MICROECONOMICS 3
PROBLEMS #8

ASYMMETRIC INFORMATION. ADVERSE SELECTION

Problem #1

A good-quality used motorcycle gives the buyer a utility of 2400, whereas a bad-quality one – 1200. The seller is ready to get rid of a good-quality motorcycle for 2000 and a bad-quality one – for 1000. The potential supply of good and bad motorcycles is 50 each. A quality check of a motorcycle costs 80. Does the possibility to check the motorcycles prior to their purchase allow for increasing the welfare lost due to adverse selection? Provide the reasoning for your answer.

Problem #2

For the case discussed in Problem #1 determine the level of the external cost caused by the supply of bad-quality motorcycles. How will the possibility to conduct the check influence the level of the external cost? Does it matter for the level of the external cost who is burdened by the cost of conducting the check? Consider the following cases: a) costs of the check burden equally the seller and the buyer, b) these costs burden only the buyer.

Problem #3

Thousands of surfers spend their holidays every year on the Selection island. They are exposed to the risk of getting bitten by a shark. The probability of such event varies for different groups (depending on the frequency of entering the water) – it has a uniform distribution over the interval [0;0.24] (informally: in a large population every risk of getting bitten level between 0 and 24% occurs equally often). Individual probability of getting bitten is known to each surfer but to noone else. A bitten person must bear the costs of medical treatment amounting to $10,000. Because of risk aversion each surfer is willing to pay for a full insurance (covering the entire treatment costs) a maximum amount of two times the individual expected value of the treatment costs (i.e. 2*individual probability of getting bitten*10,000). During the first year the local insurer offers insurance at a price (premium) which brings zero expected profits assuming that everyone buys insurance. In each of the subsequent years the premium is set so as to guarantee zero profits assuming that the average number of injuries per insuree will be the same as it were in the preceding year.

a) What is the probability of an injury within the entire population? Hence, what will the premium be in the first year? Which surfers will be willing to buy insurance at such price? What will be the probability of a injury among those insured? Will the insurance company indeed achieve zero profits?
b) What will happen with the shark-bite insurance market in the second year: what premium (adjusted to the number of injuries in the preceding year) will be set by the insurance company, who will buy insurance, how much will the company gain/lose?
c) What will be the premium and who will be insured in the long run?

The government of Selection island introduces mandatory insurance against shark bites with a premium guranteeing the insurer zero expected profits. What proportion of the surfers will be happy about this solution in comparison with point c)? Assuming that there are 15,000 surfers, what will be the social gain/loss resulting from this solution in comparison with no insurance at all? (Add up the willingness to pay for insurance and substract all premiums.) Will the situation improve or deteriorate in comparison with the one described in point c)?

Problem #4

A series of new cars consists of seemingly identical cars which can, however, be divided into 4 categories (A, B, C, and D) differing in quality. Each category consists of an equal number of cars. In order to determine the category of a given car it is necessary to possess and use it for a certain time period. Assume 1 year is sufficient in this respect. There are 2 groups of potential buyers (1 and 2). Group 1 is 3 times larger than group 2. Nobody wants to possess more than 1 car. The value of the discussed cars for the two groups of buyers is given in the table below.

	Group 1	Group 2
Category A	21	18
Category B	18	17
Category C	15	16
Category D	11	12

Assume that each car is used up after 10 years and that its depreciation is linear. The price of a new car amounts to 16. Who is going to buy a new car? Analyze the situation following the lapse of a year. Assume there are no other cars available, no other buyers exist, and after a year it is only possible to sell the car in one market. (Hint: knowing which consumers have bought a new car, determine which of them will be willing to sell the car they bought and who may be willing to buy a 1-year-old used car).

Problem #5

Will an insurer offering a large workplace more beneficial conditions of health insurance for the employees encounter a loss?

Problem #6

Provide at least two strategies how an insurance company (insurer) can counteract adverse selection.

Problem #7

Citizens of a given country belong to two categories which are indistinguishable for the employer: the more- and less-talented. All of them finish university studies, however not all of them with distinction. Acquiring a diploma with distinction costs $100,000 for the less-talented persons and $50,000 fr the more-talented ones (involving e.g. effort, private lessons, bribes, etc.) (value calculated for the moment of obtaining the first salary). University alumni sign a contract for an indefinite period envisaging a costant annual salary and discount it based on the 10% annual discount rate. There are no possibilities of promotion. Independently of the obtained diploma and talents, each alumni may take up a job for a market salary of $40,000 per year. A certain company would like to employ only more-talented employees. What could its recruitment and wage policy look like?

