5.8 Improving Production Efficiency: Lean Production, Just-in-Time and Kaizen: 30-minute Pack

AQA 8132 · Calculators not allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions in the spaces provided. Show your working for any calculation. The scenario used in several questions refers to Maple Toys Ltd, a fictional UK manufacturer.

1 Which one of the following is a central idea of lean production in a manufacturing context?

- ☐ A) Maximising inventory levels to avoid stockouts
- ☐ B) Removing waste from all parts of the production process
- ☐ C) Outsourcing all production to third parties
- ☐ D) Doubling production speed regardless of defects

(Total for Question 1 is 1 mark)

2 Identify one feature of lean production related to staff involvement that Maple Toys Ltd might use.

(Total for Question 2 is 1 mark)

3 Identify one characteristic of JIT production on the shop floor that directly affects inventory levels at Maple Toys Ltd.

(Total for Question 3 is 1 mark)

4 Identify two types of waste that lean production seeks to reduce on a factory production line.

(Total for Question 4 is 2 marks)

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5 Identify a lean tool or practice that Maple Toys Ltd might use on its assembly line to reduce motion and improve flow.

(Total for Question 5 is 1 mark)

6 Maple Toys Ltd expects that lean measures could reduce the average unit cost by 20% from the current £5.00 per toy car. Calculate the new unit cost after a 20% reduction. Show your working.

(Total for Question 6 is 2 marks)

7 Explain one way a kaizen suggestion from a production line worker could improve product quality at Maple Toys Ltd. Give a specific example in your answer.

(Total for Question 7 is 3 marks)

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8 Maple Toys Ltd currently holds about 2,000 units of work-in-progress (WIP) in the factory. Management plans to use JIT to reduce WIP and to smooth the line. Explain two ways JIT production could reduce waste for Maple Toys Ltd. Use the company context in your answer.

(Total for Question 8 is 4 marks)

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9 Scenario recap: Maple Toys Ltd makes 10,000 wooden toy cars per month, holds 2,000 units of WIP and has an average unit cost of £5.00. Management is considering whether to adopt a formal kaizen programme, inviting regular staff suggestions and funding small improvements. Discuss whether Maple Toys Ltd should adopt a kaizen programme. Make use of the scenario figures and consider both benefits and possible drawbacks before giving a justified recommendation.

(Total for Question 9 is 9 marks)

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Mark scheme · 5.8 Improving Production Efficiency: Lean Production, Just-in-Time and Kaizen: 30-minute Pack

Question 1

B cao **B1**

Answer: B

Question 2

a valid feature, e.g. worker empowerment to stop the line to fix quality problems **B1**

Answer: Empowering workers to stop the line to correct quality issues.

Question 3

a valid characteristic, e.g. minimal work-in-progress and minimal finished goods held in the factory **B1**

Answer: Keeping minimal work-in-progress and minimal finished goods in the factory.

Question 4

overproduction, or excess inventory/work-in-progress **B1**

defects, or unnecessary movement, or waiting time (any one other valid waste) **B1**

Answer: Any two, e.g. overproduction (excess WIP) and defects.

Question 5

a named lean tool, e.g. 5S, value stream mapping, or cellular layout **B1**

Answer: Example: 5S (sort, set in order, shine, standardise, sustain).

Question 6

5.00 x 0.20 seen, or 5.00 - (5.00 x 0.20) shown **M1**

£4.00 cao **A1**

Answer: £4.00.

Question 7

identifies a kaizen action, e.g. an operator suggests a change to a jig or the paint drying process **B1**

develops how the action improves quality, e.g. the jig reduces misalignment so fewer toys are out of tolerance **B1**

applies with a specific Maple Toys example, e.g. fewer rejected painted cars reduces scrap and improves customer satisfaction **B1**

Answer: A worker could suggest a small change to a painting jig so toy cars are positioned consistently; this reduces mis-spray and rejects, meaning fewer scrapped parts and higher quality toys delivered to customers.

Question 8

identifies one way, e.g. lower WIP reduces the risk of damage and obsolescence of parts **B1**

develops that way in the Maple Toys context, e.g. fewer partly assembled toy cars means fewer damaged painted parts and less scrap **B1**

identifies a second way, e.g. reduced waiting and smoother flow cuts time wasted between processes **B1**

develops the second way in context, e.g. smoother assembly reduces idle operator time at Maple Toys and lowers labour cost per unit **B1**

Answer: JIT reduces WIP so fewer partly assembled cars get damaged or scrapped, lowering material waste; it also smooths flow and reduces waiting so operators are less idle, reducing labour cost per unit for Maple Toys Ltd.

Question 9

Level 1 Makes simple, undeveloped comments about kaizen with little or no use of the scenario figures and no clear recommendation. **1-3**

Level 2 Gives a developed argument for or against adopting kaizen, using some scenario figures, but does not fully weigh both benefits and drawbacks or provide a clearly justified recommendation. **4-6**

Level 3 Weighs benefits and drawbacks, applies scenario figures such as 10,000 units per month and current costs, analyses likely impacts on cost, quality and staff, and reaches a justified recommendation supported by that analysis. **7-9**

Indicative content:

- Benefits: kaizen encourages small continuous improvements that can reduce defects, lower scrap and cut rework costs, which for 10,000 units per month could noticeably reduce average unit cost from £5.00.
- Benefits: staff involvement can increase motivation and ownership, leading to productivity gains, fewer stoppages and faster problem solving on the line.
- Benefits: small improvements are often low cost to implement, so the payback period is usually short for a small business like Maple Toys Ltd.
- Drawbacks: running a formal kaizen programme needs time for meetings, training and assessment of suggestions, which is a cost in staff time and may temporarily reduce output.
- Drawbacks: if suggestions are not well managed, there is a risk of implementing changes that do not work, causing short term disruption or extra cost.
- Application to scenario: with current WIP of 2,000 units and production of 10,000 units per month, even modest reductions in defects or small time savings per unit could give meaningful cost savings and improved capacity.
- Judgement: a justified recommendation might favour adopting kaizen because the likely benefits to quality, costs and staff engagement outweigh the modest costs of running the scheme, provided Maple Toys Ltd manages the programme well and evaluates suggestions before full implementation.

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