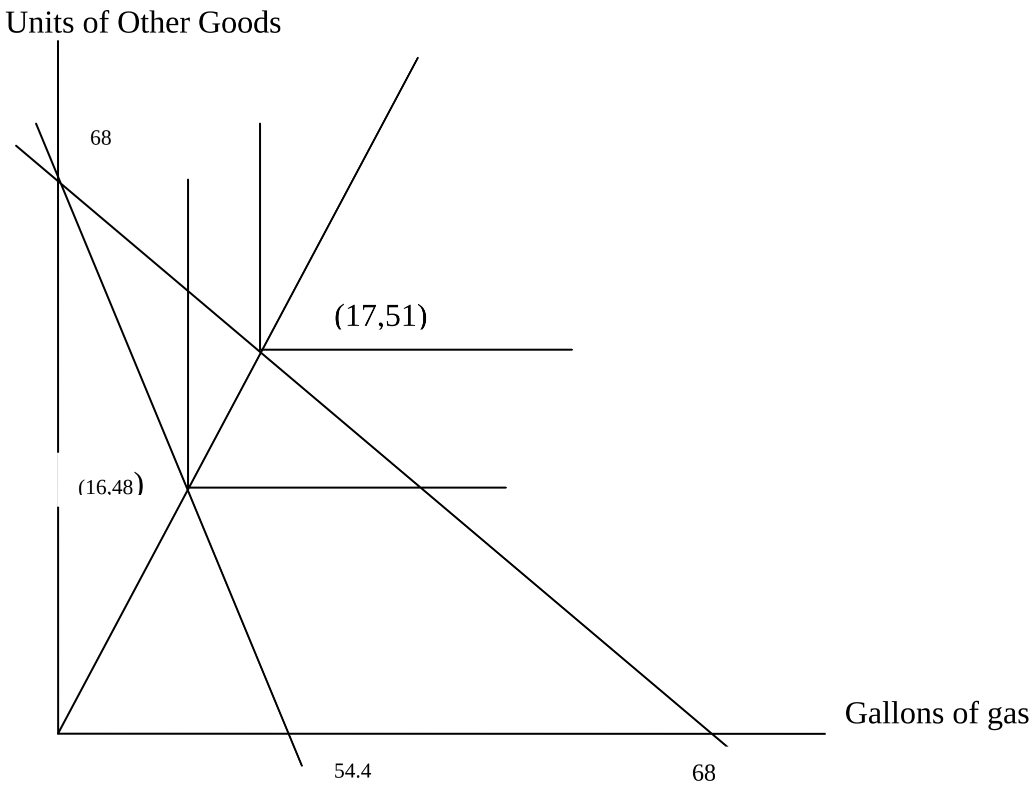
Part I Question 1

The typical American driver has a weekly commuting budget of $68 to spend on gallons of gas (x) and other necessities (y). Assume that we can represent his preferences by the utility function u(x,y) = min[3x,y].

a) **(2 points)** Suppose that the price of gas is $1 per gallon and the price of other goods is $1 per unit. Illustrate the budget set below.



b) **(6 points)** Given the preferences what is the best bundle at these prices? Illustrate the best bundle and include an indifference curve through that bundle in your diagram above.

Tangency: y=3x

Feasibility: x+y=68

$x^*=17$ and $y^*=51$

Representative Abeler proposes to tax gasoline. in particular she would like to place a tax of $.25 per gallon (so the price will rise to $1.25).

c) **(2 points)** In your diagram for part (a) illustrate the effect of Representative Abeler's proposal on the budget set.

See above

d) **(4 points)** What is the new best bundle of the typical driver? Illustrate the new best bundle in your diagram.

Tangency: $y=3x$

Feasibility: $1.25*x+y=68$

$x^*=16$ and $y^*=48$

e) **(2 points)** What are the tax revenues raised by the gasoline tax.

$R=16*(.25)= 4(\$)$

Representative Carlson took intermediate micro and he argues that a per unit tax is an inefficient way to raise revenues. He proposes that drivers should pay a flat fee instead of a per unit tax on gasoline (and so the price of gasoline would remain $1).

f) **(1 point)** If we are to make a revenue neutral comparison between the per unit tax and the flat fee then what would be the value of the flat fee?
Flat fee = $4

g) **(4 points)** Assuming that the value of the flat fee is set as in part (f) then what would be the best bundle given the flat fee? Illustrate the budget line and this best bundle in your diagram above.

