DT1 : Apply basic concepts of probability

1. What is the probability of getting matching numbers when rolling two dice?

DT2 : Calculate expected monetary value

2. Calculate the expected value of a game in which we flip a fair coin twice. Two heads and you win 20, anything else, I win 7.

DT9 : Explain/distinguish related concepts

Define these terms

3. Exhaustive/mutually exclusive
4. imperfect test
5. value of information

DT3 : Translate verbal description of decision process into descriptive decision tree and vice versa

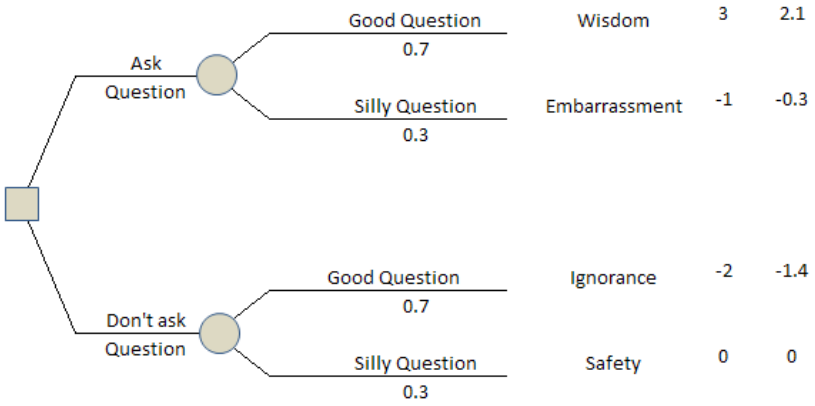
DT4 : Use simple tree to assess a set of alternatives under uncertainty

6. Draw and "solve" the decision tree for this first example in the text book.

"The officer in charge of a United States Embassy recreation program has decided to replenish the employees club funds by arranging a dinner. It rains nine days out of ten at the post and he must decide whether to hold the dinner indoors or out. An enclosed pavilion is available but uncomfortable, and past experience has shown turnout to be low at indoor functions, resulting in a 60 per cent chance of gaining $100 from a dinner held in the pavilion and a 40 per cent chance of losing $20. On the other hand, an outdoor dinner could be expected to earn $500 unless it rains, in which case the dinner would lose about $10" (Stokey & Zeckhauser 1977, 202).

7. Finish this description of the problem represented by the tree below and finish the calculations in the tree and indicate what the decision should be.

A student makes a decision tree to assess whether or not she should be ask a question in class. She estimates the probability that a question is a silly one.



DT5 : Use decision tree to Calculate the value of information provided by a perfect test (how much should we be willing to pay for information?)

8. Should we hire a potential superstar employee or should we go for a less stellar but probably tried-and-true candidate? The star would require a salary of 250, the ordinary would cost only 100. If the star lives up to potential (75%), the benefits would be 500, but if she bombs, the benefits would be only 100.

   If the ordinary candidate turns out as expected (80%) the payoff is 275, but if she falls short, it won't be so bad, just 225. What should we do?

9. Suppose there was a test that would predict with certainty whether a star was going to be a star or a disaster. How much should we be willing to pay?

DT7 : Solve a problem that incorporates imperfect tests

10. Kids these days! Of those who get into trouble, it turns out, about 20% are "real trouble-makers" who need some help. The other 80% are normal adolescents who will age out of their trouble-making under normal care. A social worker friend introduces you to a test that you can give to kids who are referred to you to determine which category they are in. Research has suggested the test is 70% accurate. Use tree flipping to describe what to make of the test's results.

11. House gets another case. There's this funny rash. We won't say where it appears, but it's a funny rash. In 2% of the cases, it means something really, really bad — *anxoreisis pultrumatata*. Fortunately, there's a test. Unfortunately, it's not a perfect test. Fortunately, it's a pretty good test. Unfortunately, it is wrong 3% of the time. Work it out.

