Exercise 1

The following table shows the number of men alive after each decade starting from a group of 1000 births (survival table)

age	survivors
0	1000
10	959
20	952
30	938
40	920
50	876
60	758
70	524
80	211
90	22
100	0

1) What is the probability that a randomly chosen individual survives for up to 10 years?

2) What is the probability that an individual would die within 10 years?

3) What is the probability that an individual alive at the age of 60 survives up to 70 years?

4) What is the probability that two individuals alive at the age of 60 will survive up to 70 years?

5) If there are 100 individuals of age 60, how many we expect to get to 70 years of age?

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1) 959/1000= 0.959

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2) 1-0.959= 0.041

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3) 524/758= 0.691

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4) 0.691*0.691= 0.478 (independent eve

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1)	959/1000=	0.959	
2)	1-0.959=	0.041	
3)	524/758=	0.691	
4)	0.691*0.691=	0.478	(independent events)
5)	100*0.691=	69	

Exercise 2

According to weather forecasts, the probability of rain is 10% for each of the next 7 days.

1. If you camp in tents, what is the probability that it rains 3 days?
2. And the probability that at most it will rain only one day?
3. Which is the expected value of the number of rainy days and its variance?

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According to weather forecasts, the probability of rain is 10% for each of the next 7 days.

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n = 7

x = 3

p = 0.10

q = 0.90

X= number of rainy days

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1.If you camp in tents, what is the probability that it rains 3 days?

n = 7

x = 3

p = 0.10

q = 0.90

X= number of rainy days

$$P(X=3)= \frac{7!}{3!(7-3)!}0.1^3 0.9^4 = \frac{7*6*5*4!}{3!\,4!}0.1^3 0.9^4 = \frac{7*6*5}{3*2*1}0.1^3 0.9^4 =$$

$$=35 \cdot 0.1^3 0.9^4 = 0.023$$

Exercise 2

2. And the probability that at most it will rain only one day?

$$P(X \leq 1) = P(X = 0) + P(X = 1)$$

$$P(X = 0) = \frac{7!}{0!7!} 0.9^7 = 0.478$$

$$P(X = 1) = \frac{7!}{1!(7-1)!} 0.1^1 0.9^6 = 7 \cdot 0.1^1 0.9^6 = 0.372$$

$$P(X \leq 1) = 0.478 + 0.372 = \mathbf{0.85}$$

Exercise 2

3. Which is the expected value of the number of rainy days and its variance?

$$E(X)=7*0.1=0.7$$

$$VAR(x)=7*0.1*0.9=0.63$$

Exercise 3

Mean and standard deviation (SD) of systolic blood pressure (SBP) by age group (in mmHg):

Age (yr)	Mean	SD	Limit
1-14	105,0	5,0	115,0
15-44	125,0	10,0	140,0

Assuming that SBP has a Gaussian distribution and that persons with SBP higher then «Limit» are defined hypertensive.

a) Which is the percentage of hypertensive in the class 1-14 yrs? Which in the class 15-44?

b) If subjects in the class 1-14 are 20% of the population, which percentage of hypertensive I expect in the all population (1-44 years)?

c) By chosing randomly 100 subjects of age 15-44 which is the probability that the mean SBP will be within 123 and 127?

a) Which is the percentage of hypertensive in the class 1-14 yrs?

$\mu = 105$

$\sigma = 5$

x=115

Standardising:

$$z = \frac{x - \mu}{\sigma} = \frac{115,0 - 105,0}{5,0} = 2,00$$

Pr(z>2,00)=1-P(z<2,00)=1-0,9772= 0,0228

2,3% of children between 1 to 14 years of age is hypertensive

a) Which in the class 15-44?

$\mu = 125$

$\sigma = 10$

x=140

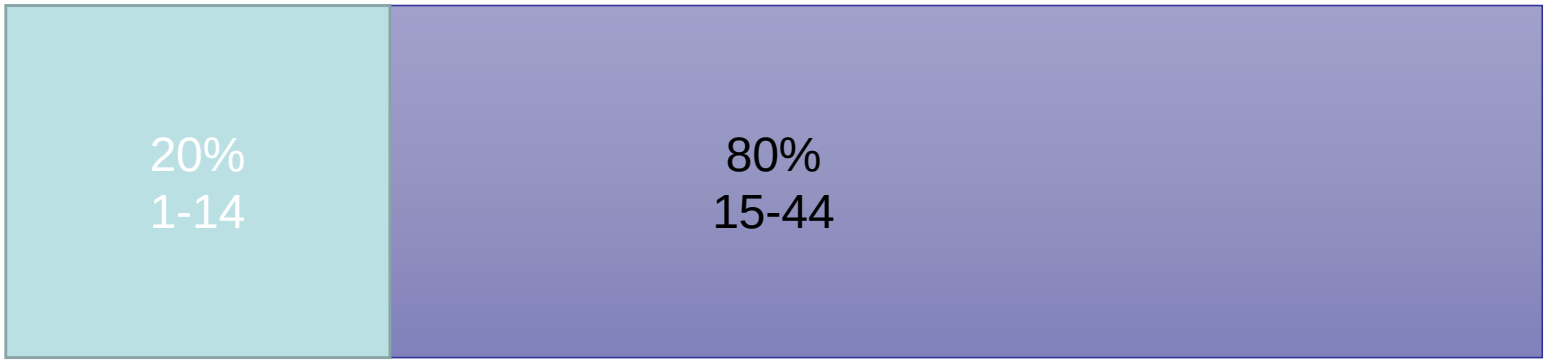
Standardising:

$$z = \frac{x - \mu}{\sigma} = \frac{140,0 - 125,0}{10,0} = 1,50$$

Pr(z>1,50)=0,0668

6,7% of subjects between 15 to 44 years of age is hypertensive

b) If subjects in the class 1-14 are 20% of the population, which percentage of hypertensive I expect in the all population (1-44 years)?



P(1-14)*P(hypethese|1-14)+P(15-44)P(hypethese|15-44)=
=0,2*0,0228+0,8*0,0668=0,058

5,8% of subjects (1-44 years) is hypertensive

	hypethese	Not hypethese	total
1-14	20*0,0228=0,5		20
15-44	80*0,0668=5,3		80
total	5,8		100

c) By chosing randomly 100 subjects of age 15-44 which is the probability that the mean SBP will be within 123 and 127?

$z1=(123-125)/(10/\sqrt{100})=-2$

$z2=(127-125)/(10/\sqrt{100})=2$

$P(-2<Z>2)=0,9772-0,02275=0,9545$

In a sample of size 100 subject with 15-44 years, the mean SBP will be included in the interval 123 e 127 mmHg 95% of the times