2.5 Lean Production: Just-in-Time, Kaizen and Time-Based Management

AQA 7132 · Calculators not allowed · about 55 minutes · Write-in edition

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions in the spaces provided. Show working for calculations. Full sentences are required for extended answers (questions 9 and 10). GreenTech Bikes, used throughout this pack, is a fictional UK business.

1 Identify one risk to GreenTech Bikes of operating with very low inventory under a JIT system.

(Total for Question 1 is 1 mark)

2 Identify one example of a kanban signal GreenTech Bikes could use on its assembly line.

(Total for Question 2 is 1 mark)

3 State two operational benefits to GreenTech Bikes of using JIT stock control on its assembly line.

(Total for Question 3 is 2 marks)

4 State two features of kaizen as it might be practised at a small manufacturer such as GreenTech Bikes.

(Total for Question 4 is 2 marks)

5 GreenTech Bikes wants to reduce the time from prototype to customer delivery. Identify one example of a time-based management technique the business might use.

(Total for Question 5 is 1 mark)

6 Explain one operational benefit to GreenTech Bikes of using kanban cards on its production line.

(Total for Question 6 is 3 marks)

7 GreenTech Bikes currently holds an average of £150,000 of inventory on the balance sheet. Management estimates that adopting JIT would reduce average inventory by 40 percent. Calculate the new average inventory value and the reduction in £. Show your working.

(Total for Question 7 is 4 marks)

---

8 Explain one drawback of adopting JIT for GreenTech Bikes. Give a developed answer that refers to the business context.

(Total for Question 8 is 6 marks)

9 Analyse the likely operational impact of introducing JIT at GreenTech Bikes, a manufacturer of electric bicycles that currently sources some parts from overseas and has seasonal demand peaks. Use the information in this pack in your answer.

(Total for Question 9 is 8 marks)

10 Evaluate whether GreenTech Bikes should adopt lean production across its operations, considering JIT, kaizen and time-based management, and using evidence from this pack. Reach a justified conclusion.

(Total for Question 10 is 12 marks)

Mark scheme · 2.5 Lean Production: Just-in-Time, Kaizen and Time-Based Management

Question 1

supply chain disruption could stop production because there is no buffer stock	**B1**

Answer: Supply chain disruption could halt production because there is no buffer stock.

Question 2

a coloured card, a barcode scan, or an empty bin used as a signal (any one)	**B1**

Answer: A coloured card, a barcode scan or an empty bin used as a signal.

Question 3

lower stockholding costs, because less capital is tied up in inventory	**B1**
reduced waste or lower risk of obsolete parts, since parts are held for shorter periods	**B1**

Answer: Lower stockholding costs; reduced waste or lower risk of obsolete parts.

Question 4

employee suggestions for small, ongoing improvements to processes	**B1**
frequent implementation of small changes rather than occasional large projects	**B1**

Answer: Employee suggestions for small improvements; frequent small changes rather than occasional large projects.

Question 5

mass customisation, parallel processing of tasks, or reducing setup times (any one)	**B1**

Answer: Mass customisation or parallel processing of tasks or reducing setup times.

Question 6

identifies a benefit, for example clearer signalling of when parts are needed	**B1**
develops the point, for example reducing overproduction and avoiding excess batches	**B1**
links to an operational outcome, for example smoother flow on the line and lower inventory levels	**B1**

Answer: Kanban provides clearer signalling of when parts are needed, reducing overproduction and avoiding excess batches, which leads to a smoother production flow and lower inventory levels.

Question 7

method: 150,000 x 0.40 seen to find reduction	**M1**
150,000 - (150,000 x 0.40) or 150,000 x 0.60 seen to find new inventory	**M1**
new average inventory £90,000 cao	**A1**
reduction £60,000 cao	**A1**

Answer: New average inventory = £90,000. Reduction = £60,000.