Tangency: $y=3x$

Feasibility: $x+y=64$

$x^*=16$ and $y^*=48$

h) **(1point)** Is the typical driver strictly better off with the flat fee than with the per unit tax?

No. He is no better nor worse off.

i) **(2 points)** What (value) is the excess burden of the per-unit tax?

$0. The difference between tax revenue and EV to the tax change is zero.

Part I Question 2 (25 points) Do all questions in Part I

In 2000 Jerry buys cans of mackerel (x) and cans of trout (y). His preferences on mackerel (x) and trout (y) can be represented by the utility function $U(x,y) = 2\ln x + \ln y$.

a) **(6 points)** If the price of a can of mackerel is P_x, the price of a can of trout is P_y and he has \$I to spend each week on mackerel and trout then find his demand functions for mackerel and trout.

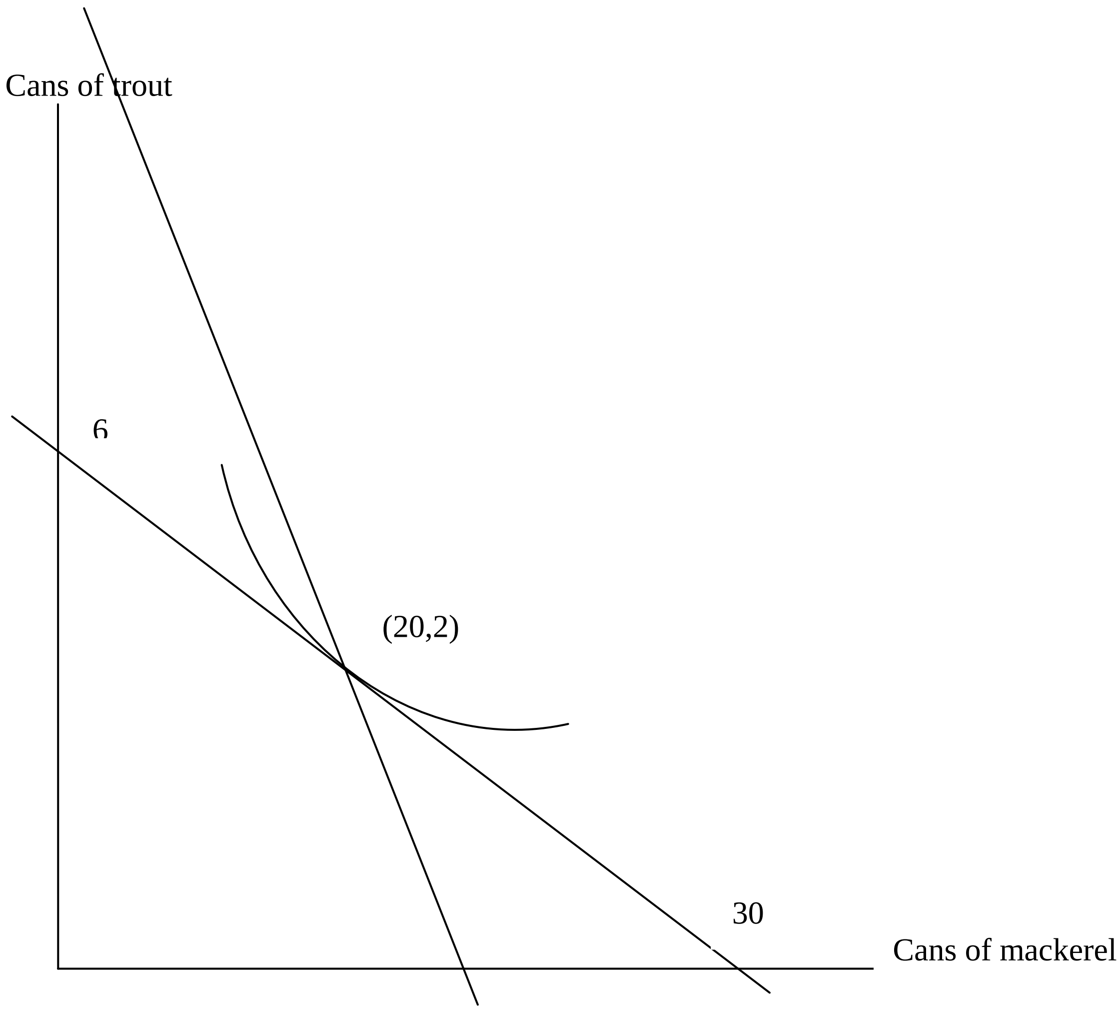
tangency: $MRS=2y/x=P_x/P_y$

feasibility: $p_x x+p_y y=I$

$x^*=(2I)/(3P_x)$ and $y^*=I/(3P_y)$

b) **(4 points)** Suppose that P_x = \$2, P_y = \$10 and I = \$60. Using your answer to (a) find his demands for mackerel and trout. Illustrate your answer in a diagram on the next page. Include an indifference curve through his best bundle.

$x^*=(2*60)/6=20$ and $y^*=60/30=2$



By 2008 the price of a can of mackerel has risen to $4 and a can of trout has fallen to $2.50 per can.

c) **(1 points)** Which good has become relatively cheaper?

Trout is relatively cheaper

d) **(5 points)** By how much would we have to adjust his income so that he could continue to afford his best bundle from 2000 in 2008? Illustrate the budget line associated with this adjusted level of income in your diagram above. Will Jerry purchase the same bundle of goods in 2008 that he purchased in 2000? If not then which good will he consume more of in 2008? Briefly explain your answer (there is additional room on the next page).

The cost of the bundle in 2008 is 4*20+2.5*2=85.

He will NOT but the same bundle, as the MRS at (20,2) is different from the price ratio in 2008.

Better bundles are available. He will consume more trout. (More up and to the left in the budget line).

e) **(1 point)** Is he better or worse off if his income is adjusted as in part (d)?

Better off.

f) **(2 points)** The rate of inflation is defined as the growth rate of a fixed weight price index**.** Assuming that the fixed weights are from the 2000 best bundle is the rate of inflation positive or negative in this example (you do not need to calculate the rate of inflation)? Briefly explain your answer.

The inflation is POSITIVE. The cost of the bundle (value of the index) in 2008 is greater than in 2000.

g) **(4 points)** Show that if his income is unchanged (so remains at 60) then Jerry is not made worse off nor better off by the price change between 2000 and 2008.

