1. $1000 = 10 \cdot 10 \cdot 10$

a) $P(A) = \frac{8}{1000}$

b) $P(B) = \frac{8 \cdot 12}{1000}$

c) $P(C) = \frac{6 \cdot 64}{1000}$

d) $P(D) = 1 - \frac{8}{1000} - \frac{8 \cdot 12}{1000} - \frac{6 \cdot 64}{1000}$

2. N^n - total outcome

$C_n^m \cdot (N-1)^{n-m}$ - favorable outcome

$$P(A) = \frac{C_n^m \cdot (N-1)^{n-m}}{N^n}$$

3. a) 52 letters & 10 digits

8 char. password. 1 mil pass. / s

62^8 - total passwords

$62^8 = 2.183 \cdot 10^{14}$

$10^6 \cdot 24 \cdot 60 \cdot 60$ tries / day

$= 8.64 \cdot 10^{10} \cdot 7$ / week $= 6.048 \cdot 10^{11}$

$6.048 \cdot 10^{11} \cdot 52 = 3.145 \cdot 10^{13}$

$\frac{2.183 \cdot 10^{14}}{3.145 \cdot 10^{13}} = 6.9412$ years

$\Rightarrow$ on average 3.5 years

b) $P = \frac{6.048 \cdot 10^{11}}{2183 \cdot 10^{14}} = 0.00277$

c) 36 char.

$36^8 = 2.8211 \cdot 10^{12}$

$\frac{2.8211 \cdot 10^{12}}{8.64 \cdot 10^{10}} = 32.6516$ days $\Rightarrow$ 16 days on average

$P_2 = \frac{6.048 \cdot 10^{11}}{2.8211 \cdot 10^{12}} = 0.2144$

4. $P(\text{"System is reliable"}) = P(B_1 \cup B_2) =$

$= P(B_1) + P(B_2) - P(B_1 \cap B_2) =$

$= P(B_1) + P(B_2) - P(B_1) \cdot P(B_2) =$

$P(B_1) = P(A \cap B) = P(A)P(B) = 0.92^2$

$P(B_2) = P(C \cap (D \cup E)) = P(C) \cdot P(D \cup E) =$

$= P(C)\left(P(D) + P(E) - P(D)P(E)\right)$

5. 70% C/C++ C = "Programmer knows C/C++"

60% Fortran F = " — " — Fortran"

50% Both

$P(C) = 0{,}7$

$P(F) = 0{,}6$

$P(C \cap F) = 0{,}5$

a) $P(A) = P(\overline{F}) = 1 - P(F) = 0{,}4$

b) $P(B) = P(\overline{C} \cap \overline{F}) = 1 - P(C \cup F) =$

$= 1 - (P(C) + P(F) - P(C \cap F))$

c) $P(C \cap \overline{F}) = P(C \setminus F) = P(C) - P(C \cap F)$

d) check that $P(C \cap F) = P(C) \cdot P(F)$

e) $P(C \mid F) = \dfrac{P(C \cap F)}{P(F)}$

f) $P(\overline{F} \mid C) = \dfrac{P(\overline{F} \cap C)}{P(C)}$

6. $A =$ " first hunter hits the target "
$B =$ " second ——— " ——— "
$C =$ " third ——— " ——— "

$P(A) = 0{,}4 \rightarrow P(\overline{A}) = 1 - 0{,}4 = 0{,}6$

$P(B) = 0{,}5 \Rightarrow P(\overline{B}) = 1 - 0{,}5 = 0{,}5$

$P(C) = 0{,}7 \Rightarrow P(\overline{C}) = 1 - 0{,}7 = 0{,}3$

AH = " only first shooter hits the target "
BH = — " — second — " — "
CH = — " — third ——— " ——— "

$P(AH) = P(A \cap \overline{B} \cap \overline{C}) = P(A) \cdot P(\overline{B}) \cdot P(\overline{C})$

$P(BH) = P(\overline{A}) \cdot P(B) \cdot P(\overline{C})$

$P(CH) = P(\overline{A}) \cdot P(\overline{B}) \cdot P(C)$

$P($" Target is hit exactly once "$) = P(AH) + P(BH) + P(CH)$

7. A = "flight arrives on time"

G = "weather is good"

B = "weather is bad" $= \bar{G}$

$\{G, \bar{G}\}$ – partition of the sample space

$P(G) = 0{,}6$

$P(B) = P(\bar{G}) = 0{,}4$

$P(A \mid G) = 0{,}8$

$P(A \mid B) = 0{,}5$

$$P(A) = P(A \mid G) \cdot P(G) + P(A \mid B) \cdot P(B) = 0{,}68$$