BUS.OP8 Improving Production Efficiency: Lean Production, Just-in-Time and Kaizen

Total Marks

AQA 8132 · Calculators not allowed · about 40 minutes

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 best describes a feature of Just-in-Time (JIT) production on the factory floor?

- ☐ A) Making goods only when there is a customer order on the shop floor
- ☐ B) Holding large amounts of work-in-progress to cope with demand peaks
- ☐ C) Using a wide range of product designs in small batches
- ☐ D) Prioritising long production runs to lower setup time

(Total for Question 1 is 1 mark)

2 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 2 is 1 mark)

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

(Total for Question 3 is 2 marks)

4 Identify two features of kaizen as used on a manufacturing production line.

(Total for Question 4 is 2 marks)

5 Scenario: Maple Toys Ltd is a small UK manufacturer that makes wooden toy cars. It currently makes 10,000 toy cars per month at an average unit cost of 5.00 pounds. Management plans to introduce lean production techniques on the assembly line to cut waste and improve flow. Explain how introducing lean production could reduce Maple Toys Ltd's unit costs. Use the company context in your answer.

(Total for Question 5 is 4 marks)

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6 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 6 is 1 mark)

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

(Total for Question 7 is 2 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 State one potential risk to Maple Toys Ltd of adopting JIT production on its factory floor.

(Total for Question 9 is 1 mark)

10 State one likely benefit to Maple Toys Ltd's customers if the company implements kaizen and continuous improvements.

(Total for Question 10 is 1 mark)

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11 Maple Toys Ltd plans to cut WIP from 2,000 units to 500 units by using JIT scheduling. Calculate the percentage reduction in work-in-progress. Show your working.

(Total for Question 11 is 2 marks)

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12 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 12 is 3 marks)

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

(Total for Question 13 is 1 mark)

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

(Total for Question 14 is 1 mark)

15 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 pounds. 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 15 is 9 marks)

Mark scheme · BUS.OP8 Improving Production Efficiency: Lean Production, Just-in-Time and Kaizen

Question 1

- **B1** A cao
- **Answer: A**

Question 2

- **B1** B cao
- **Answer: B**

Question 3

- **B1** overproduction, or excess inventory/work-in-progress
- **B1** defects, or unnecessary movement, or waiting time (any one other valid waste)
- **Answer: Any two, e.g. overproduction (excess WIP) and defects.**

Question 4

- **B1** continuous small improvements suggested by employees
- **B1** regular review of processes and minor changes to equipment or procedures
- **Answer: Any two, e.g. employee suggestions for small improvements; frequent review and incremental changes.**

Question 5

- **B1** identifies a reason, e.g. reducing waste such as excess work-in-progress or defects will lower costs per unit
- **B1** develops the reason, e.g. fewer defects reduce rework costs and fewer wasted parts reduce material cost
- **B1** applies to Maple Toys Ltd context, e.g. with 10,000 cars monthly even small waste reductions lower the average cost from 5.00 pounds
- **B1** links to an outcome, e.g. lower average unit cost improves margin or allows competitive pricing
- **Answer: Reducing waste such as defects and excess WIP will cut material and rework costs; for Maple Toys Ltd making 10,000 cars a month this lowers total costs so average unit cost falls from the current 5.00 pounds, improving profit margin or allowing lower prices to compete.**

Question 6

- **B1** a named lean tool, e.g. 5S, value stream mapping, or cellular layout
- **Answer: Example: 5S (sort, set in order, shine, standardise, sustain).**

Question 7

- **M1** 5.00 x 0.20 seen, or 5.00 - (5.00 x 0.20) shown
- **A1** 4.00 pounds cao
- **Answer: 4.00 pounds.**

Question 8

- **B1** 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
- **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

- **B1** a valid risk, e.g. supply delays cause the production line to stop
- **Answer: Supply delays could stop the assembly line, causing lost output.**

Question 10

- **B1** a valid benefit, e.g. improved product quality or more reliable delivery times
- **Answer: Improved product quality, so customers receive fewer defective toys.**

Question 11

- **M1** (2,000 - 500) seen or the change 1,500 seen
- **A1** 75% cao
- **Answer: 75%.**

Question 12

- **B1** 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
- **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 13

- **B1** a valid feature, e.g. worker empowerment to stop the line to fix quality problems
- **Answer: Empowering workers to stop the line to correct quality issues.**

Question 14

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

Question 15

- **Level 1** (1-3): Makes simple, undeveloped comments about kaizen with little or no use of the scenario figures and no clear recommendation.
- **Level 2** (4-6): 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.
- **Level 3** (7-9): 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.
- **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 pounds.
  - 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.