



H08-test Quality Assurance and Control Charts: Test Pack

EDEXCEL 1ST0 · Calculator allowed · about 20 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Quality assurance is the process a factory uses to check that the items it makes meet the required standard throughout production, not just at the end.
- (a) State what is plotted on the vertical axis of a control chart used to monitor a manufacturing process. (1)
- (b) Give two reasons why a factory monitors sample means using a control chart throughout production, rather than only checking the finished items at the very end. (2)

(Total for Question 1 is 3 marks)

- 2** For each statement about warning limits and action limits on a control chart, write down whether it is True or False.
- (i) A point that lies beyond an action limit means the process should be stopped and investigated immediately. (1)
- (ii) A point that lies beyond a warning limit but within the action limits always means the machine must be shut down immediately. (1)
- (iii) Warning limits are always closer to the mean than action limits. (1)

(Total for Question 2 is 3 marks)

3 A drinks company fills plastic bottles with milk to a target mean volume of 1000 ml. Samples are taken regularly, and the standard error of the sample mean has been calculated as 5 ml.

(a) Work out the warning limits for the control chart. (2)

.....
(b) Work out the action limits for the control chart. (2)

.....
(Total for Question 3 is 4 marks)

4 A paint factory investigates whether its tin-filling machine is working correctly, using the statistical enquiry cycle. The machine has a target mean fill volume of 5000 ml, with a process standard deviation of 40 ml. Every 30 minutes, a sample of 4 tins is measured.

(a) Plan: Give one reason why the factory samples tins every 30 minutes throughout the day, rather than testing tins only once at the start of the day. **(1)**

(b) Collect: Give one reason why the tins in each sample should be selected using a consistent method every time (for example, always testing the tins filled immediately after the sampling time). **(1)**

(c) Process: Work out the standard error of the sample mean. **(1)**

(d) Process: Work out the warning limits. **(1)**

(e) Process: Work out the action limits. **(1)**

(f) Interpret: One sample has a mean fill volume of 4935 ml. Interpret what this shows, and state the action that should be taken. **(2)**

(Total for Question 4 is 7 marks)

Mark scheme · H08-test Quality Assurance and Control Charts: Test Pack

Question 1

- (a) **B1** the mean of each sample (the sample mean), taken at regular intervals during production, oe
- (a) **Answer: The mean of each sample taken during production.**
- (b) **B1** problems with the process can be spotted and corrected early, before a large number of faulty items are produced, oe
- (b) **B1** it avoids the cost/waste of scrapping or reworking a large batch of finished items that turn out to be faulty, oe
- (b) **Answer: Problems are caught early, before many faulty items are made; it avoids wasting/scrapping a large finished batch.**

Question 2

- (i) **B1** True cao
- (i) **Answer: True**
- (ii) **B1** False cao
- (ii) **Answer: False**
- (iii) **B1** True cao
- (iii) **Answer: True**

Question 3

- (a) **M1** $1000 \pm 2 \times 5$, oe
- (a) **A1** 990 ml and 1010 ml cao
- (a) **Answer: 990 ml and 1010 ml**
- (b) **M1** $1000 \pm 3 \times 5$, oe
- (b) **A1** 985 ml and 1015 ml cao
- (b) **Answer: 985 ml and 1015 ml**

Question 4

- (a) **B1** the process could drift/change during the day (e.g. as machine parts wear or settings change), so regular sampling can catch a problem soon after it happens rather than only at one point in time, oe
- (a) **Answer: Regular sampling can catch a problem soon after it develops, rather than only checking the process once.**
- (b) **B1** so that samples are comparable and fairly represent the tins being produced at each sampling time, avoiding a biased/inconsistent method affecting the results, oe
- (b) **Answer: So that samples are collected fairly and consistently, and results are not distorted by an inconsistent sampling method.**
- (c) **B1** 20 (ml) cao
- (c) **Answer: 20 ml**
- (d) **B1** 4960 ml and 5040 ml cao, ft their SE from (c)
- (d) **Answer: 4960 ml and 5040 ml**
- (e) **B1** 4940 ml and 5060 ml cao, ft their SE from (c)
- (e) **Answer: 4940 ml and 5060 ml**
- (f) **B1** 4935 ml is below the lower action limit (4940 ml), so this point shows the process is out of control, oe
- (f) **B1** the filling process should be stopped and investigated/adjusted before continuing production, oe
- (f) **Answer: 4935 ml is beyond the (lower) action limit, so the process is out of control; it should be stopped and corrected before continuing.**