

LEARNING CURVE

1. A Company developing a new product makes a model for testing, and then a demonstration model and then goes for regular production. The time taken to make the model is 300 hours and from past experience of similar models, it is known that a 90% learning curve applies. The average time for each of the first two production models will be.

(1)	270 hours	(2)	243 hours
(3)	216 hours	(4)	219 hours

Find the correct one with calculation.
2.
 - (a) Your Company has been approached by a customer to supply four units of a new product made to the customer's individual specification. The company experiences a 90% learning rate. The estimated labour time for the first unit of this product is 150 hours and the Company's direct labour cost is ₹ 25 per hour. Estimate the labour cost for this order.
 - (b) After receiving the first order, the customer places a repeat order what will be the labour cost for the second order.
 - (c) If the customer had ordered all eight units at the same time, calculate the labour cost per unit for the combined order.
 - (d) What will be the loss if 8 units are ordered and cancel the order after receiving 4 units.
 - (e) What will be the loss if 2 units are ordered 1st & delivered, then another 6 units are ordered and cancel the order after receiving 2 units of the 2nd order.
3. Engine Ltd. manufacture engine mountings for wide-bodied airliners. They have been asked to bid on a prospective contract for 90 engine mountings for the Jumbo jet aircraft. They have just completed an initial run of 30 of these mountings at the following costs :-

Direct materials	20,000
Direct labour (6000 hours @ ₹ 4)	24,000
Tooling Cost (re-usable)	3,000
Variable Overhead (₹ 0.50 per labour hour)	3,000
Fixed Overhead (₹ 1/- per labour hour)	<u>6,000</u>
	<u>56,000</u>

An 80% learning curve is thought to be pertinent in this case. The marketing director believes that the quote is unlikely to be accepted if it exceeds ₹ 1,10,000 and as the Company are short of work, he believes the contract to be vital.

You are required to comment whether it is worth accepting at ₹ 1,10,000. State your assumptions clearly.

4. AB Limited, which has a fairly full order book, is approached by a customer with the offer of a contract for a model that is a variant, in terms of dimensions and materials used, of one of its existing products.

Though the customer expects to pay normal price for the model, he wants AB Limited to take account of an 80% learning curve in its price calculations; this level has been shown to be reasonable in AB Limited's industry for relevant work.

The prospective contract is for a total of 464 units made up of an initial order of 160 units, two subsequent orders of 80 units each, and three subsequent orders of 48 units each.

AB Limited estimates the following costs for the initial order :

`per unit

Direct materials :
P .. 8 metres at 3.50 per metre
Q .. 4kg. at 40.00 per kg.

Direct wages :
Department : 1 4 hours .. at ` 25.00 per hour
2 50 hours.. at ` 45.00 per hour

The nature of the work in the two production departments is as follows :

Department 1 uses highly automatic machines. Although the operators on these machines need to be fairly skilled, their efficiency only affects the quality of the work but can have little impact on the quantity of this department's output which is largely machine controlled.

Department 2 is partially mechanised, whilst the skill of operators is a major determinant of the volume of output.

The terms of the contract price allow for :

Direct materials cost plus 2.5 % profit margin
Conversion cost plus 12.5 % profit margin

You are required to calculate the price per unit for :

- (I) the initial order of 160 units ;
- (ii) the second, third and fourth orders, if given successively but without guarantee of further orders ;
- (iii) the whole contract of six orders if given from the start but on the same basis of production and delivery.

NB : An 80% learning curve on ordinary graph paper would show the following relationship between the x axis (volume) and y axis (cumulative average price of elements subject to the learning curve) :

x	y%	x	y%
1.0	100	2.1	78.9
1.1	96.9	2.2	77.8
1.2	93.3	2.3	76.8
1.3	93.7	2.4	76.0
1.4	89.5	2.5	74.9
1.5	87.6	2.6	74.0
1.6	86.1	2.7	73.2
1.7	84.4	2.8	72.3
1.8	83.0	2.9	71.5
1.9	81.5	3.0	70.7
2.0	80.0	3.1	70.0

5. Cosy Comforts Ltd. makes household appliances. It is now examining a three-year old contract to make electrical bread toasters for sale through a departmental store. During the entire contract period, it will receive for its toaster a fixed price of ` 40 per piece for whatever quantity it can produce in the 3 years. Skilled labour is the constraint and this cannot be increased above that currently available in the Company for making the toaster.

Capital investment required	`	50,000 payable down cash with nil scrap value
Additional overhead	`	25,000 per annum
Material	`	30 per toaster
Labour (skilled)	`	5 per hour.

The production manager envisages a learning curve effect for labour in the form of $y = ax^{-0.3}$ where y = average labour hours per unit. A = labour hours per first unit and x = cumulative production. He estimates that the first toaster will take 10 hours to produce and the fixed amount of skilled labour available will enable 5000 toasters to be produced in the first year. Assume all cash inflows to arise at year end and the cost of capital is 15%. What is your advice ?

6. A company is considering investing in a project with the following characteristics :

- Equipment is to be purchased costing ` 70,000, payable at once and having a life of five years with no residual value. The equipment's used to produce one type of product whose sales are budgeted as follows :

Year to 30th June	Number of units.	
2000	20	
2001	40	
2002	50	
2003	30	
2004	<u>10</u>	Total = 150

- The selling price of the units is to be `4,000 each.
- Costs of units are :

Direct materials	`1,200 each
Variable production overhead	50% of direct wages
Variable selling and administration overhead	10% of selling price.
- Direct wages are paid at `3 per hour. The first unit to be produced is budgeted to take 1,505.3 man-hours of work and an 80% learning curve applies to direct wages.
- Fixed overhead relating to this project is `12,000 per annum
- The company requires a 12% DCF return on its investments.

You are required to calculate whether or not the project meets the company's investment criterion, based on :

- the average direct wages rate for the whole quantity of units budgeted to be sold ;
- the direct labour times expected to be required in each individual year ; Ignore tax.

NB : An 80% learning curve on ordinary graph paper would show the following relationship between the x axis (volume) and y axis (cumulative average cost of elements subject to the learning curve) :

X	Y%	X	Y%
1	100.00	70	25.48
2	80.00	80	24.40
10	47.65	90	23.40
20	38.13	100	22.71
30	22.46	110	22.03
40	30.50	120	21.41
50	28.39	130	20.86
60	26.77	140	20.38
		150	19.93

7. Z plc experiences difficulty in its budgeting process because it fails to find the rate of learning effect as new products are introduced. An order for 32 units of a new product has been received by Z plc. So far, 14 have been completed; the first unit required 40 direct labour hours and a total of 240 direct labour has been recorded for the 14 units. The production manager expects an 80% learning effect for this type of work.

The company uses standard absorption costing. The direct costs attributed to the Centre in which the unit is manufactured and its direct materials costs are as follows:

Direct materials	` 30.00 per unit.
Direct labour	` 6.00 per hour.
Variable overhead	` 0.50 per direct labour hour
Fixed overhead	` 6,000 per four – week operating period.

There are ten direct employees working a five – day week, eight hours per day. Personal and other downtime allowances account for 25% of the total available time The company usually quotes a four – week delivery period for orders.

You are required to

- Determine whether the assumption of an 80% learning effect is a reasonable or not.
- Use the cost data given to produce an estimated product cost for the initial order.