

PROBLEMS FOR EXERCISES IN RANDOM PHENOMENA COURSE - 1ST SET

- A worker is responsible for two machines at the same time. The probability that he needs to intervene in a given hour at the machine A is 0.7, while the probability of intervention at the machine B is 0.5. The probability that he has to intervene in a given hour at one or at both machines is 0.8.
 - What is the probability that the worker in a given hour intervenes at the machine B but not at the machine A? R: $P = 0.1$
 - What is the probability that the worker's intervention in a given hour is not needed? R: $P = 0.2$
- On each of the 300 pieces the depth of bore is measured and its surface is described. The results are in the table.

		Bore		
		too shallow	appropriate	too deep
Surface	rough	15	20	10
	smooth	25	30	20
	very smooth	60	50	70

- What is the probability that a randomly selected piece has a smooth surface and an appropriate bore? R: $P = 1/10$
 - What is the probability that a randomly selected piece does not have a rough surface or does not have a too deep bore? R: $P = 29/30$
 - What is the probability that among the pieces with a smooth surface we randomly select a piece with a too shallow bore? R: $P = 1/3$
- In a garage, cars are repaired by three workers. Each car is repaired by only one worker. Worker A repairs 35% of the incoming cars, worker B 40% and worker C the rest. Customers complain for 2% of the cars repaired by the worker A, for 4% of the cars repaired by the worker B and for 3% of the cars repaired by the worker C. We randomly select a repaired car.
 - What is the probability that a complaint will occur for the selected car? R: $P = 0.031$
 - If a complaint occurred for the selected car, what is the probability that it was repaired by the worker B? R: $P = 0.525$
 - Products are bought from manufacturers A, B and C. 40% of the products are bought from the manufacturer A, 30% from manufacturer B and the rest from manufacturer C. The products of manufacturer A are defective in 1% of cases, of manufacturer B in 4% of cases and of manufacturer C in 2% of cases. A product is randomly selected.

- (a) If the selected product is defective, what is the probability that it has been manufactured by the manufacturer A or manufacturer C? R: $P = 0.455$
- (b) If the selected product is free of defects, what is the probability that it has been manufactured by the manufacturer B? R: $P = 0.294$
5. The machine consists of three components which operate independently. The probability that a component breaks down in a given day is 0.3 for the first component, 0.4 for the second component and 0.2 for the third component. If one component breaks down the machine will stop with probability of 0.5. If two components break down the machine will stop with probability of 0.8. If all three components break down the machine will surely stop. What is the probability that the machine will stop in a given day due to failure of its components? R: $P = 0.40$
6. The main office of a bank gets applications from its three branches. 30 % of which come from branch A, 50 % from branch B and the rest from branch C. Among the applications received from branch A 20 % are stockbroking cases, from branch B there are 10 % and from branch C there are 40 % of stockbroking cases. While checking the bank operations we randomly select an application.
- (a) If the selected application is not a stockbroking case, what is the probability that the application has been sent from the branch C? R: $P = 0.148$
- (b) If the selected application is a stockbroking case, what is the probability that the application has not been sent from the branch B? R: $P = 0.737$
7. At the end of the production line the quality of the products is controlled. For this purpose, a computerized system has been developed which correctly recognizes a defective product in 99 % of the cases, while in 3 % of the cases it recognizes the good product as defective. From past experience we know that 2 % of the products are defective. A product is randomly selected.
- (a) If the selected product is good, what is the probability that it is recognized as good? R: $P = 0.97$
- (b) If the selected product is recognized as good, what is the probability that it is defective? R: $P = 2 \cdot 10^{-4}$