SAMPLE PROBLEMS FOR PRODUCTIVITY

1. A company that processes fruits and vegetables is able to produce 400 cases of canned peaches in one half hour with four workers. What is the labor productivity?

Solution:
Labor productivity = Quality Produced / Labors Hours
= 400 cases/ (4 workers x 1/2 hours / workers)
= 200 cases per labor hour

2. A company that makes shopping carts for supermarkets and other stores recently purchased some new equipment that reduces the labor content of the jobs needed to produce the shopping carts. Prior to buying the new equipment, the company used five workers, who produced an average of 80 carts per hour. Workers receive $10 per hour, and machine cost was $40 per hour. With the new equipment, it was possible to transfer one of the workers to another department, and equipment cost increased by $10 per hour while output increased by four carts per hour.

a. Compute labor productivity under each system. Use carts per worker per hour as the measure of labor productivity.

b. Compute the multifactor productivity under each system. Use carts per dollar cost (labor plus equipment) as the measure.

c. Comment on the changes in productivity according to the two measures, and on which one you believe is the more pertinent for this situation.

a) Labor Productivity under each system

$$\text{Labor Productivity}_{\text{Before}} = \frac{80\ \text{carts/hour}}{5\ \text{workers}} = 16\ \text{carts per worker/hour}$$

$$\text{Labor Productivity After} = = \frac{84\ \text{carts/hour}}{4\ \text{workers}} = 21\ \text{carts per worker/hour}$$

b) The Multifactor Productivity under each system.

$$\text{MFP}_{\text{Before}} = \frac{80\ \text{carts/hour}}{(5\ \text{workers} \times \frac{\$10}{\frac{\text{worker}}{\text{hour}}}) + \$40/\text{hour}} = \$0.89\ \text{carts per}$$

$$\text{MFP}_{\text{After}} = \frac{84 \text{ carts/hour}}{(4 \text{ workers} \times \frac{\$10}{\text{worker hour}}) + \$50/\text{hour}} = \$0.93 \text{ carts per}$$

c)Comment on the changes in productivity according to the two measures:

Labor Productivity Growth = $\frac{21-16}{16} \times 100\% = 31.25\%$

MFP Growth = $\frac{0.93-0.89}{0.89} \times 100\% = 4.49\%$

Looking only at the change in labor productivity may be misleading. While the improvement in this measure is remarkable, it is not matched by a corresponding improvement in MFP.

3. A wrapping paper company produced 2,000 rolls of paper one day. Standard price is $ 1/roll. Labor cost was $ 160, material cost was $ 50, and overhead was $ 320. Determine the multifactor productivity.

Solution:
Multifactor productivity =
Quality produced at standard price/(Labor cost + Material cost + Overhead)
= 2,000 rolls x $ 1/ ($160+ $ 50 + $320)
= 3.77 rolls output per dollars
Example # 4
a) Find the productivity if four workers installed 720 square yards of carpeting in eight hours.
b) Compute for the productivity of a machine which produced 68 usable pieces in two hours.
Solution:
a) Productivity = yards of carpeting install / Labors Hours worked
= 720 square yard / (4 workers x8 hours / worker)
= 720 yards / 32 Hours
= 22.5 yards/ hours
b) Productivity = Usable Pieces / Production Time
= 68 usable pieces / 2 hrs
= 34 pieces/ hours

5. Determine the multifactor productivity for the combined input of the labor and the machine time using the following:

Input:
Labor: $ 1,000
Materials: $ 520
Overheads: $ 2,000
Keep in mind the Production is 1760 unit

Solution:
Multifactor Productivity = Output / (Labor + Materials + Overheads)
= 1,760 Units / ($ 1,000 + $ 520 + $ 2,000)
= 0.50 units

6. A hamburger factory produces 50,000 burgers each week. The equipment costs $5,000 and will remain productive for three years. The annual labor cost is $8,000.

a) What is the productivity as measured in units of output per dollar of input over a 3 year period?

b) Management has the option of $10,000 equipment, with an operating life of five years. It would reduce labor costs to $4,000 per year. Should management purchase this equipment (using productivity arguments alone)?