$x^*=(2I)/(3P_x)= (2*60)/12=10$ and $y^*=I/(3P_y) =60/(3*2.5)=8$

$U(10,8)=2ln(10)+ln(8)=ln(8*10^2)$

$U(20,2)=2ln(20)+ln(2)=ln(2*20^2)$

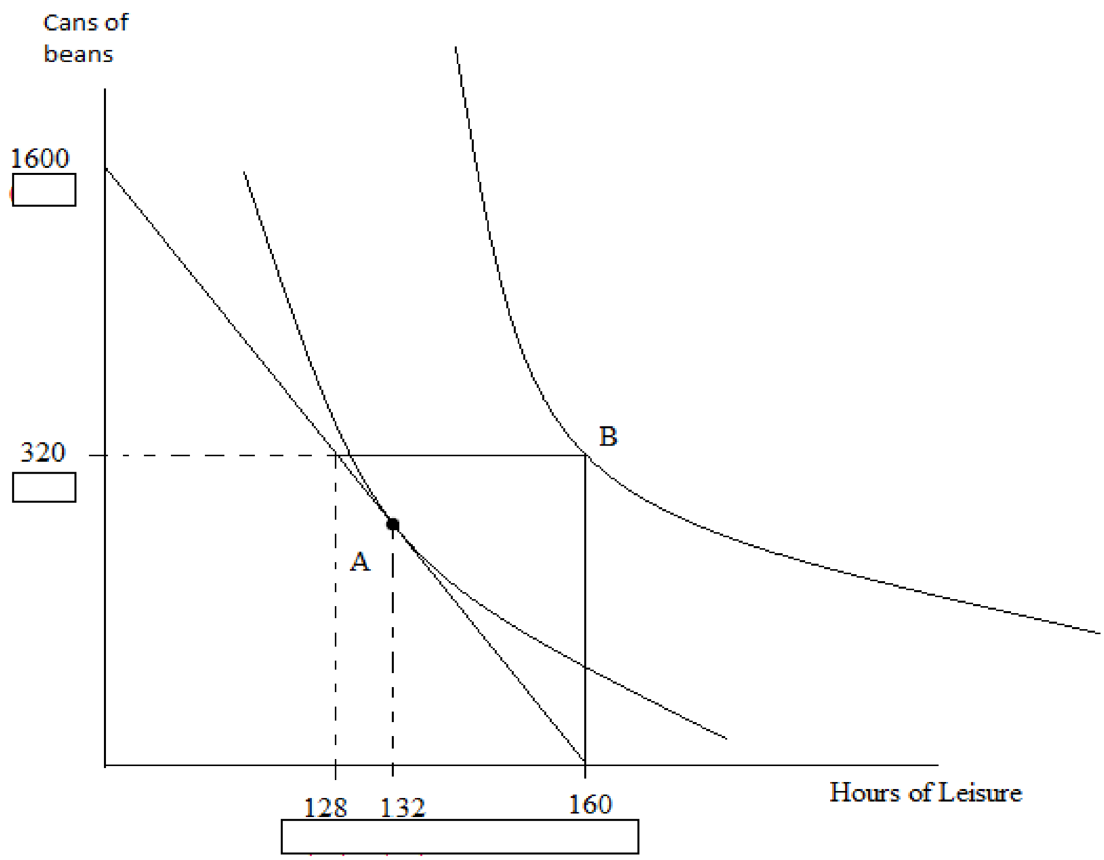
And not that $8*10^2=800=2*20^2$

h) **(2 points)** What is the compensating variation to the price change from 2000 to 2008?

$ 0 Since the consumer is no worse or better off after the price change , we do not need to compensate it at all.

Part I Question 3
Cecilia can work 160 hours in a month .She has the opportunity to work for $10 per hour. With the income that she earns from working she purchases cans of beans at a price of $1 per can. She has no other income.

