

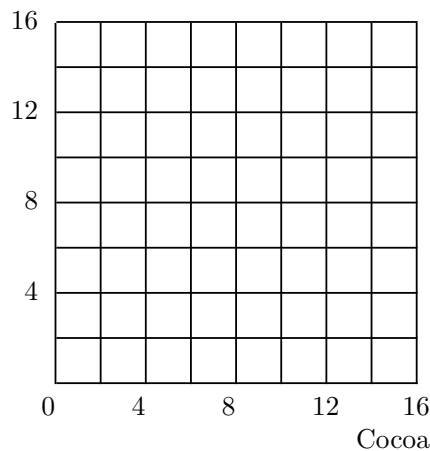
(c) If Mary had only 144 square feet in her garden, how many cockle shells would she grow?_____.

(d) If Mary grows both silver bells and cockle shells, then we know that the number of square feet in her garden must be greater than_____.

6.8 (0) Casper consumes cocoa and cheese. He has an income of \$16. Cocoa is sold in an unusual way. There is only one supplier and the more cocoa one buys from him, the higher the price one has to pay per unit. In fact, x units of cocoa will cost Casper a total of x^2 dollars. Cheese is sold in the usual way at a price of \$2 per unit. Casper's budget equation, therefore, is $x^2 + 2y = 16$ where x is his consumption of cocoa and y is his consumption of cheese. Casper's utility function is $U(x, y) = 3x + y$.

(a) On the graph below, draw the boundary of Casper's budget set in blue ink. Use red ink to sketch two or three of his indifference curves.

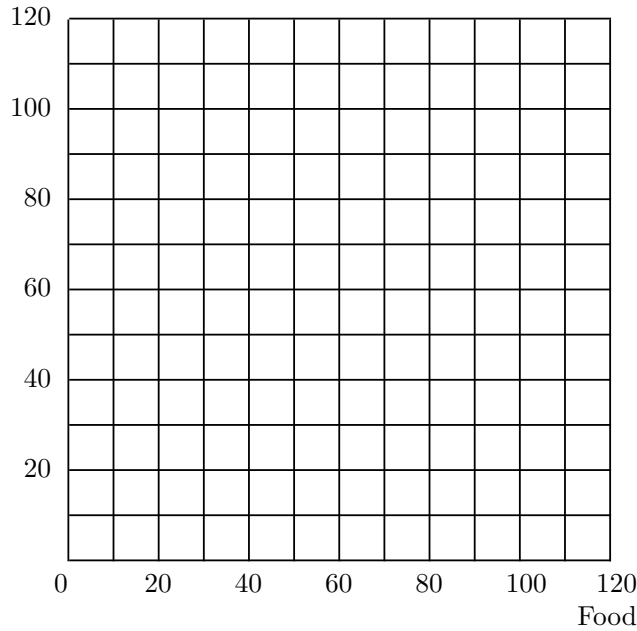
Cheese



(b) Write an equation that says that at the point (x, y) , the slope of Casper's budget "line" equals the slope of his indifference "curve." _____
 _____ Casper demands _____ units of cocoa and _____ units of cheese.

6.9 (0) Perhaps after all of the problems with imaginary people and places, you would like to try a problem based on actual fact. The U.S. government's Bureau of Labor Statistics periodically makes studies of family budgets and uses the results to compile the consumer price index. These budget studies and a wealth of other interesting economic data can be found in the annually published *Handbook of Labor Statistics*. The

Dollars worth of other things



6.12 (2) As you may remember, Nancy Lerner is taking an economics course in which her overall score is the *minimum* of the number of correct answers she gets on two examinations. For the first exam, each correct answer costs Nancy 10 minutes of study time. For the second exam, each correct answer costs her 20 minutes of study time. In the last chapter, you found the best way for her to allocate 1200 minutes between the two exams. Some people in Nancy's class learn faster and some learn slower than Nancy. Some people will choose to study more than she does, and some will choose to study less than she does. In this section, we will find a general solution for a person's choice of study times and exam scores as a function of the time costs of improving one's score.

(a) Suppose that if a student does not study for an examination, he or she gets no correct answers. Every answer that the student gets right on the first examination costs P_1 minutes of studying for the first exam. Every answer that he or she gets right on the second examination costs P_2 minutes of studying for the second exam. Suppose that this student spends a total of M minutes studying for the two exams and allocates the time between the two exams in the most efficient possible way. Will the student have the same number of correct answers on both exams?

_____ Write a general formula for this student's overall score for the course as a function of the three variables, P_1 , P_2 , and M : $S =$ _____ If this student wants to get an overall score of S , with the smallest possible

total amount of studying, this student must spend _____ minutes studying for the first exam and _____ studying for the second exam.

