Name:

Student ID:

1. Government actions and Welfare economics. (30 points)

Consider the market for sugar in China. The domestic demand function is given by

$$Q^D = 10 - 2 \times P.$$

The domestic supply function is

$$Q^S = 2 \times P - 2.$$

Please draw graphs to help illustrate your answers to the following questions.

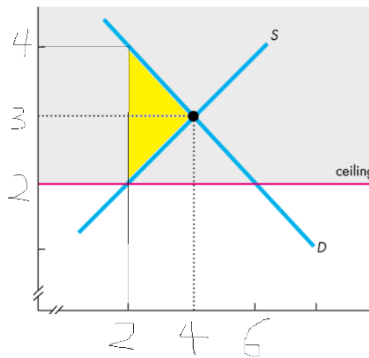(a) Suppose there is a price ceiling of 2 (RMB),

    (i)   Is there any excess demand or excess supply? If any, how much? (2 points)

        Excess demand.

        When there is a price ceiling of 2(<3), which is a binding price ceiling, the market price should be P=2.

        At P=2, quantity demanded is $10 - 2 \times 2 = 6$, quantity supplied is $2 \times 2 - 2 = 2$. Thus, the excess demand is 6-2=4 units.

    (ii)   What is the deadweight loss? (3 points)

With the price ceiling of 2, the market quantity is 2. Then the deadweight loss is $(4-2) \times \frac{4-2}{2} = 2$.

(b) Suppose there is a price floor of 4 (RMB),

(i)   Is there any excess demand or excess supply? If any, how much? (2 points)

Excess demand.

When there is a price floor of 4(>3), which is a binding price floor, the market price should be P=4.

At P=4, quantity demanded is $10 - 2 \times 4 = 2$, quantity supplied is $2 \times 4 - 2 = 6$. Thus, the excess supply is 6-2=4 units.

(ii)   What is the deadweight loss? (3 points)

With the price floor of 2, the market quantity is 4. Then the deadweight loss is $(4-2) \times \frac{4-2}{2} = 2$.

(c) Suppose the government is going to charge 1 (RMB) per unit of butter on the suppliers.

(i)   What is the tax incidence? Does the tax incidence change if the tax is levied on the buyers? (8 points)

When a tax=1 is levied on the supplier, the new supply curve should be

$$Q^S = 2 \times (P-1) - 2 .$$

The new market equilibrium price satisfies $2 \times (P-1) - 2 = 10 - 2 \times P$, i.e., P=3.5. Thus, the tax incidence is that the buyer bears a tax of 3.5-3=0.5, and the supplier bears 3-2.5=0.5.

(Note that after the tax is levied, the price paid by a buyer is 3.5 . The quantity traded in the market is $10 - 2 \times 3.5 = 3$. The price that the supplier actually receives satisfies $3 = 2 \times P - 2$, which implies that the price received is 2.5 .

Compared to the case before tax, the buyer pays 3.5-3=0.5 RMB more. The seller receives 3-2.5=0.5 RMB less.)

(ii)   What is the consumer surplus? (3 points)

The consumer surplus is $(5 - 3.5) \times 3 \div 2 = 2.25$.

(iii)   What is the producer surplus? (3 points)

The producer surplus is $(2.5 - 1) \times 3 \div 2 = 2.25$.

(iv)   What is the government revenue? (3 points)

The government revenue is $3 \times 1 = 3$.
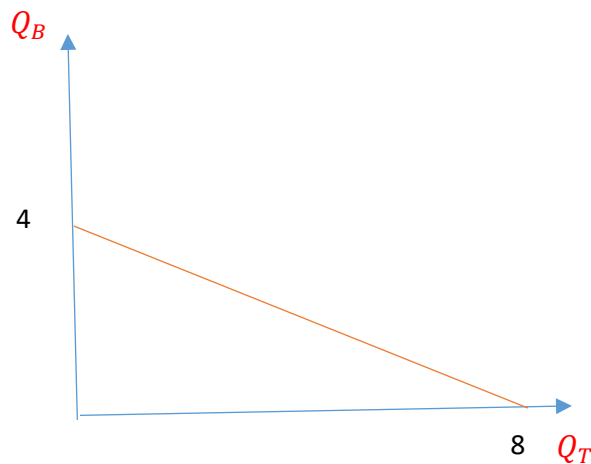
(v)   What is the deadweight loss? (3 points)

The deadweight loss is $(4 - 3) \times 1 \div 2 = 0.5$.

2. Consumer Theory. (25 points)

Xiao Ming has 8 RMB to spend. The price of tea is 1 RMB each, and burgers cost 2 RMB each.

