

Hoofdstuk 4: Het kansbegrip.

4.1 Kansen

Opgave 1:

De kans dat ze 7 gooit is groter, want ze kan op zes manieren 7 gooien: 1-6, 2-5, 3-4, 4-3, 5-2, 6-1.

Ze kan op 4 manieren 9 gooien: 3-6, 4-5, 5-4, 6-3.

Opgave 2:

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Opgave 4:

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Opgave 5:

- a. niet iedere sector is even groot
- b. $\frac{1}{6}$

Opgave 6:

totaal: $2^4 = 16$ mogelijkheden

- a. 4 keer kop of 4 keer munt dus: $\binom{4}{0} + \binom{4}{4} = 1 + 1 = 2$

$$P(4 \text{ keer hetzelfde}) = \frac{2}{16}$$

- b. 1 keer kop: $\binom{4}{1} = 4$

$$P(1 \text{ keer kop}) = \frac{4}{16}$$

- c. 2 keer munt of 3 keer munt of 4 keer munt, dus: $\binom{4}{2} + \binom{4}{3} + \binom{4}{4} = 6 + 4 + 1 = 11$

$$P(\text{meer dan 1 keer munt}) = \frac{11}{16}$$

Opgave 7:

totaal: $6^3 = 216$ mogelijkheden

- a. 1-1-3 kan op 3 manieren
1-2-2 kan op 3 manieren
dus $\frac{6}{216}$
- b. som = 3 : 1-1-1 kan op 1 manier
som = 4 : 1-1-2 kan op 3 manieren
som = 5 : kan op 6 manieren (zie opgave a)
som = 6 : 1-1-4 kan op 3 manieren
1-2-3 kan op 6 manieren
2-2-2 kan op 1 manier
dus $\frac{20}{216}$
- c. 3 keer 1, of 3 keer 2, of 3 keer 3, of 3 keer 4, of 3 keer 5, of 3 keer 6
dus $\frac{6}{216}$

Opgave 8:

totaal: $6^4 = 1296$ mogelijkheden

- a. 6-6-6-4 kan op 4 manieren

6-6-5-5 kan op $\frac{4!}{2! \cdot 2!} = 6$ manieren

dus $\frac{10}{1296}$

- b. som = 4: 1-1-1-1 kan op 1 manier
som = 5: 1-1-1-2 kan op 4 manieren
som = 6: 1-1-1-3 kan op 4 manieren
1-1-2-2 kan op 6 manieren

dus $\frac{15}{1296}$

- c. 1-1-1-4 kan op 4 manieren
1-1-2-2 kan op 6 manieren

dus $\frac{10}{1296}$

Opgave 9:

totaal: $2^6 = 64$ mogelijkheden

a. $\binom{6}{5} = 6$ dus $\frac{6}{64}$

b. $\binom{6}{3} = 20$ dus $\frac{20}{64}$

c. 0 keer kop, of 1 keer kop, of 2 keer kop: $\binom{6}{0} + \binom{6}{1} + \binom{6}{2} = 1 + 6 + 15 = 22$

dus $\frac{22}{64}$

Opgave 10:

Totaal $4^3 = 64$ mogelijkheden.

- a. som = 12 4-4-4 kan op 1 manier
som = 11 4-4-3 kan op 3 manieren
som = 10 4-4-2 kan op 3 manieren
4-3-3 kan op 3 manieren

dus totaal 10 manieren, dus $\frac{10}{64}$.

- b. 1-3-4 kan op $3! = 6$ manieren
2-2-3 kan op 3 manieren

dus totaal 9 manieren, dus $\frac{9}{64}$.

