

19 An auto insurance company insures drivers of all ages. An actuary compiled the following statistics on the company's insured drivers:

AGE OF DRIVER	PROB. OF ACCIDENT	PORTION OF COMPANY'S INSURED DRIVERS
A ₁ ... 16-20	0,06	0,08
A ₂ ... 21-30	0,03	0,15
A ₃ ... 31-65	0,02	0,49
A ₄ ... 66-99	0,04	0,28

A randomly selected driver that the company insures has an accident. Calculate the probability that the driver was age 16-20.
B... nebota

$$P(A_1|B) \stackrel{\text{BAYES}}{=} \frac{P(B|A_1) \cdot P(A_1)}{P(B)} \stackrel{\text{ÚPL. ÚST.}}{=} \frac{P(B|A_1) \cdot P(A_1)}{\sum_{i=1}^4 P(B|A_i) \cdot P(A_i)}$$

$$P(A_1|B) = \frac{0,06 \cdot 0,08}{0,06 \cdot 0,08 + 0,03 \cdot 0,15 + 0,02 \cdot 0,49 + 0,04 \cdot 0,28} = 0,1584 \approx 0,16 \quad \boxed{B}$$

21 Upon arrival at a hospital's emergency room, patients are categorized by their condition as Critical, Serious, or Stable. In the past year:

- (i) 10% of the emergency room patients were Critical;
- (ii) 30% of the emergency room patients were Serious;
- (iii) the rest of the emergency room patients were Stable; $\Rightarrow 60\%$.
- (iv) 40% of the Critical patients Died; $\Rightarrow P(D^c|C) = 0,6$
- (v) 10% of the Serious patients Died; $\Rightarrow P(D^c|S) = 0,9$
- (vi) 1% of the Stable patients Died; $\Rightarrow P(D^c|ST) = 0,99$

Given that a patient SURVIVED, calculate the probability that the patient was categorized as Serious upon arrival.

$$P(S|D^c) \stackrel{\text{BAYES}}{=} \frac{P(D^c|S) \cdot P(S)}{P(D^c)} \stackrel{\text{ÚPL. ÚST.}}{=} \frac{P(D^c|S) \cdot P(S)}{P(D^c|C) \cdot P(C) + P(D^c|S) \cdot P(S) + P(D^c|ST) \cdot P(ST)}$$

$$P(S|D^c) = \frac{0,9 \cdot 0,3}{0,6 \cdot 0,1 + 0,9 \cdot 0,3 + 0,99 \cdot 0,6} = 0,29 \quad \boxed{B}$$

26 The probability that a randomly chosen male has a blood circulation problem is 0,25. Males who have a blood circulation problems are twice as likely to be smokers as those who do not have a blood circulation problem.

Calculate the probability that a male has a blood circulation problem, given that he is a smoker.

S... fajár $\rightarrow P(S|B) = 2 \cdot P(S^c|B)$

B... problém $\rightarrow P(B) = 0,25$

$$P(B|S) \stackrel{\text{BAYES}}{=} \frac{P(S|B) \cdot P(B)}{P(S)} \stackrel{\text{L'HÔPITAL}}{=} \frac{P(S|B) \cdot P(B)}{P(S|B) \cdot P(B) + P(S|B^c) \cdot P(B^c)} = \frac{2 \cdot P(B)}{2 \cdot P(B) + P(B^c)}$$

$$P(B|S) = \frac{2 \cdot 0,25}{2 \cdot 0,25 + 0,75} = \frac{2}{5} \quad \boxed{C}$$

27 A study of automobile accidents produced the following data:

MODEL YEAR	PROPORTION OF ALL VEHICLES	PROB. OF INVOLVEMENT IN AN ACCIDENT
2014	0,16	0,05
2013	0,18	0,02
2012	0,20	0,03
OTHER	0,46	0,04

An automobile from one of the model years 2014, 2013, and 2012 was involved in an accident.

Calculate the probability that the model year of this automobile is 2014.

A... nehoda modelu r roku 2014, 2013 alebo 2012

$$P(2014|A) \stackrel{\text{BAYES}}{=} \frac{P(A|2014) \cdot P(2014)}{P(A)} = \frac{P(A|2014) \cdot P(2014)}{\sum_{i=2012}^{2014} P(A|i) \cdot P(i)}$$

$$P(2014|A) = \frac{0,05 \cdot 0,16}{0,03 \cdot 0,2 + 0,02 \cdot 0,18 + 0,05 \cdot 0,16} = \frac{0,008}{0,014} = \frac{4}{7} \quad \boxed{D}$$