Question 1 (30%)
David has been planning to start a gasoline station at a national toll way rest area. One decision David has to make is how large the station should be. The annual returns will depend on both the size of his station and a number of marketing factors. After a careful analysis, David comes up the following table:

Station Size / Probability	Good Market 0.3	Fair Market 0.5	Poor Market 0.2
Small	\$50,000	\$20,000	−\$15,000
Medium	\$80,000	\$30,000	−\$20,000
Large	\$100,000	\$30,000	−\$40,000
Very Large	\$300,000	\$25,000	−\$160,000

For example, the probability of a good market is 0.3, and if David constructs a small station and the market is good, he will realize a profit of \$50,000. Answer the following questions:

1. (10%) What is the maxmax decision?
2. (10%) What is the maxmin decision?
3. (10%) What is the maximal expected profit decision?

Question 2 (30%)
A furniture company produces tables and chairs. The production process for each is similar in that both require a certain number of hours of carpentry work and a certain number of labor hours in the painting and varnishing department. Each table takes four hours of carpentry and two hours in the painting and varnishing shop. Each chair requires three hours in carpentry and one hours in the painting and varnishing shop. During the current production period, 480 hours of carpentry time and 200 hours of painting/varnishing department time are available. Each table sold yields a profit of \$7, and each chair produces a profit of \$5. Let x_1 be the number of tables to be produced, and x_2 is the number of chairs to be produced. Give the value of the highest profit and the values of x_1 and x_2 which yield the highest profit.

Question 3 (40%)
Peter has applied a computer vision system to measure the length of a screw, from cap to tip. His computer vision system has achieved a resolution of 0.001mm when measuring a screw of 3mm long. For a couple of engineering reasons, a screw of a length between $3mm \pm 0.01mm$ is considered acceptable, otherwise the screw is rejected as a defect. The system is tested using a sample of 100 randomly selected screws. The result is extremely encouraging. Peter's system correctly accepts every good screw while correctly rejecting every defective screw. Therefore, Peter claims that his system is error-free in this application. However, Professor Wang disagrees and points out that under the assumption of normally distributed inspection errors, he can **easily** hand pick (not randomly at all) a set of screw lengths such that theoretically Peter's inspection system will be expected to make an average of 50% error. You are asked to describe the set of screw lengths Professor Wang will hand pick and explain why Peter's inspection system is expected to make an average of 50% error for such a set of hand-pick test specimens.