a) **(2 points)** Putting hours of leisure on the x-axis and cans of beans on the y-axis illustrate Cecilia's budget set. Be sure to label (put the coordinates) on both intercepts.



an individual earned $50 the payments would be only reduced $10.

b) **(4 points)** In your new diagram illustrate the budget line associated with this second government assistance program. You must calculate the y-intercept of this budget line to receive full credit.

New y intercept (2 pts):
For every hour she makes $8 and gives back $2, so to repay the full $320 she must work 320/2=160 hours. If she works the full 160 hours she makes 8*160+320 = 1600 , the same as before.

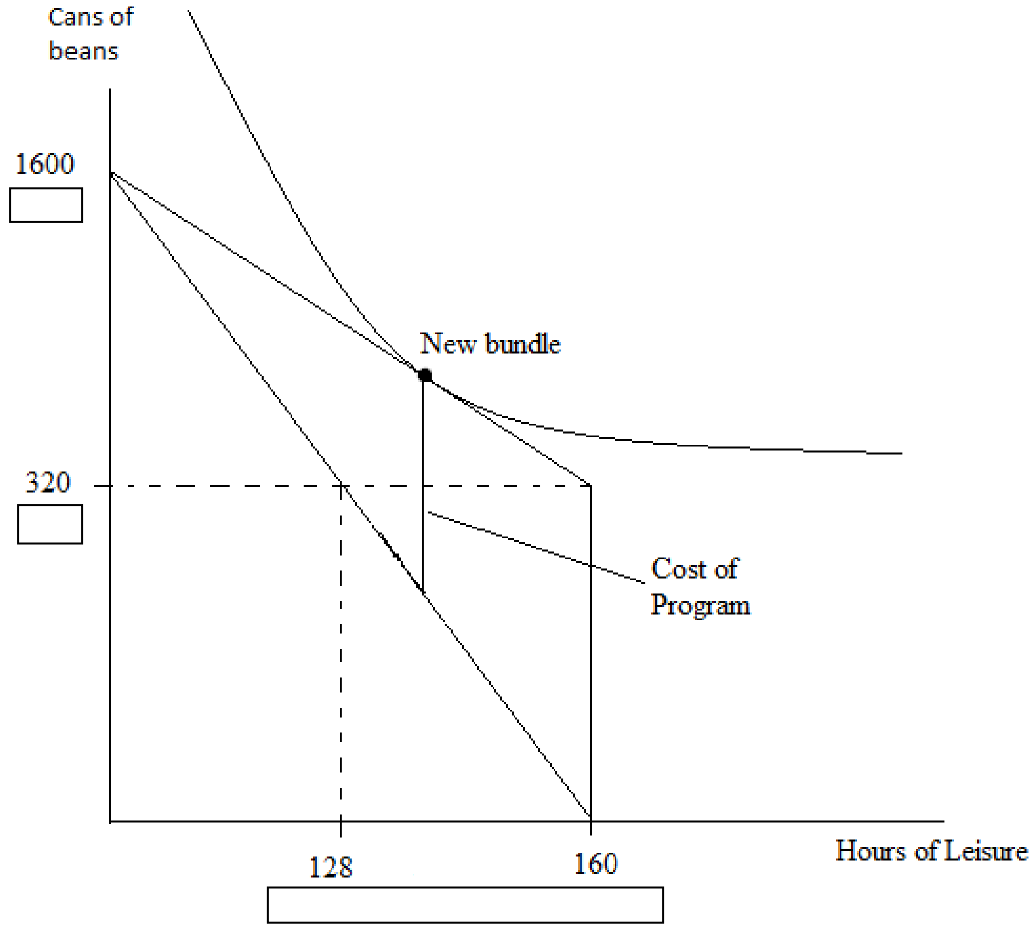
2 pts for shape of budget set below.