Question 8

identifies a drawback, for example lack of buffer stock increases vulnerability to supplier delays	**B1**
applies this to GreenTech Bikes, for example a late delivery of battery packs could stop assembly of electric bikes	**B1**
develops the consequence, for example production stoppage leads to lost sales and unmet delivery promises	**B1**
links to a financial or reputational outcome, for example lost revenue or damage to customer relationships	**B1**
explains a mitigation cost, for example holding a small safety stock or paying more for faster deliveries	**B1**
gives a short evaluative comment, for example the risk may be acceptable if suppliers are reliable but not if supply chains are unstable	**B1**

Answer: Operating with minimal stock makes GreenTech Bikes vulnerable to supplier delays; for example, a late delivery of battery packs would halt assembly, causing lost sales and missed delivery dates and potentially harming customer relationships. Mitigation, such as holding small safety stocks or paying for quicker deliveries, increases costs. The risk may be acceptable with very reliable suppliers but is dangerous if supply chains are unstable.

Question 9

identifies a relevant impact: lower inventory costs and reduced waste	**B1**
applies to the case: inventory could fall from 150,000 to £90,000 (question 7)	**B1**
identifies a second impact: improved flow and faster response to demand due to smaller stock levels and kanban signalling	**B1**
develops the second impact with business context, for example quicker assembly turnaround helps meet peaks in seasonal demand	**B1**
identifies a risk: vulnerability to supply chain delays, especially for overseas suppliers	**B1**
develops the risk with context, for example delays at ports or customs could cause production stoppages during peak season	**B1**
discusses mitigation and trade-off, for example using local backup suppliers or small safety stocks increases resilience but reduces some cost savings	**B1**
provides an overall balanced analysis linking operational impacts to business outcomes such as cost savings, capacity to meet seasonal peaks and risk of lost sales	**B1**

Answer: Introducing JIT would reduce inventory holding costs and waste, illustrated by a possible fall from 150,000 to £90,000 in average stock, freeing up cash. It should improve production flow and responsiveness, particularly if kanban is used, which could help meet seasonal demand peaks by shortening assembly turnaround. The main risk is greater vulnerability to supply chain delays, especially from overseas suppliers where port or customs delays could cause stoppages during peak season. Mitigation, such as local backup suppliers or small safety stocks, reduces the risk but also reduces some cost savings. Overall, JIT can deliver meaningful operational benefits for GreenTech Bikes but requires careful supplier management to avoid harming sales during busy periods.

Question 10

Level 1 Limited evaluation with general points about lean production. Little use of the pack's figures and no clear judgement about GreenTech Bikes.	**1-4**
Level 2 A developed evaluation that uses some evidence from the pack, considering both benefits and risks. May offer a recommendation but with limited justification.	**5-8**
Level 3 A well developed evaluation that balances detailed advantages and disadvantages, applies figures and examples from the pack, considers mitigations, and reaches a justified conclusion appropriate to GreenTech Bikes.	**9-12**

Indicative content:

- Benefits: lower inventory holding costs (example reduction from 150,000 to £90,000), reduced waste, improved flow and quicker response to customer orders, and continuous incremental improvements from kaizen that raise efficiency and staff engagement.
- Risks: increased vulnerability to supply chain disruption, especially with overseas suppliers and seasonal peaks; potential hidden costs of implementing systems such as kanban or staff training; possible need to pay higher prices for faster deliveries or hold small safety stocks.
- Time-based management: mass customisation and reduced time-to-market can increase competitiveness and allow premium pricing, but require flexible processes and possibly investment in modular design or parallel processing.
- Mitigations: using multiple suppliers, holding minimal safety stock for critical components, investing in closer supplier relationships, and rolling out lean methods gradually starting with pilot lines.
- Judgement: a balanced conclusion might recommend adopting lean production selectively and with safeguards: implement kaizen and kanban widely to gain efficiency gains, trial JIT on components with reliable local suppliers, and adopt time-based approaches where mass customisation adds clear value. Full adoption across all suppliers and components carries risk unless supplier reliability and contingency plans are in place.