

5. Which of the following are some of the causes of variability in the observed work element times that occur from cycle to cycle:
- mistakes by operator
  - errors in timing the work elements by the analyst
  - variations in worker pace
  - all of the above
6. Which of the following is not a work measurement technique:
- Direct time study
  - Estimation
  - Work sampling
  - Standard data system
7. Which of the following is the right procedure to perform snapback timing method when using a stopwatch during direct time study:
- Watch is started at the beginning of every work element by snapping it back to zero at the end of the previous element. The reader must note and record the final time for that element as the watch is being zeroed.
  - Watch is zeroed at the beginning of the first cycle and allowed to run continuously throughout the duration of the study. The analyst records the running time on the stopwatch at the end of each respective element. Some analysts adapt the continuous method by zeroing at the beginning of each work cycle, so that the starting time of any given work cycle is always zero.
  - Watch is zeroed at the beginning of the first cycle and allowed to run continuously throughout the duration of the study. The reader must note and record the final time for that element as the watch is being zeroed.
  - Watch is started at the beginning of every work element by snapping it back to zero at the end of the previous element. The analyst records the running time on the stopwatch at the end of each respective element. Some analysts adapt the continuous method by zeroing at the beginning of each work cycle, so that the starting time of any given work cycle is always zero.
8. Which of the following should be standardized before a standard time can be set:
- Method
  - Performance
  - Worker skills
  - All of the above
9. Which of the following method has higher accuracy:
- Standard data system
  - Historical records

- c. Estimates
  - d. Work sampling
10. Which of the following method has speed ratio:
- a. Standard data system
  - b. Historical records
  - c. Estimates
  - d. Work sampling
11. Which of the following consider as ineffective physical Therbligs:
- a. Transport empty
  - b. Disassemble
  - c. Hold
  - d. Position
12. Avoidable delays and rest are unproductive micromotions that should be eliminated at all times:
- a. True
  - b. False
13. "SELECT" is one of the seventeen micromotions defined by Frank Gilbreth, which of the following can reduce time taken by select motions:
- a. Make all parts in the pin with same colors
  - b. Use adequate lightning to facilitate selecting
  - c. Make the selection surface smaller
  - d. All of the above
14. The goal of the EOQ formula is to identify the optimal number of product units to order, If achieved a company can minimize:
- a. Delivering cost and raw material cost
  - b. Storing cost and workforce
  - c. Buying cost and machine time
  - d. Buying costs and delivering costs
15. Five parts (A, B, C, D, and E) are processed through a sequence of five operations (1, 2, 3, 4, and 5). Not all parts are processed in all operations. Part A, which has daily quantities of 50 units, is processed through operations 1, 3, 5, and 1 in that order. Part B, which has daily quantities of 70 units, is processed through operations 2, 4, and 5 in that order. Part C, which has daily quantities of 25 units, is processed through operations 3, 2, and 4 in that order. Part D, which has daily quantities of 10 units, is processed through operations 1, 2, 4, and 5 in that order. Finally, part E, which has daily quantities of 15 units, is processed through operations 3, 1, and 2 in that order.

1. The readings in the table below were taken by the snapback timing method of direct time study to produce a certain subassembly. The task was performance rated at 85%. In addition to the above regular elements, an irregular element must be included in the standard: each rack holds 20 mechanism plates and has universal wheels for easy movement. After completing 20 subassemblies, the operator must move the rack (which now holds the sub-assemblies) to the aisle and then move a new empty rack into position at the workstation. This irregular element was timed at 2.90 min and the operator was performance rated at 80%. The PFD allowance is 15%. Determine (a) the normalized time for the cycle, (b) the standard time, and (c) the number of parts produced by the operator, if he or she works at standard performance for a total of 6 hr and 57 min during the shift. (6 points)

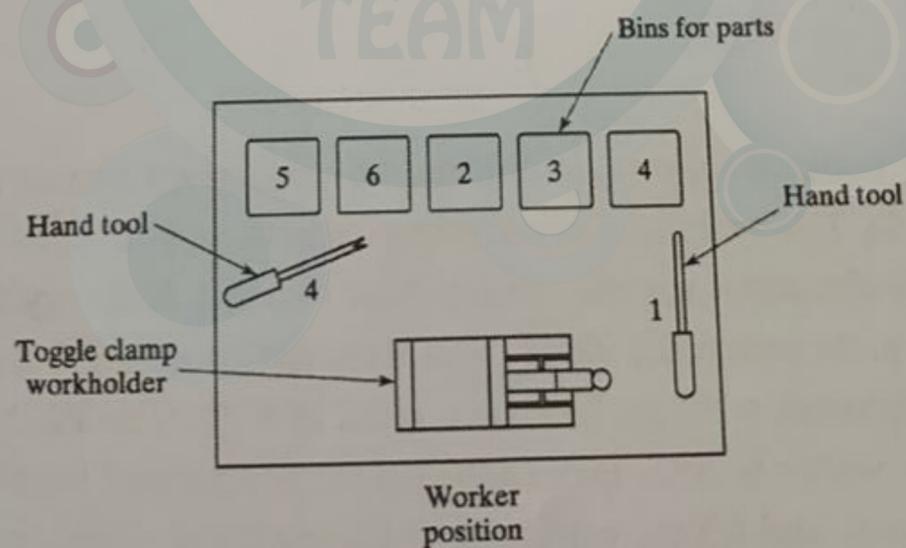
Element and Description	Observed Time (min)
1. Pick up mechanism plate from rack and place in fixture.	0.42
2. Assemble motor and fasteners to front side of plate.	0.28
3. Move to other side of plate.	0.11
4. Assemble two brackets to plate.	0.56
5. Assemble hub mechanism to brackets.	0.33
6. Remove plate from fixture and place in rack.	0.40

2. A worker-machine cycle is direct time studied using the continuous timing method. One part is produced each cycle. The cycle consists of five elements: *a*, *b*, *c*, *d*, and *e*. Elements *a*, *c*, *d*, and *e* are manual elements, external to machine element *b*. Every 16 cycles the worker must replace the parts container, which was observed to take 2.0 min during the time study. All worker elements were performance rated at 80%. The PFD allowance is 16%, and the machine allowance is 20%. Determine (a) the normalized time for the cycle, (b) the standard time per part, and (c) the worker's efficiency if the worker completes 220 parts in an 8-hour shift during which he or she works 7 hr and 12 min. (10 points)

Element	Description	Cumulative Observed Time (min)
		0.25
<i>a</i>	Worker loads machine and starts automatic cycle.	1.50
<i>b</i>	Machine is engaged in automatic cycle.	1.75
<i>c</i>	Worker unloads machine.	2.30
<i>d</i>	Worker files part to size.	2.40
<i>e</i>	Worker deposits part in container.	

3. One of the traditional definitions of standard performance is a person walking at 3.0 miles per hour. Given this, what is the performance rating of a long-distance runner who breaks the four-minute mile? (4 points)

4. Next is a figure representing the design of an assembly workstation, define three motion and work design principles violated in this workstation and draw the station design after implementation violated principles. (4 points)



- 1.
- 2.
- 3.