PATTERNS OF LAYOUT

- PROCESS LAYOUT
  - INTERMITTENT LAYOUT
  - JOB SHOP
- PRODUCT LAYOUT
  - CONTINUOUS PRODUCTION
  - ASSEMBLY LINE
- FIXED POSITION
  - SPECIAL PROJECTS

Process Layout

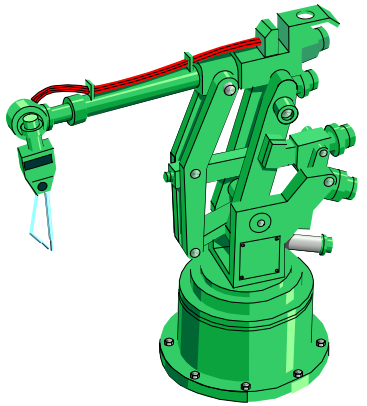
- Worker skill level is moderate to high
- Makes good use of the special skills of people and capabilities of machines
- Flexible and able to handle a wide variety of products
- Machines are general purpose --- which implies flexibility --- and are generally less expensive than special purpose machines such as robots
- Less vulnerable to shutdowns because of breakdowns

Process Layout

- General purpose machines are slower than special purpose machines (ex robotics)
- Work routing, scheduling, bills of material, job costing are much more involved and complex
- Potentially each new order is a new product --- so routings, bills of material etc. may need to be created each time an order is received
- Material handling and transportation can be quite costly
- Material movement through the shop is slow

Product Layout

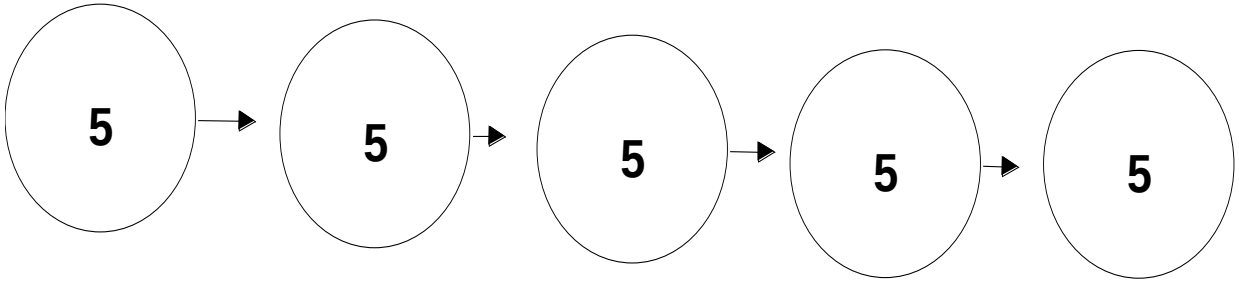
- Major advantage -- lowest cost per unit
- High rate of output
- Low training cost
- Routings, bill of material don't change frequently
- Large investment in capital equipment
- Must have a high demand in order to justify the huge capital investment
- Highly vulnerable to work stoppages ----
- Rate of output is quite inflexible ----- both up and down
- Does not handle variety very well
- Human relations problems
- Work comes to the worker



FIXED POSITION

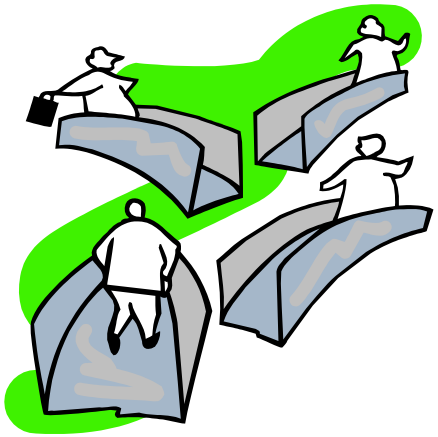
- Large complex, often unique products
- Products seldom if ever move
- Portable equipment
- Worker comes to the work
- Duplicate tooling
- More responsibility on the part of the worker
- Labor skills high
- High cost
- Time to build is longer