Opgave 11:

a. $\frac{10}{36}$

300	x	x	x			
200				x	x	
200				x	x	
100						x
100						x
100						x
	100	100	100	200	200	300

b. $\frac{25}{36}$

300						
200	x	x	x	x	x	
200	x	x	x	x	x	
100	x	x	x	x	x	
100	x	x	x	x	x	
100	x	X	x	x	x	
	100	100	100	200	200	300

c. gemiddeld per klant: $\frac{100 + 100 + 100 + 200 + 200 + 300}{6} = \frac{1000}{6}$

in 12 dagen 24 klanten dus $24 \cdot \frac{1000}{6} = 4000$ euro

Opgave 12:

a. $\frac{1}{36}$

b. $\frac{12}{36}$

v	x	x				
c	x	x				
c	x	x				
500						
50				x	x	x
50				x	x	x
	50	50	500	c	c	v

c. $\frac{5}{36}$

v						
c						
c						
500	x	x				
50			x			
50			x			
	50	50	500	c	c	v

d. $\frac{15}{36}$

v			x	x	x	
c			x			x
c			x			x
500			x	x	x	x
50	x	x				
50	x	x				
	50	50	500	c	c	v

4.2 Empirische kansen

Opgave 13:

a.

aantal worpen N	30	60	120	180	240	300
frequentie f	7	9	22	34	41	48
relatieve frequentie $\frac{f}{N}$	0,23	0,15	0,18	0,19	0,17	0,16

b. 100 keer

c. $\frac{1}{6}$

d. hij verwacht 3 keer zes ogen te gooien, omdat hij niet zo vaak gooit, kan het dus wel.

e. nee, je verwacht dan 300 keer zes ogen te ogen, dus de afwijking is heel erg groot.

Opgave 14:

a.

aantal keer gooien N	50	100	150	200	250	300	500	1000
frequentie f	31	61	89	114	141	174	282	579
relatieve frequentie $\frac{f}{N}$	0,62	0,61	0,59	0,57	0,56	0,58	0,56	0,58

b. 0,58

c. er zijn wel twee mogelijkheden, maar deze blijken in de praktijk niet even vaak voor te komen, dus de kans dat de punaise met de punt omhoog ligt is niet gelijk aan 0,5.

Opgave 15:

a. $2328757 + 1986351 + 186294 = 4501402$

totaal: 6991991

dus $\frac{4501402}{6991991} = 0,644$

b. $\frac{1544585 + 2328757}{6991991} = 0,544$

Opgave 16:

a. $\frac{19+7}{57} = 0,46$

b. $\frac{30+9+5}{57} = 0,77$

c. $\frac{13+21+12}{57} = 0,81$

Opgave 17:

a. totale frequentie = $15 + 20 + 8 + 10 + 4 + 3 = 60$ minuten

taal aantal fietsers = $15 \cdot 5 + 20 \cdot 6 + 8 \cdot 7 + 10 \cdot 8 + 4 \cdot 9 + 3 \cdot 10 = 397$

b. empirische kans

$\frac{15}{60} = 0,25$

c. $\frac{15 + 20 + 8}{60} = \frac{43}{60} = 0,717$

Opgave 18:

- a. $0,2 + 0,2 = 0,4$
- b. $0,15 + 0,25 = 0,4$
- c. $0,15 + 0,05 = 0,2$

Opgave 19:

- a. empirisch
- b. theoretisch
- c. empirisch
- d. theoretisch
- e. empirisch

4.3 Voorwaardelijke kansen

Opgave 27:

- a. $\frac{220}{1090} = 0,220$
b. $\frac{350}{4640} = 0,075$
c. $0,220 > 0,075$

Opgave 28:

- a. $\frac{14+8}{78} = \frac{22}{78} = 0,282$
b. $\frac{6+3}{15+12} = \frac{9}{27} = 0,333$
c. $\frac{8+7+3}{20} = \frac{18}{20} = 0,9$
d. $\frac{8+7+3}{78} = \frac{18}{78} = 0,231$

Opgave 29:

- a. $\frac{9+12+4}{285} = \frac{25}{285} = 0,088$
b. $\frac{10+16}{43} = \frac{26}{43} = 0,605$
c. $\frac{4+5+2+7}{27} = \frac{18}{27} = 0,667$
d. $\frac{5+2+7+3+5+2+1+5}{50+37+43} = \frac{30}{130} = 0,231$

Opgave 30:

- a. $\frac{33}{82} = 0,402$
b. $\frac{18+15}{82} = \frac{33}{82} = 0,402$
c. $\frac{3}{82} = 0,037$
d. $\frac{3}{18} = 0,167$
e. $\frac{10}{16} = 0,625$
f. $\frac{10+4+6+1+18+10}{49+18} = \frac{49}{67} = 0,731$
g. $\frac{4}{3+4+1} = \frac{4}{8} = 0,5$

Opgave 31:

a. $\frac{855134}{983378} = 0,859$

b. $983378 - 967252 = 16126$ dus $\frac{16126}{983378} = 0,016$

c. $\frac{11472}{344752} = 0,033$

d. $1000000 - 983378 = 16622$ dus $\frac{16622}{1000000} = 0,017$

e. $659273 - 344752 = 314521$ dus $\frac{314521}{845134} = 0,372$

Opgave 32:

a. $\frac{82}{496} = 0,165$

b. $\frac{82 - 59}{496} = 0,046$

c. $\frac{59}{169} = 0,349$

d. $\frac{59}{118} = 0,500$

e. $\frac{42 - 32}{42} = \frac{10}{42} = 0,238$

f. $\frac{118 - 42}{118} = \frac{76}{118} = 0,644$

Opgave 33:

- bereken de kans dat een treinpassagier jonger dan 20 jaar is.
- bereken de kans dat een treinpassagier 40 jaar of ouder is.
- bereken de kans dat een treinpassagier uit de leeftijdscategorie 20- < 40 een voordeelurenkaart heeft.
- bereken de kans dat een treinpassagier zonder voordeelurenkaart uit de leeftijdscategorie 20- < 40 komt.
- bereken de kans dat een treinpassagier een voordeelurenkaart heeft en jonger is dan 20 jaar.
- bereken de kans dat een treinpassagier uit de leeftijdscategorie 20- < 60 een voordeelurenkaart heeft.

Opgave 34:

a.

	A	B	C	
wel antwoord	570	690	147	1407
niet antwoord	30	60	3	93
	600	750	150	1500

$$\frac{1407}{1500} = 0,938$$

- b. $\frac{570}{1407} = 0,405$
 c. $\frac{3}{93} = 0,032$

Opgave 35:

- a. $\frac{2765}{4157} = 0,665$
 b. $\frac{912}{2765} = 0,330$
 c. $\frac{240}{393} = 0,611$

	Europa	Amerika	Overige	
nieuw	912	153	197	1262
2 ^e hands	1853	240	802	2895
	2765	393	999	4157

Opgave 36:

$\frac{0,45}{1,6} = 0,281$

	I	II	III	
goed	54,45	29,4	14,55	98,4
defect	0,55	0,6	0,45	1,6
	55	30	15	100

Opgave 37:

	wel tbc	niet tbc	
positief	1,96	999,98	1001,94
negatief	0,04	8998,02	8998,06
	2	99998	10000

- a. $\frac{1,96}{1001,94} = 0,0020$
 b. $0,0020 \cdot 50 = 0,1$

Opgave 38:

$P(Rh^+) = \frac{1700}{2000} = 0,85$

$P(Rh^+ \text{ onder de voorwaarde bloedgroep O}) = \frac{1250}{1500} = 0,833$

Deze kansen zijn niet gelijk dus afhankelijk.

Opgave 39:

a.

	A	geen A	
Rh +	51	119	170
Rh -	9	21	30
	60	140	200

- b. $\frac{9}{200} = 0,045$
 c. $\frac{51}{170} = 0,300$

4.4 Het vaasmodel

Opgave 40:

- als je de eerste persoon gekozen hebt, zijn er nog maar 9 mogelijkheden voor de tweede persoon en nog maar 8 mogelijkheden voor de derde persoon.
- de volgorde waarin je de personen kiest, is niet van belang.
- $\binom{10}{3} = 120$

