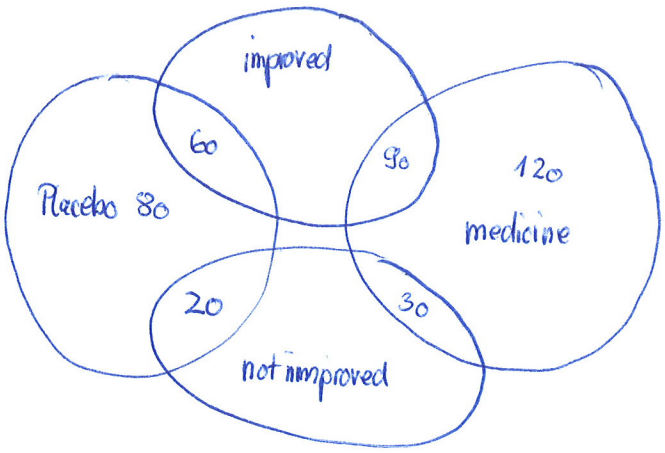
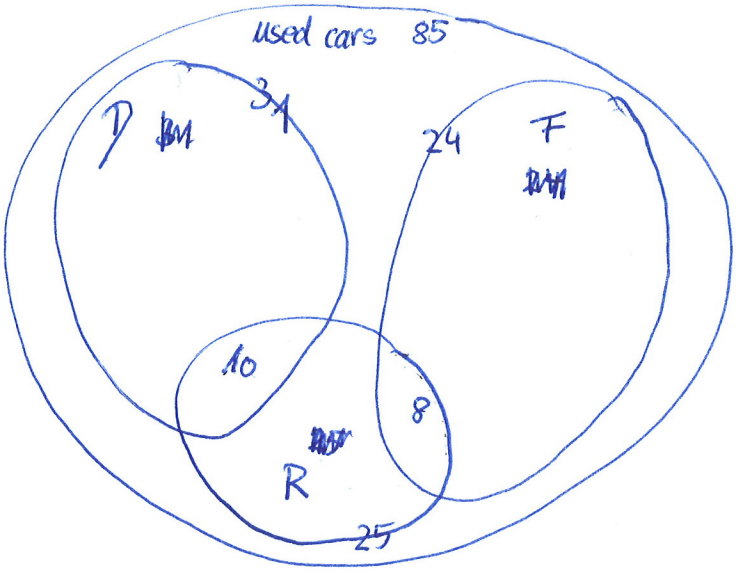
1.1

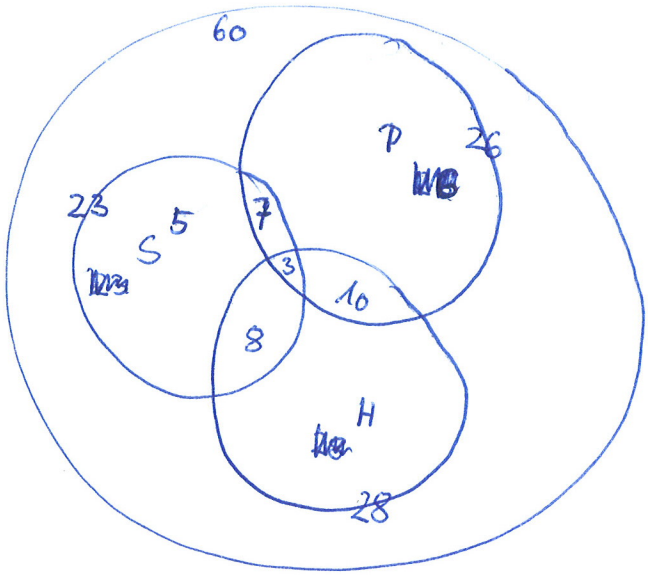


1.2. a)