c) **(2 points)** Illustrate preferences for Cecilia such that given the second assistance plan she prefers to work a positive number of hours.

2 pts for an indifference curve through the new bundle that passes above the corner point in the budget set.

d) **(2 points)** Illustrate the cost to the government of the second program (assuming that Cecilia is working a positive number of hours). Which program is cheaper for the government?

See diagram (1 pt). The second program is cheaper because she works and pays back



Part II Question 1 Do 1 of 2 questions in Part II

Bernie has $1000 to invest and he is considering the purchase of bonds of CIT. The current price of is $1 per bond. In the future if CIT does not default then the price of a bond will double to $2. However, if CIT defaults then the bond will be worth $0. The probability that CIT defaults is .20. A dollar held in cash will be worth one dollar in the future. Finally assume that his preferences over money can be represented by the utility function $u(x) = \sqrt{x}$

a) **(6 points)** Suppose that Bernie has the option of investing 0%, 60% or 100% of his $1000 in CIT. What is the expected value of each of these options? Given his expected utility which one will he choose?

Let's prepare a table with the income results under the three investment options and the two different scenarios (default, no default)

% Invested in bonds	Number of bonds	Cash left	Value of bonds if CIT defaults	Value of bonds if CIT does not default	Total value of cash + bonds if CIT defaults	Total value of cash + bonds if CIT does not default
0%	0	1000	0	0	1000	1000
60%	600	400	0	1200	400	1600
100%	1000	0	0	2000	0	2000

Now it's easy to get the expected value and expected utility of each investment options:

0%:

$$EI = 0.2*1000 + 0.8*1000 = 1000$$
$$EU = 0.2*\sqrt{1000} + 0.8*\sqrt{1000} = \sqrt{1000} = 31.62$$

60%:

$$EI = 0.2*400 + 0.8*1600 = 1360$$
$$EU = 0.2*\sqrt{400} + 0.8*\sqrt{1600} = 0.2*20 + 0.8*40 = 36$$

100%:

$$EI = 0.2*0 + 0.8*2000 = 1600$$
$$EU = 0.2*\sqrt{0} + 0.8*\sqrt{2000} = 35.77$$

Given the values for the expected utility, Bernie will choose to invest 60% of his wealth.

