Part A: Creating the Firm's Demand for Labor

Table 4-1.1
Productivity and Revenue Data for Yo-Yo Workers

L (workers per day)	Q (yo-yos per day)	MPP	P	TR	MRP
0	0	–	$5	$0	–
1	20	+20	$5	$100	+$100
2	50	+30	$5	$250	+$150
3	70	+20	$5	$350	+$100
4	85	+15	$5	$425	+$75
5	95	+10	$5	$475	+$50
6	100	+5	$5	$500	+$25

1. Complete Table 4-1.1. Assume the market price of a yo-yo is $5.

2. Why does the number of extra yo-yos produced by an additional worker decrease as more workers are added? Is it because the additional workers are less motivated and less talented than previous workers?
   MPP gets smaller due to the principle of diminishing marginal productivity, which says that as a firm adds more workers to a fixed amount of equipment, eventually the MPP diminishes. This is caused by the limited amount of capital and not because some workers are lazy or untrained. Economists assume the firm has homogeneous (identical) labor units.

3. Plot the MRP values in Figure 4-1.1. Connect those values and label the curve as "MRP." Plot each MRP value on the higher of the two L values, not at the midpoint. For example, plot the MRP value of $150 at L = 2 rather than at L = 1.5.

Figure 4-1.1

The Acme Firm's Demand for Labor and Supply of Labor
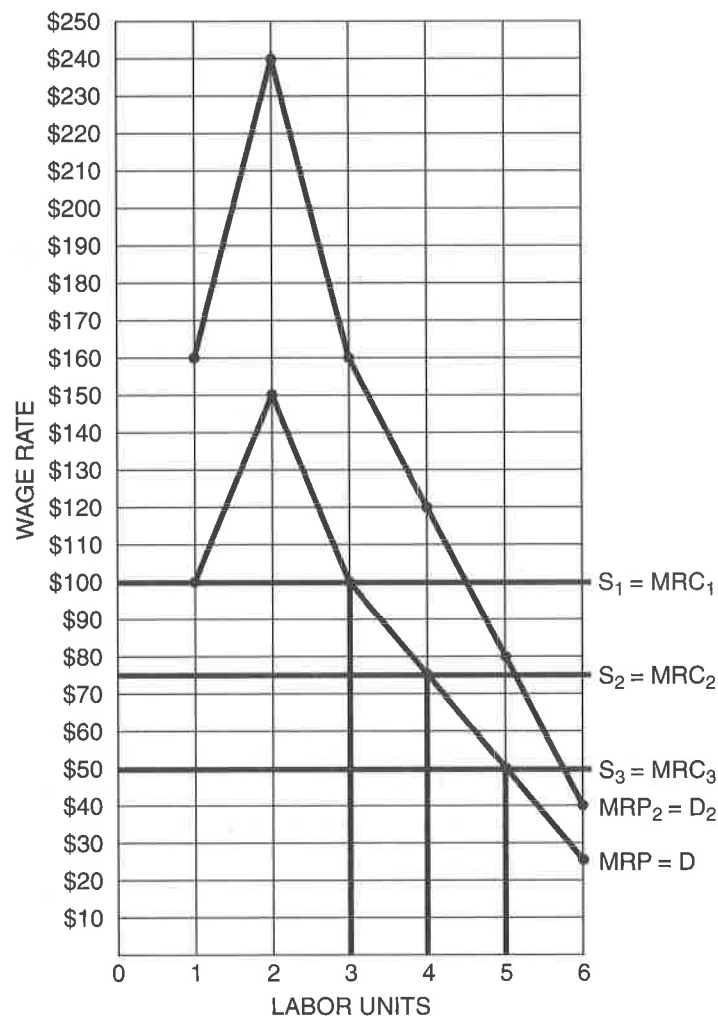
4. If the market wage is $100 per worker per day, your firm can hire all the workers it wants at that wage. This means the supply of labor to your firm can be shown as a horizontal line at the wage of $100. Draw a horizontal line in Figure 4-1.1 at $100 and label the line as "$S_1 = MRC_1$." The MRC to the firm of each extra worker is equal to the wage of $100.

5. At a wage of $100, how many workers should your firm hire? Why?
   The firm will hire 3 workers at a wage of $100. The first worker has MRP = $100, the second has MRP = $150, and the third has MRP = $100. Because the fourth worker has MRP of only $75, that worker will not be hired at a wage of $100.

6. Now assume the market wage drops to $75. Draw a new horizontal line at that wage and label it as "$S_2 = MRC_2$." How many workers will be hired at the wage of $75?
   The firm will hire four workers at a wage of $75.

7. Finally, assume the market wage is $50. Draw another horizontal line at that wage and label it as "$S_3 = MRC_3$." How many units of labor will be hired at the wage of $50?
   The firm will hire five workers at a wage of $50.

8. The firm's demand for labor shows how many workers it will hire at different wages. Complete Table 4-1.2 based on your work above.

Table 4-1.2
Acme's Demand for Labor

Wage	Number of workers hired
$100	3
$75	4
$50	5

9. If a firm hires labor in a perfectly competitive factor market, then the downward sloping portion of its MRP curve is its demand (D) curve for labor. If the wage is equal to the MRC, then by going to its MRP curve at a given wage, the firm finds the amount of labor where MRP = MCL. Go back to Figure 4-1.1 and label the MRP curve as "MRP = D."

10. Is the law of demand evident in Table 4-1.2? Why does a firm hire more workers when the wage decreases?
    Yes. As the wage decreases, the firm increases the number of workers it wishes to hire. A lower wage makes additional workers profitable.