(a) Denote Q_T, and Q_B as the quantities of tea and burgers, respectively. What is the budget constraint? Draw a graph to illustrate it. (3 points)

The budget constraint is $Q_T + 2Q_B \leq 8$.

(b) Xiao Ming's total utility schedule is as below. Fill the table below and answer the following three questions. (12 points)

Number of tea	U_T	MU_T	MU_T/P_T		Number of Burgers	U_B	MU_B	MU_B/P_B
0	0	**6**	**6**		0	0	**10**	**5**
1	6	**4**	**4**		1	10	**4**	**2**
2	10	**3**	**3**		2	14	**1**	**0.5**
3	13	**2**	**2**		3	15	**0**	**0**
4	15	**1**	**1**		4	15	**-8**	**-4**
5	16	**-**	**-**		5	7	**-**	**-**

(c) Which of the two goods demonstrates the law of diminishing marginal utility? (1 points)

Both.

(d) What is the optimal consumption bundle with the highest obtainable utility level of Xiao Ming? What is the highest utility level? (5 points)

$Q_T = 4$ and $Q_B = 2$. Highest utility level is 15+14=29.

(e) Suppose after attending some health course, Xiao Ming now prefers a healthier life. How does it affect his choices? (4 points)

MU_T/P_T would _____increase/decrease/not affected_____.

MU_B/P_B would_____increase/decrease/not affected_____.

Lisa would spend more on_____Tea_____and less on_____Burger_____.

3. Consumer Theory. (15 points)

Anna's utility function for goods X and Y is represented as

$$U(X, Y) = \ln(X) + 4\ln(Y)$$

The prices of X and Y are 2 RMB and 4 RMB, respectively. Anna's income is 20 RMB. What is Anna's optimal consumption bundle (X*, Y*).

(Notice that here X and Y also refers to the quantity consumed by Anna.)

Anna's problem is

$$\max_{X,Y} U(X, Y) = \ln(X) + \ln(Y)$$

Subject to $2X + 4Y = 20$.

At optimal, we should have $MU_X/P_X = MU_Y/P_Y$. Since $MU_X = 1/X$ and $MU_Y = 4/Y$, we have

$$\frac{1/X}{2} = \frac{4/Y}{4}$$

which gives $X = 0.5Y$. Combining the budget constraint, we have $X^* = 2$ and $Y^* = 4$.

4. Income Effect and Substitution Effect. (30 points)

Bob has $12 to spend on tea and burgers. The price of tea is $1 each. The price of burgers is $2 each. Tea is a normal good, but burger is an inferior good. Now, the price of burger has increased to $3 each. Draw a two-dimensional graph and indicate the income effect and the substitution effect.
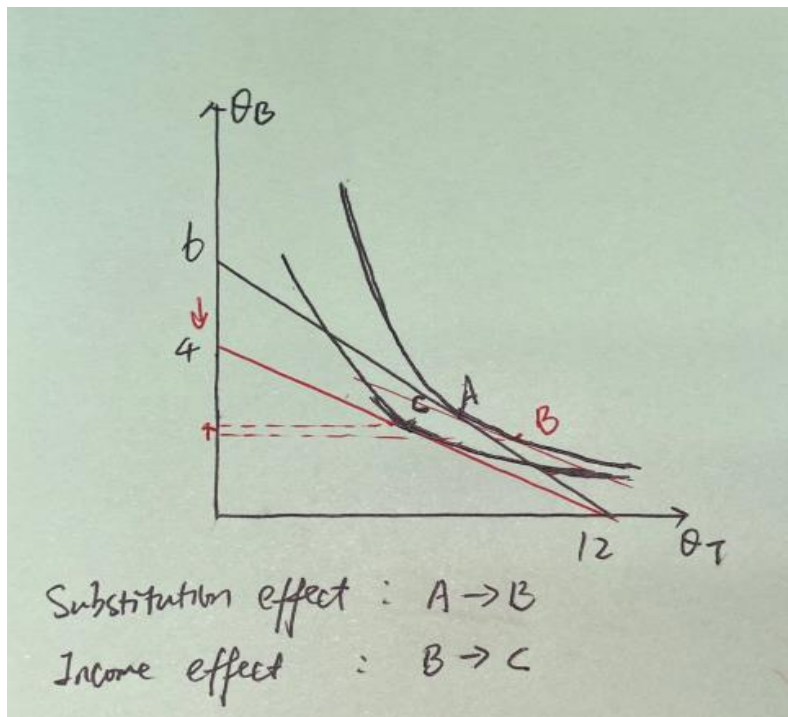
Note that Q_B at point C can be either greater or smaller than that at point A, but it must be greater than that at point B because of the income effect for an inferior good.