Opgave 41:

$$\frac{\binom{7}{5} \cdot \binom{8}{0}}{\binom{15}{5}}$$

Opgave 42:

a. $\frac{\binom{7}{3}}{\binom{21}{3}} = 0,026$

b. $\frac{\binom{15}{3}}{\binom{21}{3}} = 0,342$

c. $\frac{\binom{7}{2} \cdot \binom{8}{1}}{\binom{21}{3}} = 0,126$

d. $\frac{\binom{8}{2} \cdot \binom{13}{1}}{\binom{21}{3}} = 0,274$

Opgave 43:

a. $\frac{\binom{32}{3} \cdot \binom{12}{3}}{\binom{62}{6}} = 0,0178$

b. $\frac{\binom{30}{6}}{\binom{62}{6}} = 0,0097$

c. $\frac{\binom{32}{4} \cdot \binom{30}{2}}{\binom{62}{6}} = 0,2545$

d. $\frac{\binom{18}{1} \cdot \binom{44}{5}}{\binom{62}{6}} = 0,3180$

Opgave 44:

a. $P(0 \text{ blauw}) = \frac{\binom{10}{3}}{\binom{16}{3}} = 0,214$

$$P(1 \text{ blauw}) = \frac{\binom{6}{1} \cdot \binom{10}{2}}{\binom{16}{3}} = 0,482$$

$$P(2 \text{ blauw}) = \frac{\binom{6}{2} \cdot \binom{10}{1}}{\binom{16}{3}} = 0,268$$

$$P(3 \text{ blauw}) = \frac{\binom{6}{3}}{\binom{16}{3}} = 0,036$$

aantal blauw	0	1	2	3
kans	0,214	0,482	0,268	0,036

b. 1 ; alle kansen samen zijn altijd 1.

Opgave 45:

a. 1 rood, 5 blauw, 54 wit
hij pakt 5 knikkers

$$b. \frac{\binom{5}{2} \cdot \binom{54}{3}}{\binom{60}{5}} = 0,045$$

$$c. \frac{\binom{1}{1} \cdot \binom{5}{1} \cdot \binom{54}{3}}{\binom{60}{5}} = 0,023$$

Opgave 46:

$$a. \frac{\binom{10}{1} \cdot \binom{30}{2}}{\binom{40}{3}} = 0,440$$

$$b. \frac{\binom{7}{2} \cdot \binom{30}{2}}{\binom{40}{4}} = 0,100$$

$$c. \frac{\binom{30}{7}}{\binom{40}{7}} = 0,109$$

$$d. \frac{\binom{10}{4}}{\binom{40}{4}} = 0,002$$

Opgave 47:

$$a. \frac{\binom{9}{6}}{\binom{15}{6}} = 0,017$$

$$b. \frac{\binom{6}{3} \cdot \binom{9}{3}}{\binom{15}{6}} = 0,336$$

Opgave 48:

a.
$$\frac{\binom{5}{1}}{\binom{25}{1}} = 0,200$$

b.
$$\frac{\binom{4}{4} \cdot \binom{21}{1}}{\binom{25}{5}} = 0,0004$$

Opgave 49:

a.
$$\frac{\binom{1}{1} \cdot \binom{1}{1} \cdot \binom{1}{1} \cdot \binom{1}{1}}{\binom{26}{4}} = 6,7 \cdot 10^{-5}$$

b.
$$\frac{\binom{1}{1} \cdot \binom{1}{1} \cdot \binom{1}{1} \cdot \binom{23}{1}}{\binom{26}{4}} = 0,00154$$

c.
$$\frac{\binom{1}{1} \cdot \binom{1}{1} \cdot \binom{24}{2}}{\binom{26}{4}} = 0,0185$$

Opgave 50:

a.
$$\frac{\binom{20}{7}}{\binom{41}{7}} = 0,0034$$

b.
$$\frac{\binom{19}{7}}{\binom{41}{7}} = 0,0022$$

c.
$$\frac{\binom{36}{7}}{\binom{41}{7}} = 0,3713$$

d.
$$\frac{\binom{36}{6} \cdot \binom{1}{1}}{\binom{41}{7}} = 0,0866$$

e.
$$\frac{\binom{1}{1} \cdot \binom{1}{1} \cdot \binom{24}{5}}{\binom{41}{7}} = 0,0019$$