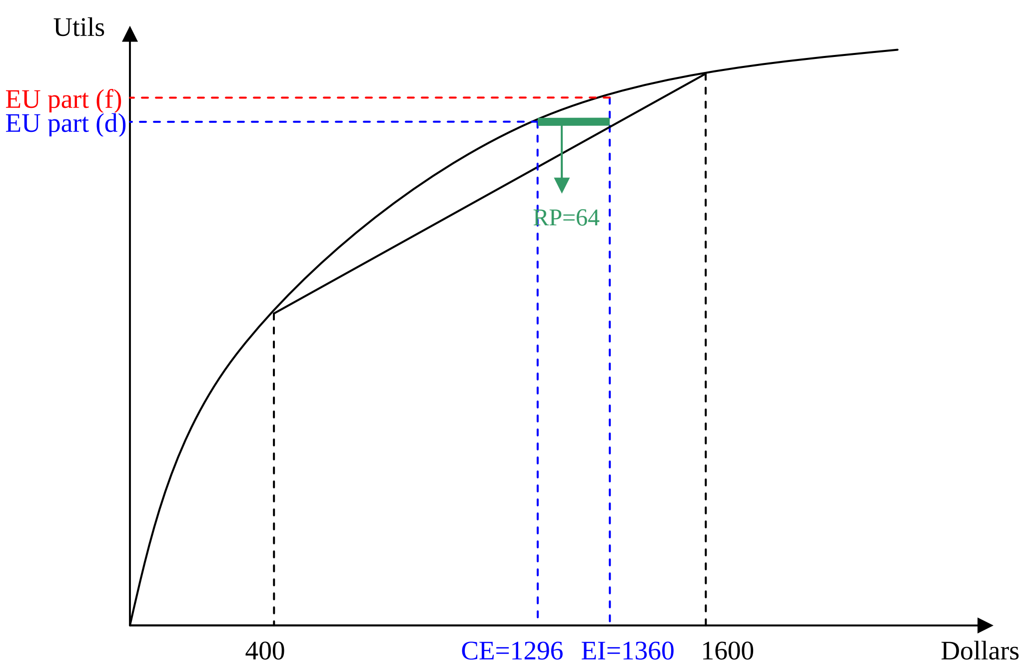
b) **(3 points)** In part (a) you should have found that investing 60% was best (if you did not then assume the answer is 60% from this point forward). What is the certainty equivalent to the 60% portfolio?

$$U\left(CE_{60\%}\right) = EU_{60\%} \Rightarrow \sqrt{CE_{60\%}} = 36 \Rightarrow CE_{60\%} = 36^2$$
$$\Rightarrow CE_{60\%} = 1296$$

c) **(3 points)** What is the risk premium associated with this portfolio?

$$RP_{60\%} = EI_{60\%} - CE_{60\%} = 1360 - 1296$$
$$\Rightarrow RP_{60\%} = 64$$

d) **(4 points)** Illustrate his utility function and the expected utility of the 60% portfolio in the diagram below. In the diagram label the expected value of the portfolio, the certainty equivalent and the risk premium.



Suppose that AGI offers to sell Bernie a credit default swap (CDS). If Bernie purchases a CDS then if CIT defaults AGI will pay him $1 per CDS. In the case that CIT does not default then the CDS pays $0. The price of a CDS is $r (so $1 of CDS coverage costs $r).

e) **(4 points)** What is the *actuarially fair* price of a CDS, i.e. for what r is the purchase of a CDS a fair bet?

The CDS costs $r no matter what, but pays back $1 if there is a default and $0 if there is no default. The fair price is such that the expected value of the CDS is equal to zero:

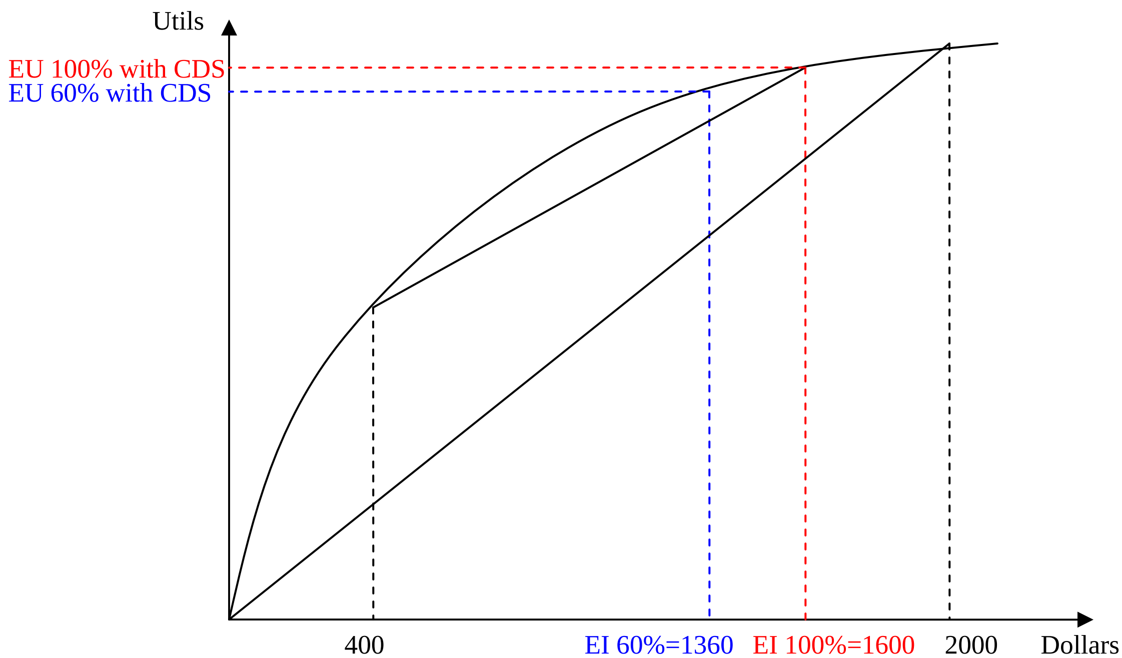
$$EV = 0.2 * 1 + 0.8 * 0 - r = 0$$
$$\Rightarrow r = 0.2$$

f) is fair then how many will he buy? Illustrate your answer in the diagram in (d).

The CDS is a kind of insurance. Since it is fairly priced, Bernie will buy full coverage (i.e. cover his total losses). With 60% invested in bonds, the no default state yields $1600 and the state with default yields $400. The losses are thus $1200. Full coverage then means buying 1200 CDS.

With 1200 CDS, Bernie pays $600 for the bonds and $240 for the CDS for a total expenditure of $840. He thus has $160 in cash left. In the no default state his bonds are worth $1200, and in the state with default his bonds are worth $0 but the CDS pay back $1200. His total income is this 1200+160=$1360 in both states. Notice that full coverage with CDS has the effect of removing risk and giving Bernie his expected income with certainty.

g) **(4 points)** If Bernie has the option of buying CDSs at the actuarially fair price that you found above then would he like to change his investment decision in part (a), i.e. would Bernie still choose the 60% portfolio? Briefly explain your answer and use the diagram to illustrate your answer.



Bernie would switch to the 100% portfolio, as he can now achieve a higher expected utility with that portfolio than he would with the CDS.

(3 points) The option of buying actuarially fair insurance has made the buying of bonds more attractive so it should raise their price from $1. What is the highest price per bond that Bernie would pay for a bond given that he can also buy the fair insurance?

This question can also be read, at what bond price would we be indifferent between investing and not investing? Or in other words, at what price does the bond become a fair bet?

Let this price be denoted by P. We will construct a security that consists of one bond and two CDS to fully cover for the bond's losses in the state with default.

The investment in the security costs: $P + 2 \cdot 0.2 = P + 0.4$
The security yields an income of $2 in the no default state (from the bond), and an income of $2 in the state with default (through the CDS).

For a fair price:
$EIncome = ECost \Rightarrow 2 = P + 0.4$
$\Rightarrow P = 1.6$

h) **(3 points)** Show algebraically that if Bernie buys 600 bonds at the price in (j) and fair insurance then he will be no better nor worse off than if he bought NO bonds.

Cost of 600 bonds @$1.6: $960
Cost of insurance @$0.2: $240
Cash left: 1000-960-240= -$200

The security yields $1200 in both states. So, the income in both states is:

$$Income(default) = -200 + 1200 = \$1000$$
$$Income(no\_default) = -200 + 1200 = \$1000$$

This is the exact sane case as with Bernie investing no money in bonds and holding on to his $1000 in cash.