Solution:

a) In this case, define

productivity = (total burgers produced)/($labor+$equipment)=(50,000*52*3)/(8000*3+5000)

= 269 burgers/$input

b) for new machine project:

productivity=(50,000*52*5)/(4000*5+10,000)

=433 burgers/$input

This is a good project from a productivity perspective. Although the proposed equipment is expensive, 5 year life and lower labor costs make new machine attractive.

7. Collins Little Company has a stuff of 4, each working 8 hours per day (for a payroll cost of $ 640/ day) and overhead expenses of $ 400 / day. Collins processes and closes on 8 titles each day.

The company recently purchased a computerized title search system that will allow the processing of 14 titles per day. Although the staff, their works hours, and pay will be same, the overheads expenses are now $ 800 per day.
Solution:
Labor productivity with the old system:
= 8 titles per day/ 32 labor hours = 0.25 titles per hour
Labor productivity with the new system:
=14 titles per day/ 32 labor hours = 0.44 title per labor hours
Multifactor productivity with the old system:
=8 titles per day / (640 + 400) = 0.0077 titles per dollars

Multifactor productivity with the new system:
=14 titles per day / (640 + 800) = 0.0097 titles per dollars

8. At Modem Lumber, Inc., Art Binley, a president and a producer of an apple crates sold to growers, has been able, with his current equipment, to produces 240 crates per 100 logs. He currently purchases 100 logs per day, and each logs required 3 labor hours to process. He believes
that he can hire a professional buyer who can buy a better quality log at the same cost. If this is the case, he increases his production to 260 crates per 100 logs. His labor hours will increase by 8 hours per day. What will be the impact on productivity (measured in crates per labor –hour) if the buyers is hired? What is the Growth in productivity in this case?
Solution:
a) Current labor productivity = 240 crates / 100 logs (3 hours pert log)
= 240/ 300
= 0.8 create per labor hour
b) Labor productivity with buyer = 260 crates / (100 logs (3 hours per logs) + 8 hours)
= 260 / 308
= 0.844 crates per labor hours
c) Growth = (0.844 – 0.8)/0.8 x100 % =

9. Calculate the productivity for the following operations:
a) Three employees processed 600 insurance policies last week. They 8 hours per day, 5 days per week.
b) A team of workers made 400 units of product, which is valued by its standard cost of $10 each (before markups for other expenses and profit). That accounting department reported that for this job the actual cost were $ 400 per labor, $1000 for materials and 4300 for overhead:
Solution:
a) Labor productivity = Policies processed /
Employee, hours
= 600 policies /
3 (40)
= 5 policies per hours
b) Multifactor productivity = Quality at standard cost
Labor + Materials + Overheads
= 400units ($10/units) /
$400 + $1000 + $ 3000
= $4000 /
$1700
=2.35

10. Student tuition at Boering University is $ 100 per semester credit hours. The states supplement school revenue by matching student tuition, dollars per dollars. Average class size for typical
three credit course is 50 students. Labor costs are $4000 per class, material costs are $20 per student, and overhead cost are $25,000 per class.

Find:
a) What is the multifactor productivity ratio?
b) If instructors work an average, what is the labor productivity ratio? (Keep in mind that professor delivering the lecture work 14 hours per week the semester last for 16 weeks)
a) Value of Output = (50 student)x (3 credit hours) x ($ 100 tuition + $ 100 state support)
class student credit hours
= $ 30,000 per class
Value of Input = Labor + Materials + Overheads
= $ 4000 + ($20 per student x 50 students) + $25,000
Class
= $ 30,000 per class
Multifactor productivity = Output/ Input
= $ 30,000 / class /
$ 30,000/ class
= 1.00
b) Labor productivity is the ratio of the value of output to the labor hours. The value of output is the same as in part (a), or $ 30,000 per class, so
Labor hours of input = 14 hours x 16 week
weeks weeks
= 224hours per class
Labor productivity = Output/ Input
= $ 30,000 per class /
224 hours per class
= $ 133.93 per hours