Balanced Line

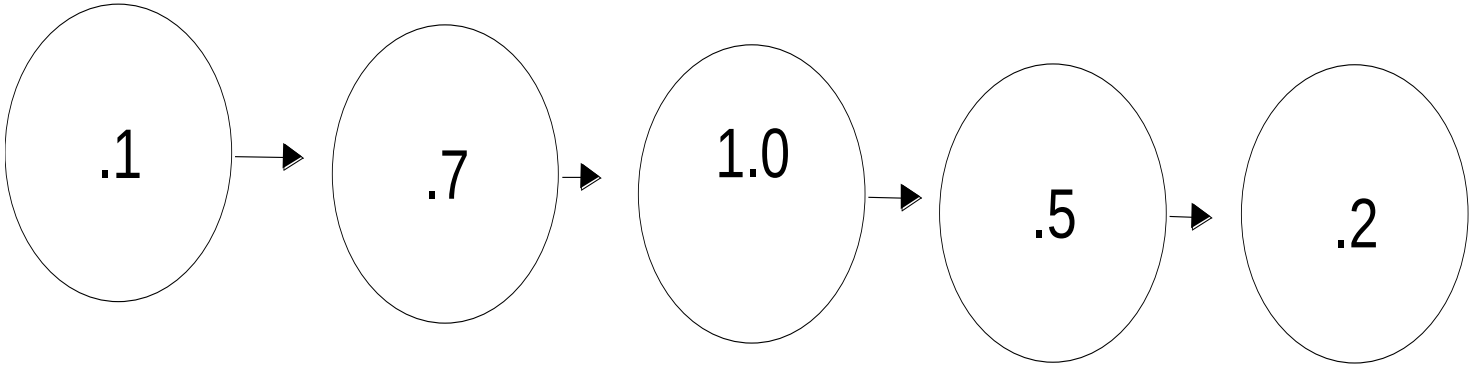


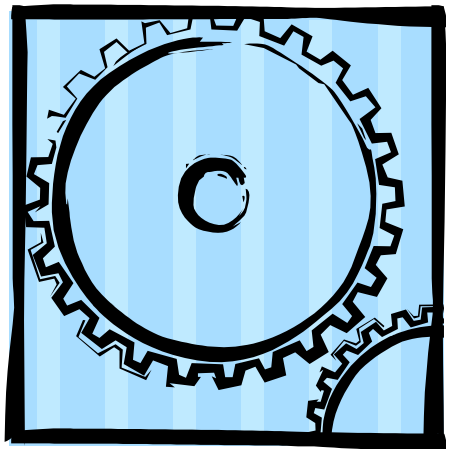
What Happens with a Balanced Line?

- Behind Schedule with Shipments
- WIP Levels Increase
- Why?
- Statistical Fluctuations
- Statistically Dependent Events



Un-Balanced Line





- Cycle Time = time interval between units coming off the line
- Longest task time=minimum possible cycle time
- Sum of task times=maximum possible cycle time
- Daily Capacity

  =Operating Time÷Cycle Time (OT÷CT)

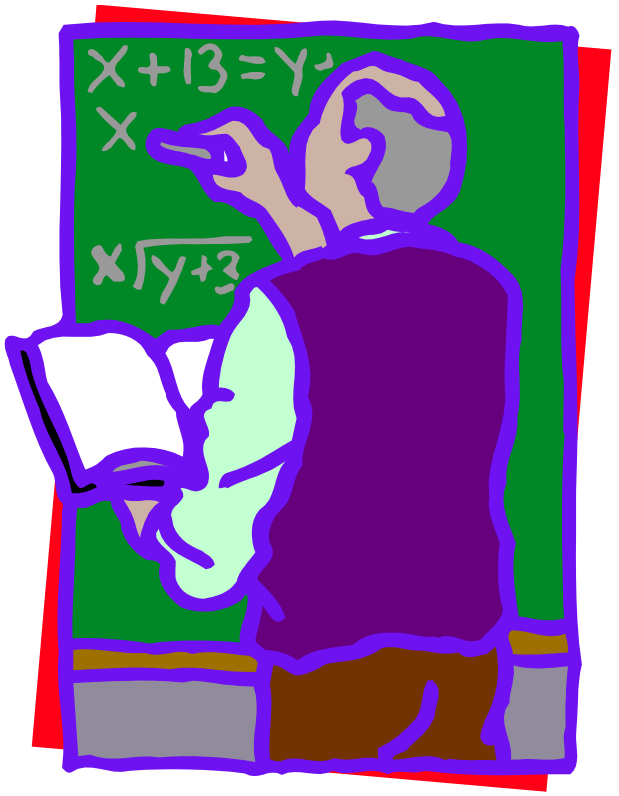
- Operating Time = 480 minutes
- Cycle Time = 1 minute