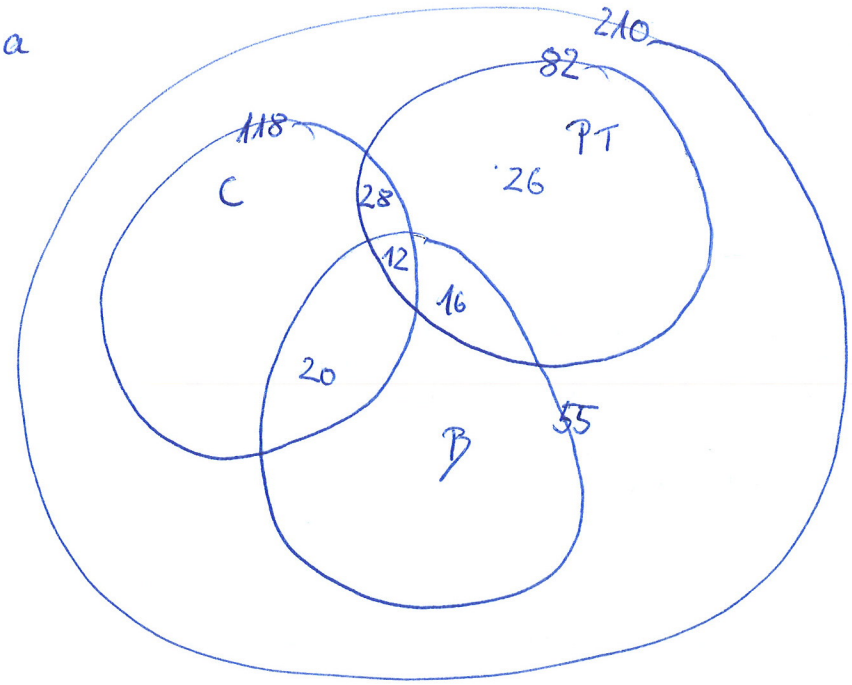
b) (i) 7
(ii) 23

1.3 a)



b) (i) 3
(ii) 46

1.4 a



b) (i) 58

(ii) 167

2.1

p	q	p∧q	¬p	¬q	¬(p∧q)	(¬p) ∨ (¬q)
T	T	T	F	F	F	F
T	F	F	F	T	T	T
F	T	F	T	F	T	T
F	F	F	T	T	T	T

equivalent

2.2

p	q	r	p∨q	(p∨q)∧r	p∧r	q∧r	(p∧r) ∨ (q∧r)
T	T	T	T	T	T	T	T
T	T	F	T	F	F	F	F
T	F	T	T	T	T	F	T
T	F	F	T	F	F	F	F
F	T	T	T	T	F	T	T
F	T	F	T	F	F	F	F
F	F	T	F	F	F	F	F
F	F	F	F	F	F	F	F

equivalent

2.3

p	q	r	p∧q	(p∧q)∨r	p∨r	p∨q	(p∨r)∧(p∨q)
T	T	T	T	T	T	T	T
T	T	F	T	T	T	T	T
T	F	T	F	T	T	T	T
T	F	F	F	F	T	T	T
F	T	T	F	T	T	T	T
F	T	F	F	F	F	T	F
F	F	T	F	T	T	F	F
F	F	F	F	F	F	F	F

not equivalent

2.4

p	q	¬p	¬q	p∧q	¬(p∧q)	(¬p)∧(¬q)
T	T	F	F	T	F	F
T	F	F	T	F	T	F
F	T	T	F	F	T	F
F	F	T	T	F	T	T

not equivalent

3.1 $2.50\ €/kg = 2.50\ \frac{€}{kg} \cdot \frac{1.33\$}{1€} \cdot \frac{1kg}{2.2lb} = \underline{\underline{1.51\ \frac{\$}{lb}}}$

3.2 $1\ ft = 12\ in.$

$(1\ ft)^3 = (12\ in)^3$

$1\ ft^3 = (12)^3\ in.^3 = 1728\ in^3 \Rightarrow 1 = \underline{\underline{\frac{1728\ in^3}{1\ ft^3}}}$

3.3 $45\ mil/5\ min = \frac{45}{5}\ \frac{mil}{min} = 9\ \frac{mil}{min} = 9\ \frac{mil}{min} \cdot \frac{60\ min}{1h} = \underline{\underline{540\ \frac{mil}{h}}}$

3.4 $5.64\ \frac{\$}{gal} = 5.64\ \frac{\$}{gal} \cdot \frac{0.2642\ gal}{1L} = 1.490088\ \frac{\$}{L}$

$1106\ km \cdot \frac{1L}{22km} = 50.\overline{27}\ L \Rightarrow 50.\overline{27}\ L \cdot 1.490088\ \frac{\$}{L} = \underline{\underline{74.91\ \$}}$

3.5 $7.2\ \frac{€}{kg} = 7.2\ \frac{€}{kg} \cdot \frac{1kg}{2.2lb} \cdot \frac{1.32\$}{1€} = \underline{\underline{4.32\ \frac{\$}{lb}}}$

3.6 $250\ km = 250\ km \cdot \frac{1mil}{1.6093km} = 155.347\ mil$

$155.347\ mil \cdot \frac{0.14\ L}{mil} = 21.749\ L$

$21.749L \cdot \frac{1.52\ \$}{L} = 33.058\ \$ = 3.058\ \$\ \frac{1€}{1.485\$} = \underline{\underline{22.26€}}$

