Assignment 2

46)

a) Participants $= 422 + 181 + 80 + 121 + 201 = 1005$

b) "≤ 1" has the highest probability because this response has the highest frequency.

$P(\leq 1) = \frac{422}{1005} = 0{,}42$

c) $P(\infty) = \frac{201}{1005} = 0{,}2$

d) $P(2 \text{ or more}) = P(2) + P(3) + P(\geq 4, < \infty) + P(\infty)$

$= 1 - P(\leq 1) = 1 - 0{,}42 = 0{,}58$

48)

a)

	Female (F)	Male (M)	Total
Uses social media (A)	0,29	0,21	0,50
Doesn't use social media (A^c)	0,24	0,26	0,50
Total	0,53	0,47	1,00

$P(A \cap F) = \frac{395}{1364} = 0{,}29$ $\quad$ $P(A \cap M) = \frac{291}{1364} = 0{,}21$

$P(A^c \cap F) = \frac{323}{1364} = 0{,}24$ $\quad$ $P(A^c \cap M) = \frac{355}{1364} = 0{,}26$

b) $P(F) = P(F \cap A) + P(F \cap A^c) = 0{,}53$

c) $P(A \mid F) = \dfrac{P(A \cap F)}{P(F)} = \dfrac{0{,}29}{0{,}53} = 0{,}55$

d) $P(A) \cdot P(F) = 0{,}50 \cdot 0{,}53 = 0{,}27$

$P(A \cap F) = 0{,}29$

Since $P(A \cap F) \neq P(A) \cdot P(F)$, the events are not independent

51)

a)

	$< 25{,}000$	$(25.000, 49.999)$	$(50.000, 99.999)$	> 100000	Total
High school graduate (H)	0,151	0,152	0,144	0,053	0,5
Bachelor's Degree (B)	0,038	0,063	0,117	0,119	0,337
Master's Degree (M)	0,010	0,018	0,046	0,062	0,136
Doctoral Degree (D)	0,001	0,003	0,006	0,017	0,027
Total	0,200	0,236	0,313	0,251	1,0

$P(H \cap < 25.000) = \dfrac{9880}{65644} = 0{,}151$ $\quad P(H \cap (25000, 49999)) = \dfrac{9970}{65644} = 0{,}152$

$P(H \cap (50000, 99\,999)) = \dfrac{9441}{65644} = 0{,}144$ $\quad P(H \cap > 100\,000) = \dfrac{3482}{65644}$ $0{,}053$

repeats for all levels of education

Rounded up due to decimals

b) $P(\text{Masters or more}) = P(M) + P(D) = 0,136 + 0,027 = 0,163$

c) $P(>100000 \mid H) = \frac{P(>100000 \cap H)}{P(H)} = \frac{0,053}{0,5} = 0,106$

d) $P(<25000 \mid H) = \frac{P(<25000 \cap H)}{P(H)} = \frac{0,151}{0,5} = 0,302$

e) $P(<25000 \mid B) = \frac{P(<25000 \cap B)}{P(B)} = \frac{0,038}{0,337} = 0,113$

f) We can see that it is more likely to have an income less than \$25000 if the houshold is headed by someone with a highschool diploma than by someone with a bachelor's degree. Level of income and educational level is therefore not independent.

56)

a) A: The event that a house is listed for more than 90 days before being sold

$P(A) = \frac{200}{800} = 0,25$

b) B: The event that the initial asking price is under \$ 150 000

$P(B) = \frac{100}{800} = 0,125$

c) $P(A \cap B) = \frac{10}{800} = 0,0125$

d) $P(A \mid B) = \frac{P(A \cap B)}{P(B)} = \frac{0,0125}{0,125} = 0,100$

The probability of event A given B is 10%

e) $P(A) \cdot P(B) = 0,25 \cdot 0,125 = 0,031$

$P(A \cap B) = 0,0125$

Since $P(A \cap B) \neq P(A) \cdot P(B)$, the events are not independent

58)

F: the event that the undergraduate is female

M: the event that the undergraduate is male

A: the event that the undergraduate study abroad

A^c: the event that the undergraduate doesn't study abroad

$P(A) = 0,095 \rightarrow P(A^c) = 0,905$

$P(F|A) = 0,6 \rightarrow P(M|A) = 0,4$

$P(F|A^c) = 0,49 \rightarrow P(M|A^c) = 0,51$

a)

$$P(A|F) = \frac{P(F|A) \cdot P(A)}{P(F|A) \cdot P(A) + P(F|A^c) \cdot P(A^c)}$$

$$P(A|F) = \frac{0,6 \cdot 0,095}{0,6 \cdot 0,095 + 0,49 \cdot 0,905} = 0,114$$

Given a female undergraduate student, the probability that she studies abroad is 11,4%

b)

$$P(A|M) = \frac{P(M|A) \cdot P(A)}{P(M|A) \cdot P(A) + P(M|A^c) \cdot P(A^c)}$$

$$P(A|M) = \frac{0,4 \cdot 0,095}{0,4 \cdot 0,095 + 0,51 \cdot 0,905} = 0,076$$

Given a male undergraduate student, the probability that he studies abroad is 7,6%

c)

$$P(F) = P(F|A) \cdot P(A) + P(F|A^c) \cdot P(A^c) = 0,6 \cdot 0,095 + 0,49 \cdot 0,905$$

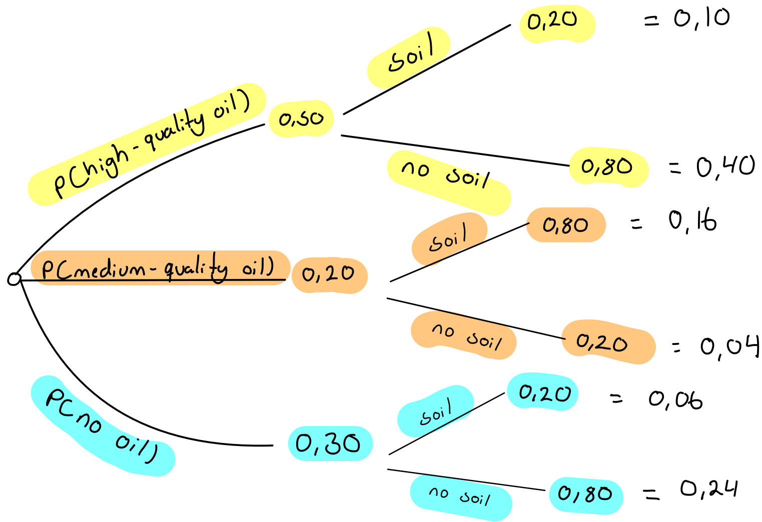
$$= 0,5$$

$$P(M) = 1 - P(F) = 1 - 0,5 = 0,5$$

59)

a) P(finding oil) = 1 - P(no oil) = 1 - 0,30 = 0,70

b)



I assume that a positive soil test means that the oil is not usable. Therefore, the probability of finding oil decreases:

P(high-quality oil) = 0,40
P(medium-quality oil) = 0,04
P(no oil) = 0,30 + 0,16 + 0,10 = 0,56

P(oil) = 0,40 + 0,04 = 0,44