  Daily Capacity = 480/1

  =480
- Cycle Time = 2.5 minutes

  Daily Capacity = 480/2.5

  =192 units



Minimum # of Work Stations

- **N=(DO*∑TT)/OT**

  Where

  DO=Desired Output

  TT=Task Times

  OT=Operating Time

- **N=(480*2.5)/480**

  =2.5

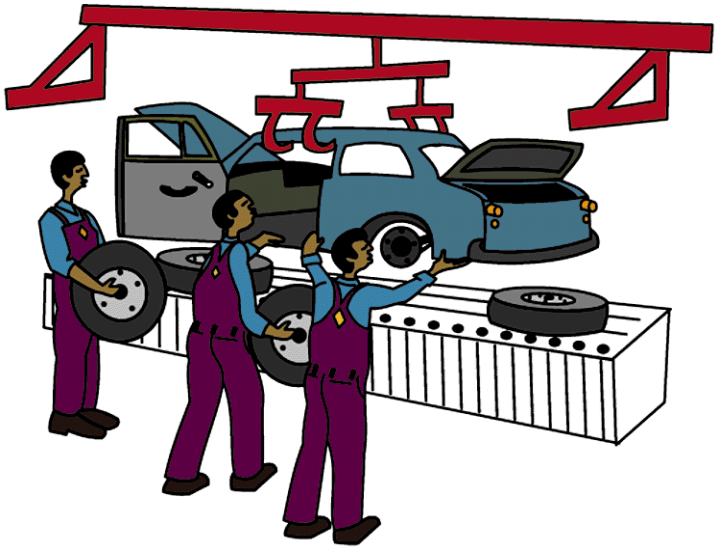
  Or 3 work stations

Station 1	Station 2	Station 3
.1+.7	1	.5+.2
=.8	=1	=.7

Bottleneck = Station 2

Capacity = 480/1

= 480



Line Problem

Task	Immediate Predecessor	Task Time
A	-----	.2
B	A	.2
C	-----	.8
D	C	.6
E	B	.3
F	D,E	1.0
G	F	.4
H	G	.3
	Sum of Task Times	3.8

A
B
E
C
D
F
G
H

Desired Output=400

- **Cycle Time=OT/DO**

  =480/400

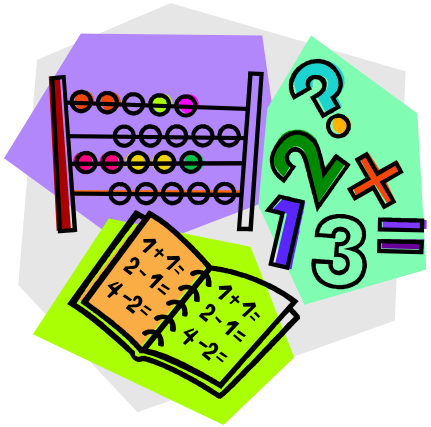
  =1.2 minutes (target cycle time)

- **Minimum # of Work Stations**

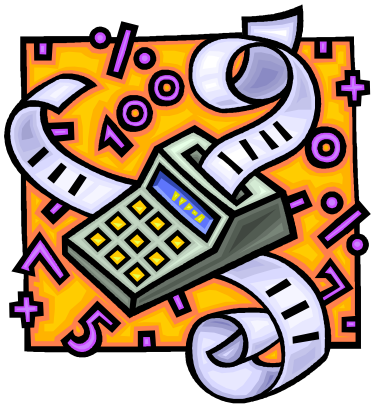
  =(DO*∑TT)/OT

  =(400*3.8)/480

  =3.2 or 4 stations



STATION	TASK	TIME	Remaining Time (1.2-cumulative time)
»			
1	C	.8	.4
	A	.2	.2
	B	.2	0
2	D	.6	.6
	E	.3	.3
3	F	1.0	.2
4	G	.4	.8
	H	.3	.5



Final Layout