HIGHER

3.5 Quality Assurance and Control Charts: 1-hour Pack

Total Marks

EDEXCEL 1ST0 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A quality check on cans of soup (mass in grams) found 3 defective items in a sample of 200.

(a) Write the defect rate as a percentage, to 1 decimal place if needed.

(b) Estimate how many defective items there would be in a batch of 2000.

(c) The firm rejects a batch if the sample defect rate is more than 5%. Is this batch rejected?

(Total for Question 1 is 4 marks)

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2 A quality check on bolts (length in mm) found 7 defective items in a sample of 100.

(a) Write the defect rate as a percentage, to 1 decimal place if needed.

(b) Estimate how many defective items there would be in a batch of 2000.

(c) The firm rejects a batch if the sample defect rate is more than 5%. Is this batch rejected?

(Total for Question 2 is 4 marks)

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3 A machine fills bags of sugar (grams). The process mean is 200 and the standard deviation is 5. A control chart has action limits at 3 standard deviations from the mean. Successive readings are 196, 184, 202, 192, 202, 206.

(a) Work out the upper and lower action limits.

(b) Write down any readings outside the action limits.

(c) What action is needed if a reading is outside the limits?

(Total for Question 3 is 4 marks)

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4 A set of 200 masses in grams of bags of flour is approximately normally distributed with mean 150 and standard deviation 2. Use the 68%, 95% and 99.7% rule. Estimate the number of these values that are greater than 152.

(Total for Question 4 is 3 marks)

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5 A quality check on bags of sugar (grams) found 8 defective items in a sample of 50.

(a) Write the defect rate as a percentage, to 1 decimal place if needed.

(b) Estimate how many defective items there would be in a batch of 5000.

(c) The firm rejects a batch if the sample defect rate is more than 5%. Is this batch rejected?

(Total for Question 5 is 4 marks)

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6 A machine fills bags of sugar (grams). The process mean is 400 and the standard deviation is 8. A control chart has action limits at 3 standard deviations from the mean. Successive readings are 406, 409, 412, 427, 403, 386.

(a) Work out the upper and lower action limits.

(b) Write down any readings outside the action limits.

(c) What action is needed if a reading is outside the limits?

(Total for Question 6 is 4 marks)

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7 A set of 800 lengths in millimetres of manufactured bolts is approximately normally distributed with mean 60 and standard deviation 5. Use the 68%, 95% and 99.7% rule. Estimate the number of these values that lie between 60 and 65.

(Total for Question 7 is 3 marks)

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8 A quality check on bolts (length in mm) found 6 defective items in a sample of 50.

(a) Write the defect rate as a percentage, to 1 decimal place if needed.

(b) Estimate how many defective items there would be in a batch of 1000.

(c) The firm rejects a batch if the sample defect rate is more than 5%. Is this batch rejected?

(Total for Question 8 is 4 marks)

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9 A quality check on bolts (length in mm) found 8 defective items in a sample of 80.

(a) Write the defect rate as a percentage, to 1 decimal place if needed.

(b) Estimate how many defective items there would be in a batch of 2000.

(c) The firm rejects a batch if the sample defect rate is more than 5%. Is this batch rejected?

(Total for Question 9 is 4 marks)

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10 A set of 2500 daily steps in hundreds taken by walkers is approximately normally distributed with mean 50 and standard deviation 15. Use the 68%, 95% and 99.7% rule. Estimate the number of these values that lie between 20 and 80.

(Total for Question 10 is 3 marks)

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11 A machine fills bolts (length in mm). The process mean is 250 and the standard deviation is 8. A control chart has action limits at 3 standard deviations from the mean. Successive readings are 255, 258, 222, 242, 251.

(a) Work out the upper and lower action limits.

(b) Write down any readings outside the action limits.

(c) What action is needed if a reading is outside the limits?

(Total for Question 11 is 4 marks)

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12 A control chart for sample means of bottles of juice (volume in ml) uses samples of size 25. The process mean is 500 and the standard deviation of individual items is 10. The control limits are mean ± 3 x (standard deviation / square root of n).

(a) Work out the standard error, standard deviation / $\sqrt{n}$.

(b) Work out the control limits.

(c) Sample means are 494, 496, 496, 509, 500. Write down any that are out of control.

(Total for Question 12 is 4 marks)

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13 A machine fills bags of sugar (grams). The process mean is 1000 and the standard deviation is 3. A control chart has action limits at 3 standard deviations from the mean. Successive readings are 1002, 1010, 1000, 1002, 998.

