

MgtOp 340
Washington State University
Sample Exam for Exam 1

Multiple Choice (3 points each)

1. If inputs increase by 6% and outputs increase by 24%, then what is the percentage productivity increase?
 - a. 400%
 - b. 16.98%
 - c. 0.25%
 - d. 4.00%

2. Suppose that the exchange rate between the U.S. and Japan is 250 ¥ / \$. If Japanese wages are 3200 ¥/hour and a U.S. worker can produce only half as many units per hour as a Japanese worker, what is the “relative” Japanese wage rate in dollars after accounting for productivity differences?
 - a. \$6.40
 - b. \$12.80
 - c. \$19.20
 - d. \$25.60

3. With which of the following quality assumptions would Japanese managers be *least* likely to agree?
 - a. It is possible to excel in low cost, fast delivery, and high quality simultaneously.
 - b. Spending money on prevention typically saves even more in appraisal and failure costs.
 - c. World-class firms should strive to achieve a 6-sigma acceptable quality level.
 - d. Defects should be highlighted, not hidden, in order to identify problems and future opportunities for improvement.
 - e. Inventory levels should be minimized.

4. Which manufacturing strategy is most like the concept of “postponement?”
 - a. make-to-stock
 - b. assemble-to-order
 - c. make-to-order

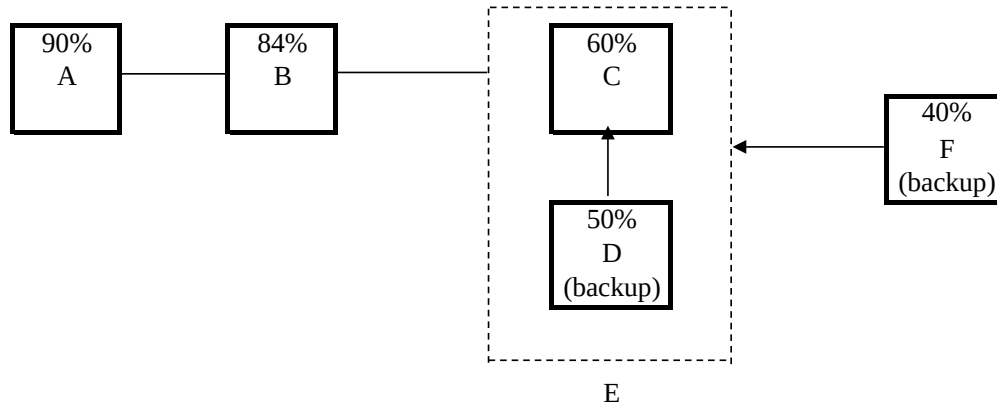
5. Suppose that the specifications for the length of a piece of wood are 36 ± 0.2 inches. If the length of the piece is out of spec, then the whole piece must be recycled at a cost of \$10.00. Suppose that you've hired a consultant, Joe Know-It-All, who believes that Taguchi was wrong and that the quality loss function should actually be linear rather than quadratic ($L = TD$). What then, would Joe Know-It-All say is the quality cost of a piece of wood that is 36.05 inches long?
- a. \$250.00
 - b. \$4000.00
 - c. \$2.50
 - d. \$0.125
 - e. \$0.625
 - f. \$2.00
 - g. \$1.25
 - h. \$324,900.63
6. Which quality award is presented exclusively in Japan?
- a. ISO 14000 Prize
 - b. ISO 9000 Prize
 - c. Tokyo Medal for Excellence in Worldwide Quality Manufacturing
 - d. Deming Prize
 - e. Malcolm Baldrige Award
7. Suppose that you are using a p chart to monitor the percentage of times that you fail to get phone numbers at bars. Each day for 30 days, you ask 15 different potential "friends" for their phone number. On average, 6 people declined to give you their phone number each day. What would be the upper control limit for the p chart?
- a. 0.00%
 - b. 2.05%
 - c. 44.80%
 - d. 52.65%
 - e. 50.98%
 - f. 66.83%
 - g. 77.95%
 - h. 97.95%
 - i. 100.00%