(b) Suppose that a student has the utility function

$$U(S, M) = S - \frac{A}{2}M^2,$$

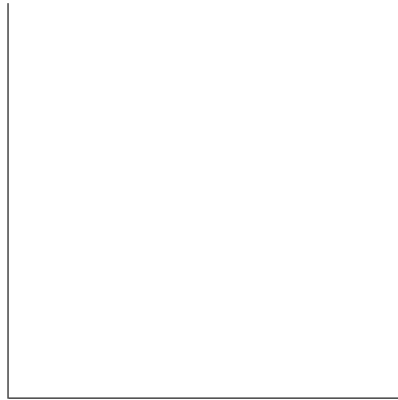
where S is the student's overall score for the course, M is the number of minutes the student spends studying, and A is a variable that reflects how much the student dislikes studying. In Part (a) of this problem, you found that a student who studies for M minutes and allocates this time wisely between the two exams will get an overall score of $S = \frac{M}{P_1 + P_2}$. Substitute $\frac{M}{P_1 + P_2}$ for S in the utility function and then differentiate with respect to M to find the amount of study time, M , that maximizes the student's utility. $M =$ _____ Your answer will be a function of the variables P_1 , P_2 , and A . If the student chooses the utility-maximizing amount of study time and allocates it wisely between the two exams, he or she will have an overall score for the course of $S =$ _____.

(c) Nancy Lerner has a utility function like the one presented above. She chose the utility-maximizing amount of study time for herself. For Nancy, $P_1 = 10$ and $P_2 = 20$. She spent a total of $M = 1,200$ minutes studying for the two exams. This gives us enough information to solve for the variable A in Nancy's utility function. In fact, for Nancy, $A =$ _____.

(d) Ed Fungus is a student in Nancy's class. Ed's utility function is just like Nancy's, with the same value of A . But Ed learns more slowly than Nancy. In fact it takes Ed exactly twice as long to learn anything as it takes Nancy, so that for him, $P_1 = 20$ and $P_2 = 40$. Ed also chooses his amount of study time so as to maximize his utility. Find the ratio of the amount of time Ed spends studying to the amount of time Nancy spends studying. _____ Will his score for the course be greater than half, equal to half, or less than half of Nancy's?_____.

6.13 (1) Here is a puzzle for you. At first glance, it would appear that there is not nearly enough information to answer this question. But when you graph the indifference curve and think about it a little, you will see that there is a neat, easily calculated solution.

Kinko spends all his money on whips and leather jackets. Kinko's utility function is $U(x, y) = \min\{4x, 2x + y\}$, where x is his consumption of whips and y is his consumption of leather jackets. Kinko is consuming 15 whips and 10 leather jackets. The price of whips is \$10. You are to find Kinko's income.

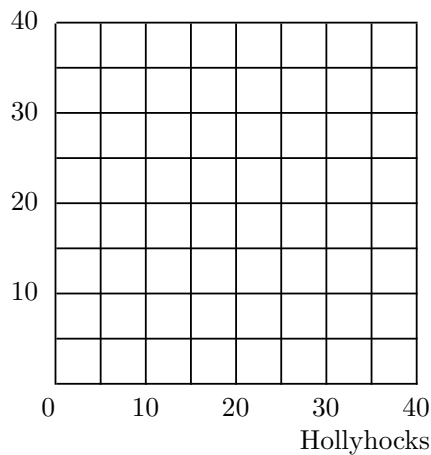


8.4 (0) Maude spends *all* of her income on delphiniums and hollyhocks. She thinks that delphiniums and hollyhocks are perfect substitutes; one delphinium is just as good as one hollyhock. Delphiniums cost \$4 a unit and hollyhocks cost \$5 a unit.

(a) If the price of delphiniums decreases to \$3 a unit, will Maude buy more of them? _____ What part of the change in consumption is due to the income effect and what part is due to the substitution effect?

(b) If the prices of delphiniums and hollyhocks are respectively $p_d = \$4$ and $p_h = \$5$ and if Maude has \$120 to spend, draw her budget line in blue ink. Draw the highest indifference curve that she can attain in red ink, and label the point that she chooses as *A*.

Delphiniums



(c) Now let the price of hollyhocks fall to \$3 a unit, while the price of delphiniums does not change. Draw her new budget line in black ink. Draw the highest indifference curve that she can now reach with red ink. Label the point she chooses now as B .

(d) How much would Maude's income have to be after the price of hollyhocks fell, so that she could just exactly afford her old commodity bundle A ? _____.

(e) When the price of hollyhocks fell to \$3, what part of the change in Maude's demand was due to the income effect and what part was due to the substitution effect? _____.

8.5 (1) Suppose that two goods are perfect complements. If the price of one good changes, what part of the change in demand is due to the substitution effect, and what part is due to the income effect? _____
_____.

8.6 (0) Douglas Cornfield's demand function for good x is $x(p_x, p_y, m) = 2m/5p_x$. His income is \$1,000, the price of x is \$5, and the price of y is \$20. If the price of x falls to \$4, then his demand for x will change from _____ to _____.

(a) If his income were to change at the same time so that he could exactly afford his old commodity bundle at $p_x = 4$ and $p_y = 20$, what would his new income be? _____ What would be his demand for x at this new level of income, at prices $p_x = 4$ and $p_y = 20$? _____.

(b) The substitution effect is a change in demand from _____ to _____ The income effect of the price change is a change in demand from _____ to _____.

(c) On the axes below, use blue ink to draw Douglas Cornfield's budget line before the price change. Locate the bundle he chooses at these prices on your graph and label this point A . Use black ink to draw Douglas Cornfield's budget line after the price change. Label his consumption bundle after the change by B .