4.1 a) $Q = Q_0 \cdot (1+r)^t$ t in months, $r = 0.025$

$= Q_0 \cdot (1.025)^t$

$3Q_0 = Q_0 (1.025)^t$

$3 = (1.025)^t$

$\log_{10} 3 = t \log_{10}(1.025)$

$t = \dfrac{\log_{10} 3}{\log_{10}(1.025)} = 44.49$ months

b) $Q = 50 \cdot (1.025)^{4 \cdot 12} = 50 \cdot (1.025)^{48} = 163.57$

4.2 a) $Q = Q_0 \cdot 2^{t/T_{double}} = Q_0 \cdot 2^{t/3} = Q_0 \cdot (2^{1/3})^t$

$3 = (2^{1/3})^t$

$\log_{10} 3 = t \log_{10} 2^{1/3}$

$t = \dfrac{\log_{10} 3}{\log_{10} 2^{1/3}} = 4.75$ months

b) $Q = 50 \cdot (2^{1/3})^{2 \cdot 12} = 50 \cdot (2^{1/3})^{24} = 12\,800.00$

4.3 a) $T_{half} \approx \dfrac{70}{12} = 5.83$ h

b) $T_{half} = -\dfrac{\log_{10} 2}{\log_{10}(1 - 0.12)} = -\dfrac{\log_{10} 2}{\log_{10}(0.88)} = 5.422$ h

c) $Q = 500 \cdot (1 - 0.12)^7 = 500\,(0.88)^7 = 204.34$ mg

4.4 a) $300 = 500\,(1+r)^5$

$\sqrt[5]{\dfrac{300}{500}} = 1 + r$

$r = \sqrt[5]{\dfrac{300}{500}} - 1 = -0.09712 \hat{=} -9.712\%$

b) $T_{half} = -\dfrac{\log_{10} 2}{\log_{10}(1 - 0.09712)} = 6.7846$ h

4.5 a) $Q = Q_0\, 2^{t/T_{double}} = Q_0 \cdot 2^{\frac{t}{1.5}}$

$3 = (2^{\frac{1}{1.5}})^t$

$\log_{10} 3 = t \log_{10}(2^{1/1.5})$

$t = \dfrac{\log_{10} 3}{\frac{1}{1.5} \log_{10} 2} = 1.5 \dfrac{\log_{10} 3}{\log_{10} 2} = 2.377$ months

b) $Q = 1 \cdot 2^{3 \cdot 12 / 1.5} = 2^{24} = 16\,777\,216$

4.6 a) $Q = Q_0 \cdot (1+r)^t$

$= 400 \cdot (1-0.12)^{10} = 400 \cdot (0.88)^{10} = 111.40 \text{ mg}$

b) $T_{half} = -\frac{\log_{10} 2}{\log_{10}(1-0.12)} = 5.422 \text{ h}$

5.1 $A = \$5000 \left(1 + \frac{0.027}{12}\right)^{20 \cdot 12}$ $\left(A = P\left(1 + \frac{APR}{n}\right)^{nY}\right)$

$= 8574.83\$$

5.2 a) $APY = 1 - \left(1 + \frac{APR}{n}\right)^{n \cdot 1}$

$= 1 - \left(1 + \frac{0.0275}{4}\right)^4$

$= 0.02778 \hat{=} 2.778\%$

b) $A = PMT \frac{\left(1 + \frac{APR}{n}\right)^{nY} - 1}{\left(\frac{APR}{n}\right)}$

$\Rightarrow PMT = A \cdot \frac{\left(\frac{APR}{n}\right)}{\left(1 + \frac{APR}{n}\right)^{nY} - 1} = 450\,000 \cdot \frac{\frac{0.0275}{4}}{\left(1 + \frac{0.0275}{4}\right)^{4.40} - 1} = 1552.40\$$

5.3 a) same as 5.2 a)

b) $PMT = A \cdot \frac{\left(\frac{APR}{n}\right)}{\left(1 + \frac{APR}{n}\right)^{nY} - 1} = 600000 \frac{\frac{0.0275}{4}}{\left(1 + \frac{0.0275}{4}\right)^{4.40} - 1} = 2069.87\$$

5.4 $A = P \cdot e^{(APR \cdot Y)}$

$= 6000 \cdot e^{0.0215 \cdot 17} = 8647.41\$$

5.5 a) $PMT = \frac{P \times \left(\frac{APR}{n}\right)}{\left(1 - \left(1 + \frac{APR}{n}\right)^{(-nY)}\right)}$

