ACTIVITY 50
The Derived Demand for a Product

The key to understanding how resources are priced in the factor markets is to see the relationship between demand in the factor market and demand in the product market.

The demand for a resource (land, labor, capital, or entrepreneurship) is called *derived demand* because it is derived from the demand for the goods and services that are produced by these resources. To be more specific, the demand for any resource is the downward sloping portion of the marginal revenue product curve. Let's examine why this is so.

1. Complete the following chart *Data for a Yo-Yo Manufacturer*. The firm operates in a perfectly competitive factor market and in a perfectly competitive product market. In a perfectly competitive factor market, market supply and demand determine the price of the factors of production, and in a perfectly competitive product market, supply and demand determine the price of the product.

Data for a Yo-Yo Manufacturer

Units of Resource	Total Product	Marginal Physical Product (Marginal Product)	Product Price	Total Revenue	Marginal Revenue Product
0	0		$2.00	$0	
		8			16
1	8		$2.00	$16	
		6			12
2	14		$2.00	$28	
3	19	____	$2.00	____	____
4	23	____	$2.00	____	____
5	26	____	$2.00	____	____
6	28	____	$2.00	____	____
7	29	____	$2.00	____	____

ACTIVITY 50 continued

2. Use the answers you got in the last column of the chart on the preceding page to graph marginal revenue product on *Plotting Resource Price and Quantity for Yo-Yos.* Label the MRP curve, "MRP = D."

Plotting Resource Price and Quantity for Yo-Yos
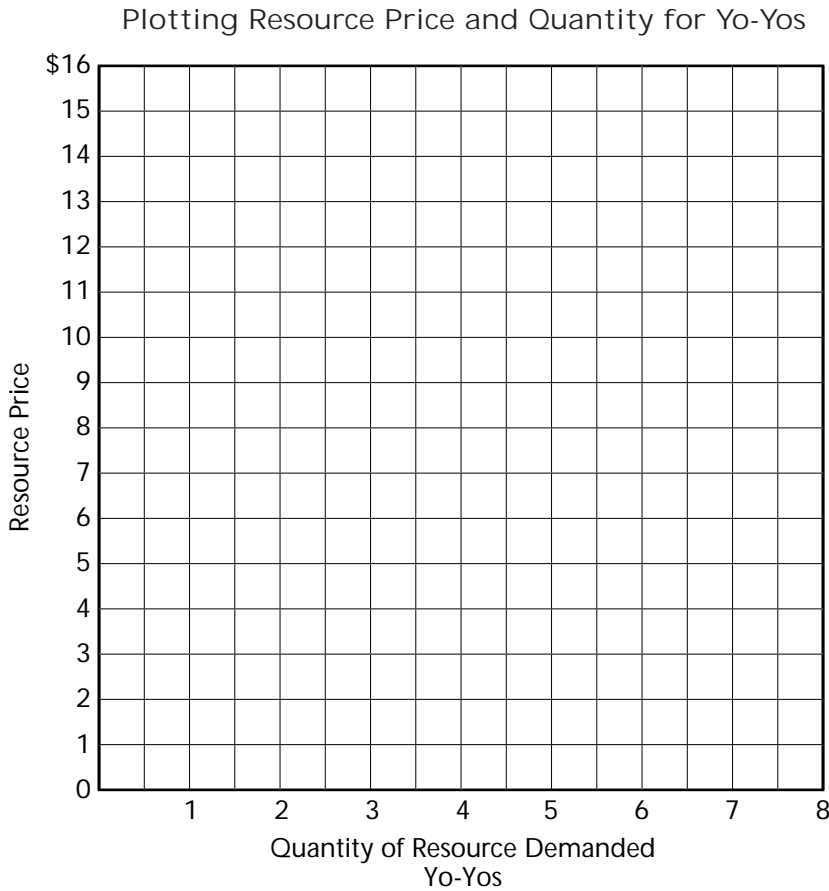
3. MRP depends on two variables. One is marginal physical product (MPP), sometimes referred to as marginal product. The second variable is the price of the good or service being produced. For each of the following situations, indicate whether the demand for a resource would increase or decrease.

   a. A new yo-yo machine increases productivity. _____

   b. The price of yo-yos increases. _____

   c. Better training increases the efficiency of yo-yo workers. _____

   d. The demand for yo-yos increases. _____

   e. New technology increases the output of yo-yo workers. _____

   f. Consumers tire of yo-yos. _____

ACTIVITY 51
How Many Workers Should Be Hired?

You are the president of Acme Yo-Yo Company, a small manufacturing firm that produced Supersonic Yo-Yos, a popular toy that makes a "supersonic" noise when used.