Opgave 51:

$$\frac{\binom{18}{4}}{\binom{20}{4}} = 0,6316$$

Opgave 52:

$$\frac{\binom{18}{18}}{\binom{20}{18}} = 0,0053$$

Opgave 53:

$$\frac{\binom{490}{25}}{\binom{500}{25}} = 0,5959$$

Opgave 54:

a. $\frac{\binom{36}{3}\binom{84}{9}}{\binom{120}{12}} = 0,249$

b. $\frac{\binom{42}{2}\binom{78}{10}}{\binom{120}{12}} = 0,103$

c. $\frac{\binom{54}{5}\binom{66}{7}}{\binom{120}{12}} = 0,234$

Opgave 55:

a. $\frac{\binom{15}{4}}{\binom{28}{4}} = 0,067$

b. $\frac{\binom{17}{3}\binom{11}{1}}{\binom{28}{4}} = 0,365$

c. $\frac{\binom{1}{1}\binom{27}{3}}{\binom{28}{4}} = 0,143$

d. $\frac{\binom{24}{4}}{\binom{28}{4}} = 0,519$

4.5 De somregel en de complementregel

Opgave 56:

- a. $P(\text{som} = 3) = \frac{2}{36}$ (1-2 of 2-1)
 $P(\text{som} = 4) = \frac{3}{36}$ (1-3 of 2-2 of 3-1)
 $P(\text{som} = 3 \text{ of } \text{som} = 4) = \frac{5}{36}$ (1-2 of 2-1 of 1-3 of 2-2 of 3-1)
- b. ja
- c. $P(\text{som} = 4) = \frac{3}{36}$ (1-3 of 2-2 of 3-1)
 $P(\text{product} = 4) = \frac{3}{36}$ (1-4 of 2-2 of 4-1)
 $P(\text{som} = 4 \text{ of } \text{product} = 4) = \frac{5}{36}$ (1-3 of 2-2 of 3-1 of 1-4 of 4-1)
Dus niet gelijk

Opgave 57:

De noemers zijn gelijknamig dus mag je eerst de tellers optellen en daarna pas delen door de noemer. Voordeel: minder werk.

Opgave 58:

- a. $\frac{\binom{4}{2} \cdot \binom{6}{1} + \binom{4}{3}}{\binom{10}{3}} = 0,333$
- b. $P(\text{minder dan 2 groene}) = P(0 \text{ of } 1 \text{ groene}) = \frac{\binom{6}{3} + \binom{6}{2} \cdot \binom{4}{1}}{\binom{10}{3}} = 0,667$

Opgave 59:

- a. $P(0 \text{ of } 1 \text{ meisje}) = \frac{\binom{13}{4} + \binom{13}{3} \cdot \binom{15}{1}}{\binom{28}{4}} = 0,244$
- b. $\frac{\binom{13}{1} \cdot \binom{15}{3} + \binom{13}{2} \cdot \binom{15}{2} \cdot \binom{13}{3} \cdot \binom{15}{1}}{\binom{28}{4}} = 0,898$

Opgave 60:

- a. $P(0 \text{ of } 1 \text{ prijs}) = \frac{\binom{76}{5} + \binom{4}{1} \cdot \binom{76}{4}}{\binom{80}{5}} = 0,982$
- b. $1 \times 50 \text{ of } 2 \times 25$
 $P = \frac{\binom{1}{1} \cdot \binom{76}{4} + \binom{3}{2} \cdot \binom{76}{3}}{\binom{80}{5}} = 0,062$

Opgave 61:

- a. $\frac{\binom{29}{9} \cdot \binom{24}{1} + \binom{29}{10}}{\binom{53}{10}} = 0,0134$

$$b. \frac{\binom{37}{10} + \binom{37}{9} \cdot \binom{16}{1} + \binom{37}{8} \cdot \binom{16}{2}}{\binom{53}{10}} = 0,3575$$

$$c. \frac{\binom{5}{2} \cdot \binom{48}{8}}{\binom{53}{10}} = 0,1935$$

Opgave 62:

$$a. \frac{\binom{10}{4}}{\binom{22}{4}} = 0,0287$$

$$b. \frac{\binom{10}{3} \cdot \binom{12}{1} + \binom{10}{2} \cdot \binom{12}{2} + \binom{10}{1} \cdot \binom{12}{3} + \binom{12}{4}}{\binom{22}{4}} = 0,9713$$

