(X \leq 14) - p(X \leq 10)$

$= \text{binomcdf}(25, \frac{1}{2}, 14) - \text{binomcdf}(25, \frac{1}{2}, 10) \approx 0,576$

X = aantal keer minstens 5 ogen

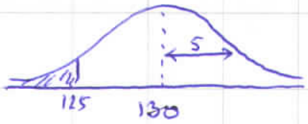
b) $p(\underbrace{\text{hoogstens 10 x}}_{X}, \underbrace{\text{minstens 5 ogen}}_{p}) = p(X \leq 10) =$ ~~binom~~

$= \text{binomcdf}(15, \frac{1}{3}, 10) \approx 0,998$

$p = p(\text{minstens 5 ogen}) = \frac{2}{6} = \frac{1}{3}$

X = aantal pakken met minder dan 125 gram

(9) a)



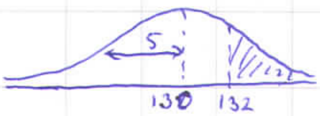
$p(\underbrace{\text{hoogstens 4}}_{X}, \underbrace{\text{minder dan 125 gram}}_{p})$

$p(X \leq 4) = \text{binomcdf}(50, 0{,}159, 4) \approx 0,085$

$p = p(\text{minder dan 125 gram}) = \text{normalcdf}(-10^{99}, 125, 130, 5) \approx 0,159$

X = aantal pakken met meer dan 132 gram

b)

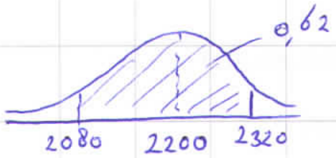


$p(\underbrace{\text{precies 8}}_{X}, \underbrace{\text{meer dan 132 gram}}_{p})$

$p(X = 8) = \text{binompdf}(50, 0.345, 8) \approx 0,002$

$p = p(\text{meer dan 132 gram}) = \text{normalcdf}(132, 10^{99}, 130, 5) \approx 0,345$

⑩



volgens de vuistregels ligt 68% binnen 1σ van μ.

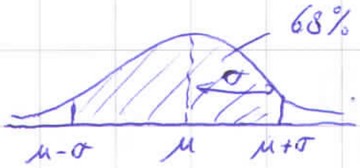
Dus $\sigma_{gok} \approx 120 \rightarrow$ kies $x_{min} = 100$ en $x_{max} = 140$

$p(2080 < X < 2320) = \underbrace{\text{normalcdf}(2080, 2320, 2200, x)}_{y_1} = \underbrace{0{,}62}_{y_2}$

neem $y_{min} = 0$ en $y_{max} = 1$

optie intersect geeft: $x \approx 136{,}7$. $\sigma \approx 140$.

⑪ a)



b)

⑫

4 K
5 S
6 C

6 pakken

a) $p(\text{alleen colaflesjes}) = \dfrac{\binom{6}{6}\binom{9}{0}}{\binom{15}{6}} \approx 0{,}0002$ of $p(cccccc) = \frac{6}{15} \cdot \frac{5}{14} \cdot \frac{4}{13} \cdot \frac{3}{12} \cdot \frac{2}{11} \cdot \frac{1}{10}$

b) $p(\text{3 spekkies en 3 kikkers}) = \dfrac{\binom{5}{3}\binom{6}{3}\binom{4}{0}}{\binom{15}{6}} \approx 0{,}040$ of $\binom{6}{3}\binom{3}{3} \cdot p(SSSKKK)$

$\binom{6}{3}\binom{3}{3} \cdot \frac{5}{15} \cdot \frac{4}{14} \cdot \frac{3}{13} \cdot \frac{6}{12} \cdot \frac{5}{10} \cdot \frac{4}{10}$

c) $p(\text{eerst 3 spekkies en daarna 3 kikkers}) = p(SSS\,KKK) = \frac{5}{15} \cdot \frac{4}{14} \cdot \frac{3}{13} \cdot \frac{6}{12} \cdot \frac{5}{14} \cdot \frac{4}{10} \approx 0{,}002$

d) $p(\text{eerst 2 K en 3 S en als laatste C}) = \binom{5}{2}\binom{3}{3} \cdot p(KKSSSC)$

$= \binom{5}{2} \cdot \binom{3}{3} \cdot \frac{4}{15} \cdot \frac{3}{14} \cdot \frac{5}{13} \cdot \frac{4}{12} \cdot \frac{3}{11} \cdot \frac{6}{10} \approx 0{,}012$