Part II Question 1 Do 1 of 2 questions in Part II

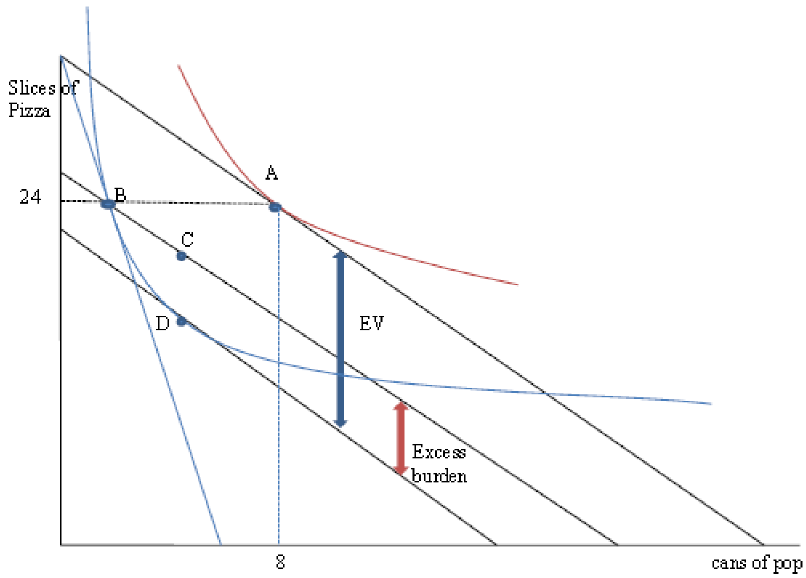
Suppose that we can represent Saul's preferences for cans of pop (the x-good) and pizza slices (y-good) with the utility function $u(x, y) = xy^2$. The Marshallian demand functions associated with this utility function are given by the following demand functions:

$$x = \frac{I}{3P_x} \quad \text{and} \quad y = \frac{2I}{3P_y}$$

In the above P_x and P_y are the prices of cans of pop and pizza slices respectively and I is the income he will spend per week.

a) **(3 points)** If P_x = $1.5, P_y = $1 and I = $36 then how many cans of pop and pizza slices does he demand? Illustrate his best bundle below and label the bundle **A**.

x 8 and y = 24



The government decides to levy a per unit tax on cans of pop. The tax rate is set at $10.50 per can.

b) **(3 points)** What will be his best bundle after the tax raises the price of a can to $12? Illustrate his new budget line and best bundle in your diagram above. Label the best bundle **B**. What is the level of his utility at bundle B?

x = 1, y is unchanged and u(1,24)= 576

Suppose instead of a per unit tax the government decides to levy a lump sum tax.

c) **(1 point)** How much revenue did the per unit tax raise?

10.50

d) **(2 points)** Assume that the government sets the lump sum tax equal to the tax revenues of the per unit tax. Illustrate in your diagram the effect of the lump sum tax on Saul's choice of best bundle. You do not need to calculate his best bundle. Label this best bundle C.

e) **(1 point)** Write the expenditure minimization problem for Saul's utility function**.**

min $p_x x + p_y y$ subject to $u(x,y) = u$

f) **(6 points)** Solve for Saul's Hicksian demands for pop and pizza as a function of prices and utility level (there is additional space on the next page).

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1. Tangency: $\frac{y}{2x} = \frac{p_x}{p_y} \Rightarrow y = \frac{2p_x}{p_y} x$

2. Feasibility: $u(x, y) = u \Rightarrow xy^2 = u$

$$x^h = u^{\frac{1}{3}} \left(\frac{p_y}{2p_x} \right)^{\frac{2}{3}}$$

$$y^h = u^{\frac{1}{3}} \left(\frac{2p_x}{p_y} \right)^{\frac{1}{3}}$$

g) **(6 points)** Use your Hicksian demands to find a bundle, D, such that 1)Saul is indifferent between D and B; 2) Saul would choose bundle D at the original prices. What is the cost of bundle D at the original prices?

1) indifferent implies that u 576

2) Choose D at the original prices P_x=1.5 and P_y=1

x^h=4 and y^h =12

Cost of (4,8) = 18 at the original prices.

h) **(2 points)** Illustrate bundle D in your indifference curve diagram.

i) **(6 points)** What is the equivalent variation to the price changed caused by the per unit tax on pop? What is the excess burden of the per unit tax on pop? Illustrate both of these values in your indifference curve diagram.

EV = \$6 because if I goes down by \$6 then he has 18 to spend and can buy bundle D.
Excess burden is \$4,5 (the difference between the tax revenues and EV)

j) **(2 points)** What bundle of goods will Saul purchase if prices remain at their original value and his income was reduced by the equivalent variation that you calculated in part (i) above?

He would by bundle D.