LCC — only for DL & VOH → directly related to labour hours of input.
does not apply to MC, non VC or items which vary with output.
All learning curve Q's marked from book.

Chapter 16

Learning Curve Theory [weight promises — buffalo]

When same work / job is done again & again by same labour force, then time taken will be reduced significantly as the result labour & labour related cost also decreases significantly, without affecting quality of the product/service. This concept is known as learning curve.

Learning curve ratio.

This ratio indicates that at what rate average time will be reduced when output is doubled as compared to previous level.
→ only with assumption that every time from 1st time output doubles.

It shall be determined as follows :-

$$LCR = \frac{\text{Average time for 2N units}}{\text{Average time for N units}}$$

Ex:-

Units / Batch / Lot	Avg L.H / cost	Total
1	100 (a)	100
2 ($100 \times r$)	90	180
4 ($90 \times r^2$)	81	324
8 ($81 \times r^3$)	72.9	583.20.

$r_1 = \frac{2N}{N} = \frac{90}{100} = 90\%$.

or, $\frac{81}{90} \times 100 = 90\%$.

or, $\frac{72.90}{81} \times 100 = 90\%$.

LC Equation :- → used when uneven outputs.

$Y = a b^x$.

Y = Average labour hour / cost p.u. for certain cumulative units (Avg time p.u. for n units)

a = Labour hour / labour cost for first unit

b = Cumulative number of units

x = "Learning coefficient / index".

→ Log of learning ratio / Log 2 = Log r / Log 2.

↓ some people write b in place of "x" as "b"
so formula changes, but meaning the same ($Y = a x^b$).

Ans in 2 decimals.

F & VOH (Based on hours) → hours same as labour → i.e. Learning effect also.
→ Rate different

LC not applicable on automatic machines.

If batch / lot given, calculation of hrs / cost as per batch / lot (i.e. $Y = ab^x$)

Properties of log :-

$\log (a \times b) = \log a + \log b$.

$\log (a \div b) = \log a - \log b$.

$\log a^b = b \log a$.

$\log 1 = 0$; $\log 10 = 1$.

Ex:- $\log 40 = \log 2^3 5$
→ $3 \log 2 + \log 5$

Concept of log :-

Natural No.	Log	Antilog.
4475	3.6508	4475
44.75	1.6508	44.75
4.475	.6508	4.475
0.4475	$\bar{1}.6508$	0.4475
0.004475	$\bar{3}.6508$	0.004475
10	1	
100	2	
1000	3	

} Increase in 0 Increases no.

	Actuals	MP.
10		
11		
:	6503.	5
44		
:		
99.		

① Learning curve is used to calculate standards, by using past data, ∴ actual will differ or will be same.

② Learning ratio is resultant figure i.e improvement ratio. −100%.
↳ if 80% → 20%.
if 90% → 10%.

so ↑ in LR ← came you are gaining more and not necessarily less time consumption as it is based on ↑.

How to locate log in table :- [range always from 1 to 9] for log.

(a) log 20 :-

→ log (2.0 × 10)
→ log 2.0 + log 10
→ log 2.00 + 1 → 0.3010 + 1 = 1.3010.

vertical area mein
20 doodho.
horizontal mein 0
dono tha ka intersection point is our value. "xxxx"
ab usko. poora ko .xxxx kardo.

(b) log 543 :-

→ log. (5.43 × 100).
→ log 5.43 + log 100
→ log 5.43 + 2. → 2 + .7348. = 2.7348.

now, look in vertical area.
for 54.
and in horizontal area. for 3.
(as it is read as .03)

(c) log 2435 :-
→ log (2.435 × 1000)
→ log 2.435 + log 1000
→ log 2.435 + 3.

..n, look in VA OR round up 2.435 to 2.44
.. 24. phir 24 or 2.4 doondho → VA
HA me doondho. 4 or .04 → HA
.. 3 (which is read as .03) → Add both
MD me doondho (as it is read as .005).
.. 5
→ Then add all.

Log ·6329 :-

→ log (6·329 ÷ 10)
→ log 6·329 − log 10.
→ ·8013 − 1

[For understanding only,
"3· 3865" → koi log 1−9 ke beech ka value.
↓ log 1000
pirpe "·" laga dise.]

Practice of Antilog.

if (log y) = 3·3865 → y = Antilog (3·3865)

we need "y"
and not log "y" tab is case mein
go for antilog method

↓
now ignore 3
↓
so we have log (anti) ·3865.
↓
antilog table mn MD.
lookin rA for ·38, 6 HA, 5
uska value ata hoin
2435, and now take it as
2·435