Acme's yo-yos are manufactured by yo-yo makers working at two yo-yo making machines. You have been estimating how many yo-yos your company can make using different numbers of workers, and you now have to decide just how many workers Acme will hire.

Your study of your yo-yo making process has shown that you can produce the following number of yo-yos per day depending upon how many workers you hire.

Workers Hired and Yo-Yos Produced

No. of workers hired	No. of yo-yos produced each workday	Change in no. of yo-yos produced
1	20	20
2	50	30
3	70	20
4	85	15
5	95	10
6	100	5

After the second worker is hired, hiring more workers still increases the number of yo-yos produced, but the extra number of yo-yos produced gets smaller and smaller as more workers are hired.

You have also learned that the market for Acme's yo-yos is such that Acme can sell as many yo-yos as it wants each day for $2 each, and that you can hire as many qualified yo-yo makers as you need by paying each one $25 per day.

The table *How Many Workers to Hire for $2 Yo-Yos* can help you decide how many workers to hire. First, you need to calculate the marginal physical product, the *additional* output created by one more worker.* You can do this by comparing the level of output with the level of output from *one less* worker. Next, you need to calculate how much revenue Acme will take in at each possible level of output. Then you will have to calculate how much *additional* revenue is earned by hiring one more worker. You can do this by comparing total revenue at one level of output with total revenue at the *next lowest* level of output. Finally, you can compare the *additional* revenue from hiring each worker (this is called the marginal revenue product of labor) with the *cost* of hiring the additional worker (which in this case is always $25 per day).

How Many Workers to Hire for $2 Yo-Yos

1 Number of workers hired	2 Level of output (number of yo-yos produced per day)	3 Marginal Physical Product (Extra output from hiring one more worker)	4 Price at which yo-yos can be sold	5 Total Revenue (P x Q, or col. 4 x col. 2)	6 Marginal Revenue Product (col. 3 x col. 4)
0	0		$2.00	$0	
		20			$40
1	20		$2.00	($20 x 2) = $40	
		____			____
2	50		$2.00	_____	
		____			____
3	70		$2.00	_____	
		____			____
4	85		$2.00	_____	
		____			____
5	95		$2.00	_____	
		____			____
6	100		$2.00	_____	

* Some textbooks call this marginal product.
Adapted from *Student Activities to Accompany the People on Market Street Series,* Indiana Council on Economic Education, Purdue Research Foundation, 1983.

ACTIVITY 51 continued

1. Why does the number of extra yo-yos produced decrease as more workers are hired?

2. If the wage is $25 per day, how many workers should Acme hire? _____ Why?

3. If the demand for yo-yos increases so that Acme can sell as many yo-yos as it wants for $3 each, what effect will this have on Acme's level of employment?

4. In order to make as much profit as possible, a firm should hire an additional worker as long as that worker's _____ is greater than his or her _____ .

ACTIVITY 52
The Only (Yo-Yo) Game in Town

Instead of being able to sell as many yo-yos as it wants at $2 each, suppose that Acme Yo-Yo Company is a monopolist. This means that Acme has no direct competition in selling yo-yos (although Acme will face competition from other kinds of toys and games). Acme finds that as a result of its monopolistic position it can charge a price higher than $2 if it wants to cut back its production and sell only a few yo-yos each day. Acme will, however, have to lower its price to sell additional yo-yos.

Daily Price and Demand for Yo-yos
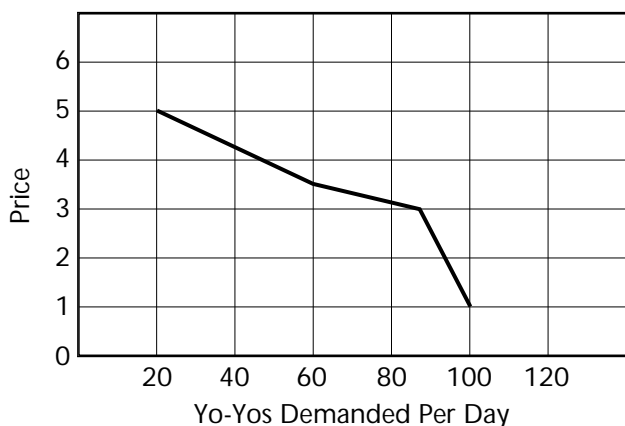
What effect will this have on Acme's demand for labor? You can figure this out by using the same procedure you followed when the price stayed constant at $2. You will have to calculate how much additional revenue will be brought in by hiring one more worker, and comparing that extra revenue with the extra cost of hiring the worker (i.e., the wage rate).

You can use the same table you used before except that now the price changes if more yo-yos are sold.