$= \frac{250\,000 \cdot \frac{0.0625}{12}}{1 - \left(1 + \frac{0.0625}{12}\right)^{(-12 \cdot 30)}} = 1539.29\$$

b) $30 \cdot 12 \cdot 1539.29\$ - 250\,000\$ = 304145.48\$$

c) $PMT = \frac{250\,000 \cdot \frac{0.0625}{12}}{1 - \left(1 + \frac{0.0625}{12}\right)^{(-12 \cdot 20)}} = 1827.32\$$

$20 \cdot 12 \cdot 1827.32\$ - 250\,000\$ = 188,556.92 \Rightarrow$ save $304145.48 - 188556.92$

$= 115588.56\$$

5.6 a) $PMT = \frac{220\,000 \cdot \frac{0.0625}{12}}{1 - \left(1 + \frac{0.0625}{12}\right)^{(-12 \cdot 30)}} = 1354.58\,\$$

b) $12 \cdot 30 \cdot 1354.58\,\$ - 220\,000\,\$ = 267648.02\,\$$

c) $PMT = \frac{220\,000 \cdot \frac{0.0625}{12}}{1 - \left(1 + \frac{0.0625}{12}\right)^{(-12 \cdot 30)}} = 1608.04\,\$$

$12 \cdot 20 \cdot 1608.04\,\$ - 220\,000\,\$ = 165930.09\,\$$

save: $267648.02\,\$ - 165930.09\,\$ = 101717.93\,\$$

5.7 a) $APY = 1 - \left(1 + \frac{APR}{n}\right)^n =$

$= 1 - \left(1 + \frac{0.035}{4}\right)^4 =$

$= 0.03546 \;\hat{=}\; 3.546\,\%$

b) $PMT = A \cdot \frac{\left(\frac{APR}{n}\right)}{\left(1 + \frac{APR}{n}\right)^{nY} - 1} = 500\,000 \cdot \frac{\frac{0.035}{4}}{\left(1 + \frac{0.035}{4}\right)^{4 \cdot 35} - 1}$

$= 1833.55\,\$$

6.1 No.

6.2 after one year: $\frac{NV - OV}{OV} = \frac{115\,\% - 100\,\%}{100\,\%} = 0.15 \;\hat{=}\; 15\,\%$

$NV = 1.150V$

after 2 years $NNV = 0.9\,NV = 0.9 \cdot 1.15 \cdot OV = 1.035\,OV \rightsquigarrow 0.035$ change

=> prices increase by 3.5%.

6.3 $Q = Q_0 \cdot (1+r)^t$

$= 24\,000 \cdot (1 - 0.15)^{15} = 24000 \cdot 0.85^{15} = 2096.50\,\$$

exponential

6.4 a) $Q = Q_0 \cdot (1+r)^t =$

$= 210\,000\,(1 + 0.075)^{25} = 1\,280\,651.32\,\$$

b) exponential

6.5 $T_{new} = T_{old} \cdot 1.12 \cdot 0.95 = T_{old} \cdot 1.064$ => 0.064 change

=> increase by 6.4%

6.6 $NV = 22\,\%$ $\frac{NV - OV}{OV} = 0.2$ => $NV - OV = 0.20V$ $NV = 1.2\,OV$

=> $OV = \frac{NV}{1.2} = \frac{22\,\%}{1.2} = 18.\overline{3}\,\%$

6.7 $\frac{NV - OV}{OV} = \frac{42\% - 56\%}{56\%} = -0.25 \hat{=} -25\%$

7.1 $h = 15\,cm$
$A = 406.84\,cm^2$
$V = 577.27\,cm^3$

$h_{new} = 2\,cm \Rightarrow C = \frac{h_{new}}{h} = \frac{2\,cm}{15\,cm} = 0.1\overline{3}$

$A_{new} = A \cdot C^2 = 406.84\,cm^2 \cdot \left(\frac{2}{15}\right)^2 = 7.23\,cm^2$

$V_{new} = V \cdot C^3 = 577.27\,cm^3 \cdot \left(\frac{2}{15}\right)^3 = 1.37\,cm^3$

7.2 $r = 3\,cm$
$A = 245\,cm^2$
$V = 282.74\,cm^3$

$r_{new} = 16\,cm \Rightarrow C = \frac{r_{new}}{r} = \frac{16\,cm}{3\,cm} = 5.\overline{3}$

$A_{new} = A \cdot C^2 = 245\,cm^2 \cdot \left(\frac{16}{3}\right)^2 = 6968.\overline{8}\,cm^2$