Problem #8

Seemingly indistinguishable types of persons apply for a job to the mafia – tough guys and wimps. In order to select the tough guys the mafia makes each candidate undergo a painful trial. The trial lasting for m minutes decreases the tough guy's utility by m^2, while the effect on the wimp's utility is a decrease by $4m^2$. Being hired by the mafia increases utility by 101, independently of the type. Assuming that the capo di tutti capi accepts only full minutes of the trial (integers), how many different separating equilibria (i.e. such that one type will apply for the job and the other will not) are there? Which of these equilibria will be chosen by the capo-sadist and which by the emphatic capo?

Problem #9

Assume there are 3 types of employees: bad ones, medium ones and good ones. Each employee knows his/her type but the firms seeking to employ them are not able to determine the type of an employee at the moment of signing the employment contract. At the same time, each employee has a possibility

to take a free test that can specify his/her type and this employee will receive a credible certificate for the potential employers stating his/her type. Employees of which type will take the test? If the employee willing to take the test was to pay for it, how would this influence the decisions of the employees? What factors would this decision depend on?

Problem #10

In a given corporation there are More-Involved and Less-Involved employees. The utility function for the first type is $f(w,e) = w - 2e^2$, while for the second type it is $f(w,e) = w - 8e^2$, where w is the annual wage in thousand *zloty* and e stands for the average overtime hours per week. The company does not remunerate for overtime but registers the number of such hours. The two types of employees are indistinguishable. In the first year each employee obtains a wage of w_0 and may take as many hours overtime per week as they would like. After the first year some employees may be promoted. The company wants to promote only the More-Involved. A promotion results in an annual increase of the wage by 200,000 *zloty*. After the second year i może braćemployees transfer to a new company so the promotion does not matter anymore. Assume that there is no discounting. Indicate all pooling and separating equilibria (i.e. what number of overtime hours in the first year may be a signal of involvement). Provide a detailed reasoning. Which equilibrium will prevail if the company does make use of employees' overtime?

Problem #11

Advertisement as a signal of quality: Assume that there are n potential customers. Each of them is willing to by a maximum of 2 units of a product (not necessarily at the same time). The willingness to pay for the first unit is v while for the second unit it is $v + 0.4$, where v is 0.4 for a low quality product and 0.9 for a high quality product. The producer knows the quality of the product, however each customer can only get to know this quality after he/she buys the first unit. The probability that v is high *a priori* amounts to 50%. In any case, the average cost of producing the good is $c < 1$ and it is independent of its quality.

a) The unit price of the product is 1. The producer considers whether to launch an advertisement campaign. This campaign does not impact v. The costs of the campaign do not depend on the quality of the product. Find the cost interval within which this campaign is profitable only for the producer selling the high quality product (separating equilibrium).
b) The market for advertisements does not exist, however the producer is free to choose the price of the product, potentially differentiating between the first and second unit bought by the given customer: p_1 and p_2, respectively. The producer must, however, announce these prices *a priori*. Additionally, assume that the following inequality holds: $0.8 < c < 0.9$. Find the optimal price levels dependent on the quality of the product such that $p_1^H \neq p_1^L$, $p_2^H \neq p_2^L$ (separating equilibrium), assuming that there is anything sold at all.

Multiple choice questions:

Problem #1

Two-year old Mama Motors cars are worth for their owners between 0 and 60,000 (uniform distribution, i.e. informally, each value will occur equally often). Each car worth X for the seller has a potential buyer, for whom it would be worth 1.5X. If cars are indistinguishable, resulting in adverse selection, what proportion of them will be sold?

a) 0%
b) 20%
c) 40%
d) 60%
e) none of the above

Problem #2

As above but with a distribution (10,60).

Problem #3

Are the following statements true or false?

a) An insurance company must take into account the possibility that someone will buy fire insurance for a house and set it on fire himself. This is an example of moral hazard.
b) A company selling life insurance must take into account the possibility that persons who buy such insurance are not as healthy as persons who do not. This is an example of adverse selection.
c) An example of a "market for lemons" is a situation where there exist many types of a certain good, however only the lowest quality ones are for sale in the market.
d) Education is a significant signal for productivity whenever it is equally accessible for all.