How Many Workers to Hire for Varying Price Yo-Yos

1 Number of workers hired	2 Level of output (number of yo-yos produced per day)	3 Marginal Physical Product (Extra output from hiring one more worker)	4 Price at which yo-yos can be sold	5 Total Revenue (P x Q, or col. 4 x col. 2)	6 Marginal Revenue Product (the change in total revenue from previous level)
0	0		$0.00	$0	
		20			$100
1	20		$5.00	(20 x $5) = $100	
		____		_____	____
2	50		$4.00	_____	
		____		_____	____
3	70		$3.50	_____	
		____		_____	____
4	85		$3.00	_____	
		____		_____	____
5	95		$2.00	_____	
		____		_____	____
6	100		$1.00	_____	

1. How does Acme's demand for labor differ from when its product sold for $2 each?

2. Acme's decision-making rule is the same: If an additional worker adds more to revenue than cost, this worker should be hired. If Acme can still hire workers at $25 per day, how many workers should Acme hire? _____ Why?

ACTIVITY 53
Factor Market Pricing

Part A.

1. Fill in the blank spaces in the table *Number of Workers Hired in a Competitive Market.* Note that marginal figures are placed between levels of employment.

2. If the product of this firm sells for $3.00 in a purely competitive market and the costs for wages and benefits for each worker hired are $60 per day, how many workers would be hired? _____

3. At this employment level, total wage and benefit cost is $ _____ per day; total revenue is $ _____; and the difference is $ _____ .

4. What is the daily wage and benefit cost below which a seventh worker would be hired? $ _____

5. If the price of the competitive firm's product increased to $5.00, how many workers would be hired at a wage and benefit cost of $60.00 a day? _____

Number of Workers Hired in a Competitive Market

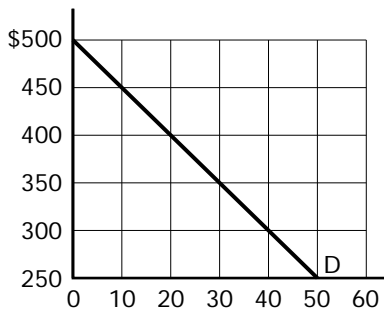| Employment No. of Workers (L)	Total Output per Day (Q)	Marginal Physical Product ($\Delta Q/\Delta L$)	Marginal Revenue Product ($\Delta R/\Delta L$) P = $3.00	Marginal Revenue Product ($\Delta R/\Delta L$) P = $5.00
0	0			
		20	$60	$100
1	20			
		30	____	150
2	50			
		35	105	____
3	85			
		30	____	____
4	115			
		____	75	____
5	140			
		____	____	100
6	160			
		____	45	____
7	175			
		10	____	____
8	185			
		____	15	____
9	190			
		____	____	0
10	190			
		-5	-15	-25
11	185			

Part B.

Assuming that there is a competitive market at Siwash University, graduate students can earn money by working for professors as Research Assistants (RAs) or as Teaching Assistants (TAs). A survey gives the following results:
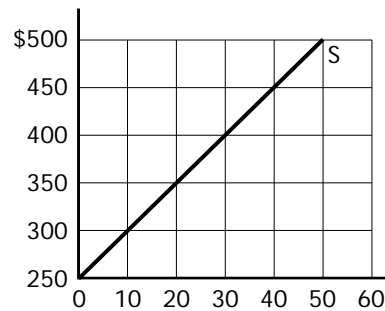
RAs Who Would Be Hired

Monthly Salary	No. of Grad Students Professors Would Hire (D)	No. of Grad Students Who Would Work (S)
$500	0	60
450	10	50
400	20	40
350	30	30
300	40	20
250	50	10

TAs Who Would Be Hired

Monthly Salary	No. of Grad Students Professors Would Hire (D)	No. of Grad Students Who Would Work (S)
$500	10	50
450	20	40
400	30	30
350	40	20
300	50	10
250	60	0

RAs–Supply and Demand

TAs–Supply and Demand

Follow directions, fill in the answer blanks, or cross out the incorrect words in parentheses.

1. Draw in the supply curve of RAs (left diagram) and label it "S."

2. Draw in the demand curve for TAs (right diagram) and label it "D."

3. a. The equilibrium wage for RAs is $ _____ .

   b. The equilibrium wage for TAs is $ _____ .

4. At these wages how many students would be hired? as RAs _____ as TAs _____

5. Suppose research assistants formed a union and agreed not to work unless they received $400 a month.

   a. How many RAs would be employed at $400 a month? _____

   b. How many previously employed RAs would be out of a job at $400 a month? _____

ACTIVITY 53 continued

6. If these unemployed RAs start looking for work as TAs, what would happen in the TA market at the old equilibrium wage? There would be an excess *(demand/supply)*.

7. Under these circumstances, what would you expect to happen to the equilibrium wage of TAs? It would tend to *(rise/fall)*.

