

4. You've just completed a pilot run of 10 units of a major product and found the processing time for each unit was as follows:

UNIT NUMBER	TIME (HOURS)
1	970
2	640
3	420
4	380
5	320
6	260
7	220
8	207
9	190
10	190

- a. According to the pilot run, what would you estimate the learning rate to be?

$$\text{Units 1 to 2} = 640/970 = 65.98\%$$

$$\text{Units 2 to 4} = 380/640 = 59.38\%$$

$$\text{Units 4 to 8} = 207/380 = 54.47\%$$

Average learning rate = 59.94% Round this to 60% to use the tables.

- b. Based on (a), how much time would it take for the next 190 units, assuming no loss of learning?

From Exhibit 4A.5:

$$200 \text{ units} = 12.090$$

$$-10 \text{ units} = \underline{3.813}$$

$$8.277$$

Therefore, time for 190 more units = $970(8.277) = 8,029$ hours

- c. How much time would it take to make the 1,000th unit?

For 1,000th unit from Exhibit 4A.4:

$$.0062(970) = 6.0 \text{ hours}$$

7. Johnson Industries received a contract to develop and produce four high-intensity longdistance receiver/transmitters for cellular telephones. The first took 2,000 labor hours and \$39,000 worth of purchased and manufactured parts; the second took 1,500 labor hours and \$37,050 in parts; the third took 1,450 labor hours and \$31,000 in parts; and the fourth took 1,275 labor hours and \$31,492 in parts. The company expect "learning" to occur relative to labor and also the pricing of parts from suppliers.

Johnson was asked to bid on a follow-on contract for another dozen receiver/transmitter units. Ignoring any forgetting factor effects, what should Johnson estimate time and parts costs to be for the dozen units? (Hint: There are two learning curves—one for labor and one for parts.)

For labor the following learning was experienced:

$$\text{Unit 1 to 2} = 1500/2000 = 75\%, \text{ from units 2 to 4} = 1275/1500 = 85\%$$

Based on this, we estimate an average labor learning rate of 80%

For cost the following learning was experienced:

$$\text{Unit 1 to 2} = 37050/39000 = 95\%, \text{ from units 2 to 4} = 31492/37050 = 85\%$$

Based on this, we estimate an average cost of parts learning rate at 90%

Labor for 12 more units:

<i>From Exhibit 6.5</i>	16 units	= 8.920
	-4 units	= <u>3.142</u>
		5.778

$$\text{Therefore, Labor for 12 more units} = 2,000(5.778) = 11,556 \text{ hours}$$

Cost for 12 more units:

<i>From Exhibit 6.5</i>	16 units	= 12.040
	-4 units	= <u>3.556</u>
		8.484

$$\text{Therefore, cost for 12 more units} = 39,000(8.484) = \$330,876$$