**SUID:** 

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**Exam 2**
Fall 2010

**DO NOT OPEN THIS EXAM UNTIL YOU ARE TOLD TO DO SO.**

**Instructions**

1. Write your SUID in the upper right corner of this exam. Do NOT write your name.

2. SHOW ALL YOUR WORK. Answers without supporting work will receive little or no credit.

3. Do all your work on this exam. If you need extra space, write on the backs of the pages. However, if you do write an answer on the back of a page, *be sure you've noted that near the question.*

4. There are 72 points on the exam and you'll have 80 minutes to work on it. Budget your time accordingly.

5. Most of the questions have several steps. For clarity, they are indicated by (1a), (1b), (1c) etc. in the text.

6. Here is the general form of the Cobb-Douglas utility function and the corresponding demand equations:

$$U = X^a Y^{1-a} \qquad X = \frac{aM}{P_X} \qquad Y = \frac{(1-a)M}{P_Y}$$

**Question 1 (12 points)**

One of the households in the table below has Cobb-Douglas preferences. **(1a)** Please determine which one and calculate the value of *a* for that household. **(1b)** If Px=$10, Py=$6 and the household has $1000 to spend, please determine the household's consumption of X and Y. **(1c)** Draw the household's budget constraint and include the numerical values of its intercepts. Also sketch several of its indifference curves and show its equilibrium on the diagram. Be sure to show your work and label everything.

| House | Year | Income | Px | Py | Qx | Qy |
|---|---|---|---|---|---|---|
| A | 2008 | 900 | 10 | 5 | 30 | 120 |
| | 2009 | 1800 | 15 | 9 | 45 | 125 |
| B | 2008 | 800 | 10 | 5 | 32 | 96 |
| | 2009 | 900 | 15 | 9 | 24 | 60 |
| C | 2008 | 1100 | 10 | 5 | 88 | 44 |
| | 2009 | 1170 | 15 | 9 | 60 | 30 |

**Question 2 (12 points)**

**(2a)** Please derive the expenditure function for a household with Cobb-Douglas preferences. Be sure to show all the steps, not just the final result. Then analyze a $2.50 tax on good X applied to the household from question 1. The supply of X is perfectly elastic and Px rises to $12.50. Everything else remains the same: Py=$6 and M=$1000. **(2b)** What is the compensating variation for this policy? **(2c)** How much tax revenue does it raise?

**Question 3 (12 points)**

**(3a)** A household regards X and Y as perfect complements and always buys *a* units of good X for each unit of good Y. Please derive the household's demand equations for X and Y in terms of *a*, Px, Py and income M. Be sure to show the steps involved, don't just write down the equations. **(3b)** One of the households in the table below (same as the previous table) has perfect complements preferences. Please determine which household it is and calculate the value of *a*.

| House | Year | Income | Px | Py | Qx | Qy |
|---|---|---|---|---|---|---|
| A | 2008 | 900 | 10 | 5 | 30 | 120 |
| | 2009 | 1800 | 15 | 9 | 45 | 125 |
| B | 2008 | 800 | 10 | 5 | 32 | 96 |
| | 2009 | 900 | 15 | 9 | 24 | 60 |
| C | 2008 | 1100 | 10 | 5 | 88 | 44 |
| | 2009 | 1170 | 15 | 9 | 60 | 30 |

**Question 4 (12 points)**

Suppose the household from question 3 has $1300 of income, Px=$10 and Py=$6. **(4a)** Please determine the household's equilibrium consumption of X and Y. **(4b)** Draw the household's budget constraint and include the numerical values of its intercepts. Also sketch several of its indifference curves and show its equilibrium on the diagram. Be sure to show your work and label everything. **(4c)** Determine the compensating variation for a subsidy policy that reduces Px to $8. (You do not need to graph the new equilibrium.) **(4d)** Is the household better or worse off? How do you know?

**Question 5 (12 points)**

A household buys two goods, food (X) and services (Y), and its preferences can be represented by the utility function shown below. Also shown are the household's demand equations and expenditure function:

$U = (X - 5)^{0.5} * Y^{0.5}$
$X = 5 + (M - 5*Px)/(2*Px)$
$Y = (M - 5*Px)/(2*Py)$
$M = 2*U*Px^{0.5}*Py^{0.5} + 5*Px$

Initially, Px=$10, Py=$5 and M=$1050.

**(5a)** Please calculate the initial equilibrium. Now suppose the government is considering a package of policy changes that would cause Px to rise to $12 and Py to fall to $3. The household's income would remain $1050. **(5b)** Please calculate the compensating variation for this policy.

**Question 6 (12 points)**

Suppose households consume two goods, C and D. It is known that when M=$1000, Pc=$1 and Pd=$1, households choose C=800 and D=200. However, the exact form of household preferences is unknown. Some analysts argue C and D are complements and the demand for D is D=M/(Pd+4*Pc). Others argue preferences are Cobb-Douglas and D=0.2*M/Pd.

Good D creates health problems and the government would like to reduce D to 100 by raising Pd (Pc and M would be unchanged). **(6a)** Please calculate the value of Pd that would be needed under each set of preferences. **(6b)** Determine the compensating variation in each case. For convenience, the expenditure function for the Cobb-Douglas case is shown below. **(6c)** Finally, suppose the reduction produces $300 in health benefits which are not included in the CV. Why would it be important to resolve the uncertainty about preferences before going ahead with the policy? Be brief but quantitative!

Cobb-Douglas:
$M = 1.649*U*Pd^{0.2}*Pc^{0.8}$