8. In the TA market, would this be a shift in the supply curve or a move along it? *(shift/move)*

9. If more TAs are employed at a new equilibrium wage rate, would this be the result of a shift in the demand curve or a move along it? *(shift/move)*

ACTIVITY 54
What Is the Optimum Allocation of Resources?

1. The table *Total Production Employing Varying Amounts of Resource A* shows the total production a firm will be able to obtain if it employs varying amounts of resource A while the amounts of the other resources the firm employs remain constant.
    a. Compute the marginal product of each of the seven units of resource A and enter these figures in the table.
    b. Assume the product the firm produces sells in the market for $1.50 per unit. Compute the total revenue of the firm at each of the eight levels of output and the marginal revenue product of each of the seven units of resource A. Enter these figures in the table.

Total Production Employing Varying Amounts of Resource A

Quantity of Resource A employed	Total product	Marginal product of A	Total revenue	Marginal revenue product of A
0	0		$ _____	
		_____		$_____
1	12		_____	
		_____		_____
2	22		_____	
		_____		_____
3	30		_____	
		_____		_____
4	36		_____	
		_____		_____
5	40		_____	
		_____		_____
6	42		_____	
		_____		_____
7	43		_____	

   c. On the basis of your computations, complete the firm's demand schedule for resource A by indicating in the table *Demand Schedule for Resource A* the number of units of resource A the firm would employ at the given prices.

Demand Schedule for Resource A

Price of A	Quantity of A demanded
$21.00	_____
18.00	_____
15.00	_____
12.00	_____
9.00	_____
6.00	_____
3.00	_____
1.50	_____

ACTIVITY 54 continued

2. The table *Marginal Product Data for Resource B* shows the marginal product data for resource B. Assume that the quantities of other resources employed by the firm remain constant.

   a. Compute the total product (output) of the firm for each of the seven quantities of resource B employed and enter these figures in the table.

   b. Assume that the firm sells its output in an imperfectly competitive market and that the prices at which it can sell its product are those given in the table.

   Compute and enter in the table:

   1) Total revenue for each of the seven quantities of B employed.

   2) The marginal revenue product of each of the seven units of resource B.

   c. How many units of B would the firm employ if the market price of B were:

   1) $25_____   4) $9_____

   2) $20_____   5) $5_____

   3) $15_____   6) $1_____

Marginal Product Data for Resource B

Quantity of resource B employed	Total product	Marginal product of B	Product price	Total revenue	Marginal revenue product of B
0	0	—		$ 0.00	—
		_____			$ _____
1	22		$ 1.00	_____	
		_____			_____
2	21		.90	_____	
		_____			_____
3	19		.80	_____	
		_____			_____
4	16		.70	_____	
		_____			_____
5	12		.60	_____	
		_____			_____
6	7		.50	_____	
		_____			_____
7	1		.40	_____	

ACTIVITY 54 continued

3. The table *Marginal Revenue Data for Resources C and D* shows the marginal product and marginal revenue product schedules for resources C and D. Both resources are variable and are employed in purely competitive markets. The price of C is $2 and the price of D is $3. Resources C and D are substitutable.

Marginal Revenue Data for Resources C and D

Quantity of resource C employed	Marginal product of C	Marginal revenue product of C	Quantity of resource D employed	Marginal product of D	Marginal revenue product of D
1			1		
	10	$5.00		21	$10.50
2			2		
	8	4.00		18	9.00
3			3		
	6	3.00		15	7.50
4			4		
	5	2.50		12	6.00
5			5		
	4	2.00		9	4.50
6			6		
	3	1.50		6	3.00
7			7		
	2	1.00		3	1.50

a. The least-cost combination of C and D that would enable the firm to produce:

1) 64 units of its product is _____ C and _____ D.

2) 99 units of its product is _____ C and _____ D.

b. The profit-maximizing combination of C and D is _____ C and _____ D.

c. When the firm employs the profit-maximizing combination of C and D, it is also employing C and D in the least-cost combination because _____ equals _____.

d. Examination of the figures in the table *Marginal Revenue Data for Resources C and D* reveals that the firm sells its product in a _____ competitive market at a price of _____.

e. Employing the profit-maximizing combination of C and D, the firm's:

1) Total output is _____.

2) Total revenue is _____.

3) Total cost is _____.

4) Assuming resources C and D are the only inputs, total profit is _____.

4. Acme Yo-Yo, Inc., can hire labor for $2 per unit and capital at $4 per unit. The firm can produce 50 yo-yos using any one of the three following combinations of factors:

Method of Production

	A	B	C
Units of labor	2	5	6
Units of capital	9	7	5

a. Should Acme use method A, B, or C? _____ Why?

b. How much profit will Acme make if it uses its most profitable combination and sells the yo-yos for $1 each?_____