SUID:

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Exam 2
Fall 2013

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. *You may not discuss this exam with anyone before Friday, November 8th.*

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

5. 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*.

6. Some algebraic relationships for exponents:

$$\left(AB\right)^c = A^c B^c, \qquad A^c A^d = A^{c+d}, \qquad \left(A^c\right)^d = A^{cd}$$

7. The general form of the Cobb-Douglas utility function and its demand equations:

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

Question 1 (9 points)

A household regards X and Y as perfect complements and always buys *b* units of good X for each unit of good Y. **(1a)** Please *derive* the household's demand equations for X and Y in terms of *b*, Px, Py and income M. Be sure to show the steps involved, don't just write down the equations. **(1b)** Determine which one of the households in the table below has perfect complements preferences and calculate the value of *b*. In the remainder of the exam, this will be referred to as the "PC" household.

House	Year	Income	Px	Py	X	Y
A	2011	900	6	12	100	25
	2012	1800	8	10	125	80
B	2011	1200	6	12	50	75
	2012	1600	8	10	50	120
C	2011	3000	6	12	300	100
	2012	2720	8	10	240	80

Question 2 (15 points)

Now suppose that in 2012 the government imposes a $1 tax on X and a $1 subsidy on Y, and also gives the PC household $52 of additional income. You may assume that the supply of each good is perfectly elastic so the prices become $9 for each good. **(2a)** Determine the household's new consumption of X and Y and illustrate the new equilibrium with an appropriate diagram. **(2b)** Calculate the compensating variation for the policy (relative to 2012 before the policy) and indicate whether the household is better or worse off. **(2c)** Calculate the total tax revenue paid by the household and the total value of the subsidy it receives. **(2d)** Taking into account all of the taxes, subsidies and transfers involved, what is the DWL associated with the policy?

Question 3 (9 points)

One of the households in the table below (identical to Question 1) has Cobb-Douglas preferences. **(3a)** Please determine which one and calculate the value of *a* for that household. **(3b)** Please *derive* the expenditure function for the household. Be sure to show all the steps, not just the final result. In the remainder of the exam, this will be referred to as the "CD" household.

House	Year	Income	Px	Py	X	Y
A	2011	900	6	12	100	25
	2012	1800	8	10	125	80
B	2011	1200	6	12	50	75
	2012	1600	8	10	50	120
C	2011	3000	6	12	300	100
	2012	2720	8	10	240	80

Question 4 (15 points)

Continuing the analysis from Question 3, now suppose that in 2012 the government wishes to use a tax to reduce the CD household's consumption of X by 20%. You may assume that the pre-tax supply of X is perfectly elastic at the 2012 price of $8. **(4a)** What tax will be needed to achieve the government's goal? Illustrate the household's new equilibrium (after the tax) with an appropriate diagram. **(4b)** Calculate the compensating variation for the policy. **(4c)** Calculate the total tax revenue paid by the household and the amount of DWL. **(4d)** What is the DWL per dollar of revenue?

Question 5 (12 points)

A household buys two goods, X and Y, and its preferences can be represented by the utility function shown below. Also shown are the household's demand equations and its expenditure function. Be careful about subscripts: the numerators and the denominators in the demand equations are both different.

$$U = (X^{0.5} + Y^{0.5})^2 \qquad X = \frac{M * P_y}{P_x * (P_x + P_y)}$$

$$M = U * (\frac{P_x * P_y}{P_x + P_y}) \qquad Y = \frac{M * P_x}{P_y * (P_x + P_y)}$$

Initially, Px=$9, Py=$9 and M=$1548. The government is considering a policy that would place a $6 tax on good X but would also give the household an extra $252 in income. The supply of X is perfectly elastic and its price would rise to $15. **(5a)** Please calculate the initial equilibrium before the policy is enacted and the new equilibrium with the policy in place. **(5b)** What is the CV for the policy? Is the household better or worse off? **(5c)** Calculate the income and substitution effects associated with the policy.

Question 6 (12 points)

An individual is concerned about consumption in two periods: 0 and 1. In period 0, she works and has an income of $200,000. In period 1, she expects to be retired and receiving a pension of $50,000. Her preferences over bundles of consumption in the two periods, C0 and C1, are given by a Cobb-Douglas utility function: $U = C0^{0.5} C1^{0.5}$. She can borrow or save at an interest rate of 25 percent. **(6a)** Please calculate her equilibrium, indicate how much she consumes in each period, and calculate how much she borrows or saves in period 0. **(6b)** Illustrate your results with an appropriate diagram showing her intertemporal budget constraint, indifference curve and equilibrium.