8. Suppose that an electrical part has 2 components set up in parallel, where only one component must be working in order for the part to function properly. The reliabilities are each .75. What is the reliability of the part?
- a. 93.75%
 - b. 75%
 - c. 56.25%
 - d. 18.75%
9. Which pioneer introduced the concept of interchangeability of parts?
- a. Frederick W. Taylor
 - b. Eli Whitney
 - c. Henry Ford
10. Consider a production line with three stations. The first station can process a unit in 10 minutes. The second station has two identical machines, each of which can process a unit in 12 minutes (each unit only needs to be processed on one of the two machines). The third station can process a unit in 8 minutes. Which station is the bottleneck station?
- a. station 1
 - b. station 2
 - c. station 3
11. Steel is typically manufactured according to which of the following types of processes?
- a. continuous flow
 - b. job shop
 - c. assembly line
 - d. batch flow
12. Which of the following statements would be most likely to minimize expected fixing costs?
- a. A machine should always be calibrated at the midpoint between the upper and lower spec limits.
 - b. A machine should be calibrated closer to the upper spec limit than the lower spec limit if the cost of fixing output that is too high is greater than the cost of fixing output that is too low.
 - c. A machine should be calibrated closer to the lower spec limit than the upper spec limit if the cost of fixing output that is too high is greater than the cost of fixing output that is too low.

13. Suppose that the output of a bottle filling process is normally distributed with a natural process variability of $\sigma = 0.10$. The process center has been fixed at 10 ounces. The Upper Spec Limit = 10.2 ounces and the Lower Spec Limit = 9.8 ounces. The liquid costs \$0.25 per ounce and the bottles cost \$0.50 to fix if they are out of spec. What is the average cost per bottle (filling and fixing) of this process?
- a. \$2.9886
 - b. \$2.5114
 - c. \$2.50
 - d. \$2.5228
14. Which of the following is true with respect to a job shop vs. a continuous process? The job shop tends to have:
- a. less formal quality control and more general purpose equipment.
 - b. more formal quality control and more general purpose equipment
 - c. less formal quality control and less general purpose equipment
 - d. more formal quality control and less general purpose equipment

Problems (58 points total)

1. Consider the system shown below. The reliability of each process is listed at the top of the box. Components A and B are attached separately. Component C comes in a container (E) and has a backup (D). Component F is a backup if E fails. A, B, and E (or F) have to work in order for the system to work. **Please round all percentages to 4 decimal places (e.g., 45.87%).**



- a. (10 points) What is the reliability of the system?
- b. (3 points) If \$900 must be spent to fix a failed system, what is the expected failure cost of the system?
Please round to the nearest dollar.

c. (6 points) If an 80% reliable backup for component A could be included at a cost of \$45, should it be included in the product? Why or why not?

d. (4 points)

Ignore the potential backup for component A in part c. Suppose that a new streamlined system could be designed that consists of only one component (G) with a backup (H). The component's (cheaper) backup (H) would be twice as likely to fail as the primary component (G) itself. What would the reliability of the primary component (G) have to be in order for this new streamlined system to have the same reliability as the original system (your answer to part a)? What then would be the reliability of H?

2. Twenty samples of $n = 200$ were taken by an operator at a workstation in a production process. The number of defective items in each sample was recorded as follows.

<u>Sample</u>	<u>Number of Defects</u>	<u>Sample</u>	<u>Number of Defects</u>
1	12	11	16
2	18	12	15
3	10	13	13
4	15	14	16
5	16	15	18
6	19	16	17
7	17	17	18
8	12	18	20
9	11	19	21
10	14	20	22

Management wants to develop a p -chart using 3-sigma limits. What are the control limits?

3. Inspectors want to develop process control charts to measure the weight of crates of wood. Data (in pounds) from three samples are:

<u>Sample</u>	<u>Crate 1</u>	<u>Crate 2</u>	<u>Crate 3</u>	<u>Crate 4</u>
1	20	40	24	28
2	28	32	30	22
3	28	28	28	28

Round answers to three decimal places.

- a. What is the upper control limit for the R chart?
- b. What is the lower control limit for the R chart?
- c. What is the upper control limit for the $\bar{x}$ -bar chart?
- d. What is the lower control limit for the $\bar{x}$ -bar chart?
- e. Is the process in control? If not, why not?