Opgave 63:

$$a. P(\text{minstens 1 prijs}) = 1 - P(\text{geen prijs}) = 1 - \frac{\binom{21}{3}}{\binom{25}{3}} = 0,4217$$

$$b. P(\text{niet 3 prijzen}) = 1 - P(3 prijzen) = 1 - \frac{\binom{4}{3}}{\binom{25}{3}} = 0,9983$$

$$c. \frac{\binom{4}{2} \cdot \binom{21}{1}}{\binom{25}{3}} = 0,0548$$

$$d. \frac{\binom{21}{3}}{\binom{25}{3}} = 0,5783$$

Opgave 64:

$$a. P(\text{som} \neq 5) = 1 - P(\text{som} = 5) = 1 - \frac{6}{216} = \frac{210}{216} = 0,972$$

$$b. P(\text{som} < 17) = 1 - P(\text{som} \geq 17) = 1 - \frac{4}{216} = \frac{212}{216} = 0,981$$

Opgave 65:

$$a. P(\text{minstens 1 groene}) = 1 - P(\text{geen groen}) = 1 - \frac{\binom{9}{3}}{\binom{12}{3}} = 0,618$$

$$b. P(\text{hoogstens 2 blauw}) = 1 - P(3 blauw) = 1 - \frac{\binom{5}{3}}{\binom{12}{3}} = 0,955$$

$$c. \frac{\binom{4}{1} \cdot \binom{3}{1} \cdot \binom{5}{1}}{\binom{12}{3}} = 0,273$$

$$d. \frac{\binom{4}{3} + \binom{3}{3} + \binom{5}{3}}{\binom{12}{3}} = 0,068$$

Opgave 66:

- het complement van geen groene is minstens 1 groene.
- het complement van gelijke kleuren is niet allemaal gelijke kleuren.
- het complement van meer dan 2 rood is hoogstens 2 rood.
- het complement van hoogstens 3 wit is minstens 4 wit.

Opgave 67:

$$a. P(\text{minstens 1 barst}) = 1 - P(\text{geen barst}) = 1 - \frac{\binom{46}{5}}{\binom{50}{5}} = 0,353$$

$$b. \frac{\binom{4}{4} \cdot \binom{46}{1}}{\binom{50}{5}} = 2,2 \cdot 10^{-5}$$

Opgave 68:

$$a. P(\text{minstens 2 bestuursleden}) = 1 - P(\text{hoogstens 1 bestuurslid}) \\ = 1 - \left(\frac{\binom{59}{5} + \binom{59}{4} \cdot \binom{6}{1}}{\binom{65}{5}} \right) = 0,0633$$

$$b. P(\text{minstens 1 keer supermarkt}) = 1 - P(\text{geen supermarkt}) \\ = 1 - \frac{\binom{57}{5}}{\binom{65}{5}} = 0,4931$$

- c. er zijn 8 leden van de supermarkt en nog 4 bestuursleden die geen lid zijn van de supermarkt.

$$\frac{\binom{53}{3}}{\binom{65}{5}} = 0,3474$$

Opgave 69:

$$a. P(0 \text{ of } 1 \text{ prijs}) = \frac{\binom{42}{4} + \binom{8}{1} \cdot \binom{42}{3}}{\binom{50}{4}} = 0,8848$$

$$b. 1 - P(\text{€75,-}) = 1 - \frac{\binom{3}{1} \binom{4}{1} \binom{42}{2} + \binom{4}{3} \binom{42}{1}}{\binom{50}{4}} = 0,9544$$

$$c. 1 - P(200 \text{ of meer}) = 1 - \frac{\binom{1}{1} \binom{3}{3} + \binom{1}{1} \binom{3}{2} \binom{4}{1} + \binom{1}{1} \binom{3}{1} \binom{42}{2} + \binom{42}{1}}{\binom{50}{4}} = 0,9994$$

$$d. 1 \times 100 \text{ of } 2 \times 50 \text{ of } 1 \times 50 + 2 \times 25 \text{ of } 4 \times 25 \\ \frac{\binom{1}{1} \binom{42}{3} + \binom{3}{2} \binom{42}{2} + \binom{3}{1} \binom{4}{2} \binom{42}{1} + \binom{4}{4}}{\binom{50}{4}} = 0,0644$$

