**Table 1**

Labor      Total Product (TP)   Average Product of labor (AP)   Marginal Product of labor (MP)

**0               0                                  na                                                     na**

**1             100                              100                                                   100**

**2             300                             -----                                                   \_\_\_**

**3             450                             \_\_\_                                                    \_\_\_**

**4             \_\_\_                             \_\_\_                                                    110**

**5             630                             \_\_\_                                                    \_\_\_**

**6             \_\_\_                             110                                                    \_\_\_**

* **Complete this table.**
* **Draw the graphs of the marginal product (MP) and the average product (AP).**
* **To learn how to plot the data in Excel, see**[*https://www.youtube.com/watch?v=B3U9tDcoNeI*](https://www.youtube.com/watch?v=B3U9tDcoNeI)
* **Where do the AP and MP curve cross?**

The cost of 1 worker is $2000 per month. Total fixed cost is $4000 per month.

* **Complete Table 2 using your answers from Table 1 and by computing total variable cost (TVC) and total cost(TC).**

**Table 2**

Labor      Total Product (TP)   Total variable cost (TVC)   Total cost (TC)

**0               0                                  na                                                  4000**

**1             100                              2000                                                 \_\_\_**

**2             300                             -----                                                   \_\_\_**

**3             450                             \_\_\_                                                    \_\_\_**

**4             \_\_\_                             \_\_\_                                                    12000**

**5             630                             \_\_\_                                                    \_\_\_**

**6             \_\_\_                             12000                                                \_\_\_**

* **Draw the graphs of the TC and TVC curves. What is the relationship between these two curves?**
* **Complete Table 3 by using your answers from the previous Tables and calculating the AVC, ATC, and MC.**

**Table 3**

 Total Product (TP) Average variable cost (AVC) Average total cost (ATC)   Marginal cost (MC)

**0                                na                                na                                           na**

**100                              20                                \_\_\_                                          20**

**300                             -----                              \_\_\_                                         \_\_\_**

**450                             \_\_\_                               \_\_\_                                         \_\_\_**

**\_\_\_                             \_\_\_                               21.43                                      \_\_\_**

**630                             \_\_\_                                \_\_\_                                        \_\_\_**

**\_\_\_                             \_\_\_                                \_\_\_                                       66.67**

* **Draw the graphs of the ATC, AVC, and MC curves. What is the relationship between the ATC and AVC curves? Between the MC and AVC curves?**

Suppose that Al discovers new technology that boosts the productivity of his workers, so that more bicycles can be produced than before.

* **Complete Table 4, which presents production data with the new technology.**

**Table 4**

Labor      Total Product (TP)   Average Product of labor (AP)   Marginal Product of labor (MP)

**0               0                                  na                                                     na**

**1             120                               120                                                   120**

**2             360                              -----                                                   \_\_\_**

**3             540                              \_\_\_                                                    \_\_\_**

**4             672                              \_\_\_                                                    \_\_\_**

**5             756                              \_\_\_                                                    \_\_\_**

**6             792                              \_\_\_                                                    \_\_\_**

Al’s fixed cost remains at $4000, and he can continue to hire workers at the monthly rate of $2000.

* **Use the new technology data to complete Tables 5 and 6.**

**Table 5**

Labor      Total Product (TP)   Total variable cost (TVC)   Total cost (TC)

**0               0                                  na                                                    \_\_\_**

**1             120                              \_\_\_                                                    \_\_\_**

**2             360                              -----                                                   \_\_\_**

**3             540                              \_\_\_                                                    \_\_\_**

**4             672                              \_\_\_                                                    \_\_\_**

**5             756                              \_\_\_                                                    \_\_\_**

**6             792                              \_\_\_                                                    \_\_\_**

* **Draw the ATC and MC curves you just entered in Table 5.  How do the old and new ATC curves compare? The old and the new MC curves?**

 **Table 6**

Total Product (TP) Average variable cost (AVC) Average total cost (ATC)   Marginal cost (MC)

**0                                na                                na                                           na**

**120                              \_\_\_                              \_\_\_                                        \_\_\_**

**360                             -----                              \_\_\_                                         \_\_\_**

**540                             \_\_\_                               \_\_\_                                         \_\_\_**

**672                             \_\_\_                               \_\_\_                                         \_\_\_**

**756                             \_\_\_                                \_\_\_                                        \_\_\_**

**792                            \_\_\_                                \_\_\_                                         \_\_\_**

Return to the old technology data. Suppose that the cost of Al’s fixed inputs remains the same at $4000, but the cost of labor rises. Specifically, suppose that a worker now receives $3000 per month.

* **Complete Table 7. For the two missing TP copy your answers from Table 1**

**Table 7**

Labor      Total Product (TP)   Total variable cost (TVC)   Total cost (TC)

**0               0                                  na                                                   4000**

**1             100                              3000                                                 \_\_\_**

**2             300                             -----                                                   \_\_\_**

**3             450                             \_\_\_                                                    \_\_\_**

**4             \_\_\_                             \_\_\_                                                    16000**

**5             630                             \_\_\_                                                    \_\_\_**

**6             \_\_\_                             18000                                                \_\_\_**

**In Table 8 compare the cost before and after the increase**

**Table 8**

**Before the increase                                            After the increase**

TP            ATC         MC                                                   ATC         MC

**0               \_\_\_        \_\_\_                                                       \_\_\_        \_\_\_**

**100            \_\_\_        \_\_\_                                                       \_\_\_        \_\_\_**

**300           \_\_\_        \_\_\_                                                       \_\_\_        \_\_\_**

**450           \_\_\_        \_\_\_                                                       \_\_\_        \_\_\_**

**\_\_\_           \_\_\_        \_\_\_                                                       \_\_\_        \_\_\_**

**630           \_\_\_        \_\_\_                                                       \_\_\_        \_\_\_**

**\_\_\_          \_\_\_        \_\_\_                                                       \_\_\_        \_\_\_**

* **Last question: how did the rise in variable costs affect the average total cost?  The marginal cost?**