$V_{new} = V \cdot C^3 = 42\,892.71\,cm^3$

7.3 $L = 3\,cm$
$A = 135.74\,cm^2$
$V = 97.875\,cm^3$

$L_{new} = 25\,cm \Rightarrow C = \frac{L_{new}}{L} = \frac{25\,cm}{3\,cm} = 8.\overline{3}$

$A_{new} = A \cdot C^2 = 135.74\,cm^2 \cdot \left(\frac{25}{3}\right)^2 = 9426.38\,cm^2$

$V_{new} = V \cdot C^3 = 97.875\,cm^3 \cdot \left(\frac{25}{3}\right)^3 = 56\,640.625\,cm^3$

7.4 $V = \frac{4}{3} r^3 \pi = \frac{4}{3} \cdot 24^3 \cdot \pi\ m^3$

$r = 18\,\frac{y^3}{s} = 18 \cdot \frac{y^3}{s} \cdot \frac{1}{(1.094)^3}\,\frac{m^3}{y^3} \cdot \frac{60\,s}{1\,min} = 824.84\,\frac{m^3}{min}$

$t = \frac{V}{r} = \frac{\frac{4}{3} 24^3 \cdot \pi\ m^3}{824.84\,\frac{m^3}{min}} = 70.20\,min$

7.5 $V = h \cdot r^2 \pi = 25m \cdot (15)^2 m^2 \pi = 25 \cdot (15)^2 \pi\ m^3$

$r = 1\,\frac{m^3}{s} = 1\,\frac{m^3}{s} \cdot \frac{60\,s}{1\,min} = 60\,\frac{m^3}{min}$

$t = \frac{V}{r} = \frac{25 \cdot (15)^2 \pi\ m^3}{60\,\frac{m^3}{min}} = 294.52\,min$

7.6 $V_A = h \cdot r^2 \pi = 10cm \cdot (6cm)^2 \cdot \pi = 360\,cm^3 \pi$

$V_B = h \cdot r^2 \pi = 6in. \cdot (2.5in)^2 \cdot \pi = 37.5\,in^3 \pi = 37.5in^3 \frac{(2.54\,cm)^3}{in^3} \pi = 614.51\,cm^3 \pi$

can B is bigger.

8.1 $7x + 4y = 10 \Rightarrow y = -\frac{7}{4}x + \frac{10}{4} = -1.75x + 2.5$

$\Rightarrow$ slope = -1.75
y-intercept = 2.5
x-intercept = $\frac{10}{7} = 1.429$

8.2 a) ind. var. = time = t

dep. var. = height of snow = h

b) $h = f(t) = 2.5 \frac{cm}{h} \cdot t + 10\,cm$

8.3 a) $y = mt + b$

$2.6 = 3m + b \Rightarrow b = 2.6 - 3m$

$3.2 = 5m + b \Rightarrow b = 3.2 - 5m$

$\Rightarrow 2.6 - 3m = 3.2 - 5m$

$2m = 0.6$

$m = 0.3$

$2.6 = 3 \cdot 0.3 + b$

$b = 2.6 - 0.9 = 1.5$

$\Rightarrow y = 0.3t + 1.5$

b) $20 = 0.3t + 1.5$

$t = \frac{20 - 1.5}{0.3} = 61.\overline{6}$ days

8.4 a) $y = f(t) = mt + b = \frac{0.5}{3} \frac{cm}{y} \cdot t + 5cm = 0.1\overline{6} \frac{cm}{y} t + 5cm$

$y = 0.1\overline{6}t + 5$

b) $16 = 0.1\overline{6}t + 5$

$t = \frac{16 - 5}{0.1\overline{6}} = 66\,y$

9.1 $\frac{y^4}{(x^{-3}y)^5} \cdot \frac{x^{-2}}{y^3} = \frac{y^4 \cdot x^{-2}}{x^{-15} y^5 y^3} = \frac{x^{13}}{y^4}$

9.2 $\frac{5-4t}{3} = \frac{t}{4} \Leftrightarrow 4(5-4t) = 3t$

$20 - 16t = 3t$

$20 = 19t$

$1.053 = \frac{20}{19} = t$

9.3 $\frac{10}{3} \cdot \frac{3}{7} = \frac{10}{7} = 1.429$

9.4 $\frac{1}{2} + \frac{2}{3} + \frac{3}{4} = \frac{6}{12} + \frac{8}{12} + \frac{9}{12} = \frac{23}{12} = 1.91\overline{6}$

9.5 $(3 \cdot 10^3) \cdot (2 \cdot 10^2) = 6 \cdot 10^5$