Part B: The Derived Demand for Labor

We saw in Part A that if a firm operates in perfectly competitive resource markets, its demand for labor is its MRP curve. So what can increase the firm's demand for labor? Remember how we calculate MRP if the product market is perfectly competitive: MRP = (MPP)(price of the good). An increase in the MPP of labor or an increase in the price of the good will increase the MRP of labor, thus increasing the firm's demand for labor. A decrease in the marginal physical product or a decrease in the good's price will reduce the demand for labor.

11. In Table 4-1.3, indicate for each situation whether the product or labor market is being affected, whether the MPP of labor or the price (P) of the good will change, and whether the demand for labor will increase or decrease.

Table 4-1.3
Factors Changing a Firm's Demand for Labor

Situation	Which market?	Change in MPP?	Change in P?	Change in demand for labor
(A) A new yo-yo machine increases productivity of labor.	Product / **_Labor_**	**_Yes_** / No	Yes / **_No_**	**_Increase_** / Decrease
(B) The price of yo-yos increases.	**_Product_** / Labor	Yes / **_No_**	**_Yes_** / No	**_Increase_** / Decrease
(C) New government safety regulation reduces worker productivity.	Product / **_Labor_**	**_Yes_** / No	Yes / **_No_**	Increase / **_Decrease_**
(D) The demand for yo-yos decreases.	**_Product_** / Labor	Yes / **_No_**	**_Yes_** / No	Increase / **_Decrease_**
(E) New technology increases output of yo-yos.	Product / **_Labor_**	**_Yes_** / No	Yes / **_No_**	**_Increase_** / Decrease
(F) Consumers become tired of yo-yos.	**_Product_** / Labor	Yes / **_No_**	**_Yes_** / No	Increase / **_Decrease_**

The demand for any resource is called a *derived demand* because it is derived from the demand for the good or service that is produced by the resource. It is important that you understand the relationship between demand in the factor market and demand in the product market. (Even if you are a charming individual, unless you produce a good or service that is in demand, you will find it hard to land a good job.)

12. Assume that yo-yos become a hot fad and the increased demand for them drives the market price
of a yo-yo up to $8. Complete Table 4-1.4, which has the same productivity data as Table 4-1.1.

Table 4-1.4
Productivity and Revenue Data for Yo-Yo Workers

L (workers per day)	Q (yo-yos per day)	MPP	P	TR	MRP
0	0	–		$0	–
1	20	+20	$8	$160	+$160
2	50	+30	$8	$400	+$240
3	70	+20	$8	$560	+$160
4	85	+15	$8	$680	+$120
5	95	+10	$8	$760	+$80
6	100	+5	$8	$800	+$40

13. Plot the new MRP data in Figure 4-1.1 and label it as "$D_2 = MRP_2$." Does this represent an increase
in Acme's demand for labor? What caused it?
*This is an increase in the demand for labor caused by an increase in the price of the good
that labor is producing. The productivity of labor is unchanged but the value of the MPP has
increased because of the higher price of yo-yos.*

14. Based on your new MRP_2 curve in Figure 4-1.1, fill in Table 4-1.5.
*Because of the increase in labor's MRP, Acme will increase the number of workers hired at wage
of $100 and $75. It still hires 5 workers at a wage of $50 because the MRP of the sixth worker is
still less than $50.*

Table 4-1.5
Acme's New Demand for Labor

| Wage	Number of workers hired
$100	4
$75	5
$50	5

Part C: How Many Workers to Hire?

Figure 4-1.2 shows the MRP curve and the MRC curve for a company that sells its product in a perfectly competitive goods market and hires its labor in a perfectly competitive resource market.

15. You tell your friend that this firm should hire 760 units of labor because that is where MRP = MRC. Your friend is confused and asks how this firm can maximize total profit with 760 labor units since the marginal profit from the 760th labor unit appears to be $0. Can you help your friend understand the logic of the MRP = MRC rule?

Figure 4-1.2
Logic of the MRP = MRC Rule
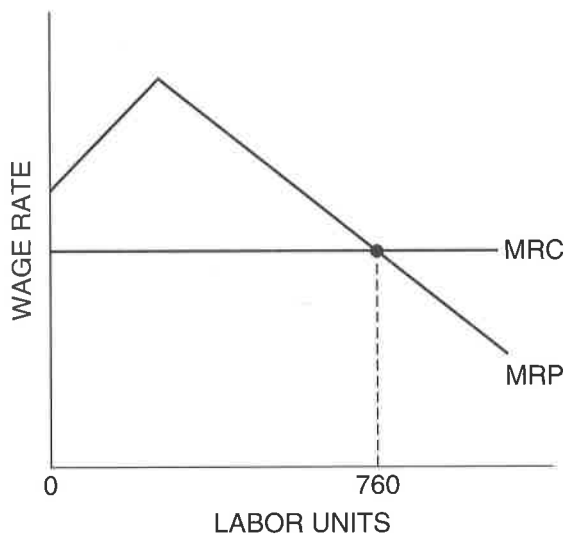
Yes, the marginal profit of the 760th worker is $0 because for that worker we see that MRP = MRC. But by hiring 760 workers, the firm hired the first 759 workers. And each of them had MRP > MRC, which means they each created positive marginal profit for the firm, thus increasing the firm's total profit. By stopping with the 760th unit, the firm did not hire workers with MRP < MRC because they would have negative marginal profit, which would decrease the firm's total profit. The "MRP = MCL" rule is a handy tool that identifies the amount of labor needed to maximize the firm's total profit.