(a) Work out the upper and lower action limits.

(b) Write down any readings outside the action limits.

(c) What action is needed if a reading is outside the limits?

(Total for Question 13 is 4 marks)

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14 A machine fills bags of sugar (grams). The process mean is 250 and the standard deviation is 2. A control chart has action limits at 3 standard deviations from the mean. Successive readings are 251, 257, 252, 249, 253.

(a) Work out the upper and lower action limits.

(b) Write down any readings outside the action limits.

(c) What action is needed if a reading is outside the limits?

(Total for Question 14 is 4 marks)

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15 A set of 200 lengths in millimetres of manufactured bolts is approximately normally distributed with mean 170 and standard deviation 4. Use the 68%, 95% and 99.7% rule. Estimate the number of these values that are less than 162 or greater than 178.

(Total for Question 15 is 3 marks)

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16 A control chart for sample means of cans of soup (mass in grams) uses samples of size 4. The process mean is 500 and the standard deviation of individual items is 12. The control limits are mean ± 3 x (standard deviation / square root of n).

(a) Work out the standard error, standard deviation / $\sqrt{n}$.

(b) Work out the control limits.

(c) Sample means are 506, 494, 480, 503, 503. Write down any that are out of control.

(Total for Question 16 is 4 marks)

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Mark scheme · 3.5 Quality Assurance and Control Charts: 1-hour Pack

Question 1

3/200 x 100	**M1**
1.5% cao	**A1**
30 cao	**B1**
Not rejected	**B1**

Answer: (a) 1.5%; (b) 30; (c) not rejected

Question 2

7/100 x 100	**M1**
7% cao	**A1**
140 cao	**B1**
Rejected	**B1**

Answer: (a) 7%; (b) 140; (c) rejected

Question 3

200 + 3 x 5 or 200 - 3 x 5	**M1**
185 and 215	**A1**
184	**B1**
stop the process / investigate and adjust the machine	**B1**

Answer: (a) 185 and 215; (b) 184; (c) stop and investigate the process

Question 4

uses the empirical rule percentage that applies	**M1**
16% of 200	**M1**
32 cao	**A1**

Answer: 32

Question 5

8/50 x 100	**M1**
16% cao	**A1**
800 cao	**B1**
Rejected	**B1**

Answer: (a) 16%; (b) 800; (c) rejected

Question 6

400 + 3 x 8 or 400 - 3 x 8	**M1**
376 and 424	**A1**
427	**B1**
stop the process / investigate and adjust the machine	**B1**

Answer: (a) 376 and 424; (b) 427; (c) stop and investigate the process

Question 7

uses the empirical rule percentage that applies	**M1**
34% of 800	**M1**
272 cao	**A1**

Answer: 272

Question 8

6/50 x 100	**M1**
12% cao	**A1**
120 cao	**B1**
Rejected	**B1**

Answer: (a) 12%; (b) 120; (c) rejected

Question 9

8/80 x 100	**M1**
10% cao	**A1**
200 cao	**B1**
Rejected	**B1**

Answer: (a) 10%; (b) 200; (c) rejected

Question 10

uses the empirical rule percentage that applies	**M1**
95% of 2500	**M1**
2375 cao	**A1**

Answer: 2375

Question 11

250 + 3 x 8 or 250 - 3 x 8	**M1**
226 and 274	**A1**
222	**B1**
stop the process / investigate and adjust the machine	**B1**

Answer: (a) 226 and 274; (b) 222; (c) stop and investigate the process

Question 12

$10 / \sqrt{25}$	**M1**
2	**A1**
limits 494 and 506	**A1**
509	**B1**

Answer: (a) 2; (b) 494 and 506; (c) 509

Question 13

1000 + 3 x 3 or 1000 - 3 x 3	**M1**
991 and 1009	**A1**
1010	**B1**
stop the process / investigate and adjust the machine	**B1**

Answer: (a) 991 and 1009; (b) 1010; (c) stop and investigate the process

Question 14

250 + 3 x 2 or 250 - 3 x 2	**M1**
244 and 256	**A1**
257	**B1**
stop the process / investigate and adjust the machine	**B1**

Answer: (a) 244 and 256; (b) 257; (c) stop and investigate the process

Question 15

uses the empirical rule percentage that applies	**M1**
5% of 200	**M1**
10 cao	**A1**

Answer: 10

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Question 16

$12 / \sqrt{4}$	**M1**
6	**A1**
limits 482 and 518	**A1**
480	**B1**

Answer: (a) 6; (b) 482 and 518; (c) 480

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