**Solution (Assignment 8)**

**I/ Problems**

***Problem 1***

The following schedule shows the total output of CDs produced by workers:

|  |  |
| --- | --- |
| Workers | Total CDs per day |
| 1 | 40 |
| 2 | 70 |
| 3 | 90 |
| 4 | 100 |
| 5 | 105 |

If CDs sell for a price of $2 and workers can be hired in a competitive labor market for $30 per day, how many workers should be hired?

To know how many workers should be hired, we first should compute the Marginal Revenue Product (MRP) of each worker. MRPL = MPL × CD price

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Workers** | **CDs** | ***MP*** | ***MRP*** |
|  | 1 | 40 | 40 | $80 |
|  | 2 | 70 | 30 | $60 |
|  | 3 | 90 | 20 | $40 |
|  | 4 | 100 | 10 | $20 |
|  | 5 | 105 | 5 | $10 |

The firm should hire workers as long as *MRPL* exceeds the wage rate(W). When *W*= $30, the firm should hire three workers.

***Problem 2***

Consider the following information for a T-shirt manufacturing firm that can sell as many T-shirts as it wants for $3 per shirt:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of workers | Shirts produced per day | MPL | TR ($) | MRPL ($) |
| 0 | 0 | - | 0 | - |
| 1 | 30 | 30 | 90 | 90 |
| 2 | 80 | 50 | 240 | 150 |
| 3 | 110 | 30 | 330 | 90 |
| 4 | 135 | 25 | 405 | 75 |
| 5 | 155 | 20 | 465 | 60 |
| 6 | 170 | 15 | 510 | 45 |
| 7 | 180 | 10 | 540 | 30 |
| 8 | 185 | 5 | 555 | 15 |

1. Fill in the blanks in the table (done)
2. Verify that MRPL can be calculated in two ways: i) the change of TR from adding another worker; and ii) MPL times the price of output

For illustration purposes, let us compute MRPL as the change of TR induced by hiring the 7th worker: TR when 6 workers are hired is $3 × 170 = $510; TR when 7 workers are hired is $3 × 180 = $540. The variation in TR is an increase of $30.

Let us now compute the MRP of the 7th worker using the usual formula of MRPL: MPL (of the 7th worker) times the shirt price 🡺 10 × 3 = $30. We can see that we obtain the same result using two different methodologies. This should not be surprising: the MRP of the 7th worker is the additional revenue resulting from hiring this worker 🡸🡺 it’s the increase in TR that results from hiring the 7th worker

1. If the market-determined wage rate is $50 per worker per day, how many workers should the firm hire?

The firm should hire workers as long as *MRPL ≥ W*: if the wage rate is $50 🡺 the firm will hire 5 workers, because the MRP of the sixth worker is only $45, which is less than the wage.

1. Suppose the firm adopts a new technology of production that doubles output at each level of employment. What is the effect of this new technology on MPL and MRPL (the price of shirts remains constant)? How many workers should the firm hire now?

The new technology will double both MPL and MRPL at each number of workers. Now, at a wage of $50, the firm should hire seven workers (because the MRP of the seventh worker will be $60, but the MRP of the eighth worker will be only $30).

**II/ Multiple choice questions**

1. To mine coal, a mine owner can use a robotic drill or a team of coal miners. The drill and the coal miners are

(**a**) substitutable inputs.

(b) complementary inputs.

(c) both substitutable and complementary inputs.

(d) unrelated inputs.

This is an either/or situation. The inputs are substitutes in this case

2. “Al Banna’oun Cement” (BC) is a perfectly competitive firm. Cement sells at $4 per bag. BC employs 15 workers at a wage of $12 per hour. The marginal revenue product of the fifteenth worker is $8 per hour. To increase profits, BC should

(a) increase employment until the *MRP* of labor equals $12.

(**b**) decrease employment until the *MRP* of labor equals $12.

(c) increase the price of cement to at least $8 per bag.

(d) increase the price of cement to at least $12 per bag.

In a perfectly competitive industry, the producer has no control over price. Because wage exceeds *MRP*, BC should reduce its labor force

3. The supply of labor falls in the fishing industry. Which of the following events will occur? The wage rate will            and firms will            employment until *MRP* equals the new wage.

(a) increase; increase

(**b**) increase; decrease

(c) decrease; increase

(d) decrease; decrease

A decrease in supply increases the price of labor (wage). To restore equality, *MRP* must increase. To accomplish this, fewer workers will be hired.

4. The wage of workers (a variable resource) is increased. This will cause each of the following to occur EXCEPT

(a) the firm’s profit-maximizing output level will decrease.

(b) the firm will substitute away from labor to capital.

(**c**) the *MRP* of the final worker hired will decrease.

Fewer workers are being hired. As fewer workers are hired, the *MRP* of the final worker increases