Opgave 70:

$$a. \frac{\binom{20}{6} \cdot \binom{10}{2} + \binom{20}{7} \cdot \binom{10}{1} + \binom{20}{8}}{\binom{30}{8}} = 0,452$$

$$b. \quad P(\text{minder dan 7 jongens}) = 1 - P(\text{minstens 7 jongens}) = 1 - \frac{\binom{12}{7} \cdot \binom{18}{1} + \binom{12}{8}}{\binom{30}{8}} = 0,0025$$

$$c. \quad \frac{\binom{13}{3} \cdot \binom{17}{5}}{\binom{30}{4}} = 0,3024$$

Opgave 71:

$$a. \quad \frac{\binom{9}{4} \cdot \binom{6}{4}}{\binom{15}{8}} = 0,2937$$

b. dus 8 linker handschoenen

$$\frac{\binom{9}{8}}{\binom{15}{8}} = 0,0014$$

$$c. \quad 1 - P(\text{geen of 1 paar}) = 1 - \frac{\binom{9}{8} + \binom{9}{7} \cdot \binom{6}{1}}{\binom{15}{8}} = 0,965$$

Opgave 72:

$$a. \quad \frac{\binom{24}{5}}{\binom{30}{5}} = 0,2983$$

$$b. \quad P(\text{minstens 2 defect}) = 1 - P(\text{hoogstens 1 defect}) = 1 - \left(\frac{\binom{24}{5} + \binom{24}{4} \cdot \binom{6}{1}}{\binom{30}{5}} \right) = 0,7457$$

$$c. \quad \frac{\binom{24}{3} \cdot \binom{6}{2} + \binom{24}{4} \cdot \binom{6}{1} + \binom{24}{5}}{\binom{30}{5}} = 0,9587$$

4.6 Diagnostische toets

Opgave 1:

<p>a. $\frac{6}{48}$</p> <p>b. $\frac{3}{48}$</p> <p>c. $\frac{10}{48}$</p> <p>d. $\frac{6}{48}$</p>	<table style="border-collapse: collapse; margin-bottom: 10px;"> <tr><td style="border-right: 1px solid black; padding: 5px;">8</td><td style="padding: 5px;"></td><td style="padding: 5px;"></td><td style="padding: 5px;"></td><td style="padding: 5px;"></td><td style="padding: 5px;"></td></tr> <tr><td style="border-right: 1px solid black; padding: 5px;">7</td><td style="padding: 5px;">8</td><td style="padding: 5px;"></td><td style="padding: 5px;"></td><td style="padding: 5px;"></td><td style="padding: 5px;"></td></tr> <tr><td style="border-right: 1px solid black; padding: 5px;">6</td><td style="padding: 5px;"></td><td style="padding: 5px;">8</td><td style="padding: 5px;"></td><td style="padding: 5px;"></td><td style="padding: 5px;"></td></tr> <tr><td style="border-right: 1px solid black; padding: 5px;">5</td><td style="padding: 5px;"></td><td style="padding: 5px;"></td><td style="padding: 5px;">8</td><td style="padding: 5px;"></td><td style="padding: 5px;"></td></tr> <tr><td style="border-right: 1px solid black; 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Opgave 2:

Totaal $4^4 = 256$ mogelijkheden

- a. 1-1-4-4: $\frac{4!}{2! \cdot 2!} = 6$ manieren
 1-2-2-4: $\frac{4!}{2!} = 12$ manieren
 2-2-2-2: 1 manier
 dus $\frac{19}{256}$
- b. som = 14: 4-4-4-2: 4 manieren
 4-4-3-3: $\frac{4!}{2! \cdot 2!} = 6$ manieren
 som = 15: 4-4-4-3: 4 manieren
 som = 16: 4-4-4-4: 1 manier
 dus $\frac{15}{256}$