LP1 : Understand vocabulary and concepts associated with linear programming.

12. Identify in the following variables, constraints, objective function.

"A dietitian wants to design a breakfast menu for certain hospital patients. The menu is to include two items A and B. Suppose that each ounce of A provides 2 units of vitamin C and 2 units of iron and each ounce of B provides 1 unit of vitamin C and 2 units of iron. Suppose the cost of A is 4¢/ounce and the cost of B is 3¢/ounce. If the breakfast menu must provide at least 8 units of vitamin C and 10 units of iron, how many ounces of each item should be provided in order to meet the iron and vitamin C requirements for the least cost? What will this breakfast cost"

13. What is a feasible set in LP and how is the concept used more generally?

LP2 : Translate word problems into inequalities for Use in linear programming model.

Translate the following into inequalities in the form

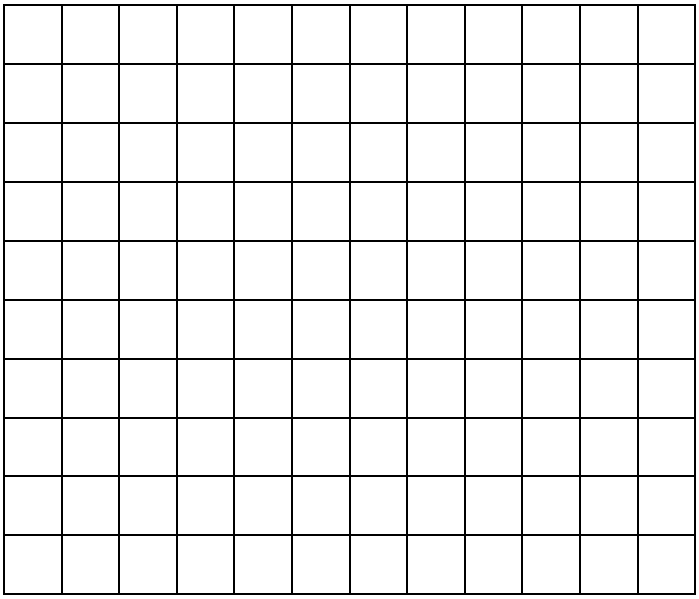
coefficient*variable +…+ coefficient*variable (≥≤ =) CONSTANT

14. I can only I spend as much cash as in my wallet on dinner, dessert, drinks, and a tip and I really want to have dinner and drinks though I might pass on dessert. I also will not feel comfortable if the drinks cost as much as dinner.

15. You are managing a youth shelter. Kids present with an array of personal challenges, each of which require different levels of attention from your staff. Clients with issue A require 4 hours of attention per week. Issue B, about 2 hours, C requires 16, and D 7. Your budget allows you to staff 75 hours per week.

LP3 : be able to Solve linear programming model graphically

16. I have to divide my 20 hours of study time between policy, sociology, and geography. I have to spend at least 4 hours on geography, 2 on sociology and 6 on policy. Sociology and policy together should be at least 12. How can you make this ostensibly three dimensional problem into a two dimensional problem? What feasible set is generated by the following constraints. Draw the constraint lines and feasible set on the grid below.



LP4 : Translate simple linear programming problem into Excel and Use solver to find optimum.

17. Use Excel Solver to find optimum for the following

Your are the supervisor at a new after-school program for science and arts students. The program will serve 100 science students and 100 arts students. Activities will include math help, writing help, and crafts. Materials, supervision, and the like have been priced out at $6/person for math, $3/person for writing help, and $5 for crafts. Space needs are such that we can get 4 math help at a table, 2 writing help players, or 6 crafters. The center has 50 tables. Solid research has shown that needs among these students is somewhat major specific. Math help will always be 40% science students and 60% arts, writing help 50-50, and crafts ends up being 70% science and 30% arts. What is the most economical division of activities subject to these constraints?

(NOTE: spreadsheet available)