Opgave 3:

- a. $\frac{159 + 33}{215} = 0,983$
- b. $\frac{12}{215} = 0,056$
- c. $\frac{15 + 5}{215} = 0,093$

Opgave 4:

- a. $\frac{15 + 59}{80} = 0,925$
- b. $\frac{6}{33} = 0,182$
- c. $\frac{59 + 49 + 6 + 12}{80 + 66} = \frac{126}{146} = 0,863$

d. $\frac{49 + 51 + 12 + 15}{215} = 0,591$

Opgave 5:

	A	B	C	
wel op post	0,357	0,20	0,2706	0,8276
niet op post	0,063	0,05	0,0594	0,1724
	0,42	0,25	0,33	1

a. 0,1724

b. $\frac{0,063}{0,1724} = 0,365$

c. 0,357

d. $P(\text{er is geen bewaking} | C \text{ heeft dienst}) = \frac{0,0594}{0,33} = 0,18$

$P(\text{er is geen bewaking}) = 0,1724$

De kansen zijn niet gelijk, dus de gebeurtenissen zijn afhankelijk.

Opgave 6:

a. $\frac{\binom{5}{2} \binom{7}{2} \binom{9}{2}}{\binom{21}{6}} = 0,1393$

b. $\frac{\binom{12}{6}}{\binom{21}{6}} = 0,0170$

c. $\frac{\binom{5}{2} \binom{16}{4}}{\binom{21}{6}} = 0,3354$

Opgave 7:

a. $\frac{\binom{33}{4}}{\binom{40}{4}} = 0,4478$

b. $\frac{\binom{7}{2} \binom{33}{2}}{\binom{40}{4}} = 0,1213$

c. $\frac{\binom{1}{1} \binom{6}{1} \binom{33}{2}}{\binom{40}{4}} = 0,0347$

Opgave 8:

$\frac{\binom{16}{2} \binom{144}{18}}{\binom{160}{20}} = 0,3046$

Opgave 9:

a. $P(\text{minstens 1 rood}) = 1 - P(\text{geen rood}) = 1 - \frac{\binom{8}{4}}{\binom{14}{4}} = 0,930$

b. $\frac{\binom{9}{4} + \binom{9}{3} \cdot \binom{5}{1}}{\binom{14}{4}} = 0,545$

c. $\frac{\binom{8}{4}}{\binom{14}{4}} = 0,070$

d. $P(\text{minder dan 3 zwart}) = 1 - P(3 \text{ zwart}) = 1 - \frac{\binom{3}{3} \cdot \binom{11}{1}}{\binom{14}{4}} = 0,989$

Opgave 10:

a. $\frac{\binom{115}{6} + \binom{115}{5} \cdot \binom{5}{1}}{\binom{120}{6}} = 0,980$

b. 1 keer 100 of 4 keer 25

$$\frac{\binom{1}{1} \cdot \binom{115}{5} + \binom{4}{4} \cdot \binom{115}{2}}{\binom{120}{6}} = 0,042$$

c. minimaal 30 euro aan prijzengeld winnen

$$P(\text{geen verlies}) = 1 - P(0 \text{ of } 25 \text{ euro}) = 1 - \frac{\binom{115}{6} + \binom{115}{5} \cdot \binom{4}{1}}{\binom{120}{6}} = 0,062$$

Opgave 11:

a. $\frac{\binom{10}{5} \binom{19}{2} + \binom{10}{6} \binom{19}{1} + \binom{10}{7}}{\binom{29}{7}} = 0,0302$

b. $\frac{\binom{14}{7} + \binom{14}{6} \cdot \binom{15}{1} + \binom{14}{5} \cdot \binom{15}{2}}{\binom{29}{7}} = 0,1657$

c. $1 - P(0 \text{ of } 1 \text{ cijfer } 5 \text{ of lager}) = 1 - \frac{\binom{21}{7} + \binom{21}{6} \cdot \binom{8}{1}}{\binom{29}{7}} = 0,6474$