1.16 Production Planning and Costs

AQA 8552 · Calculator allowed · about 55 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions.

1 A designer needs 6 individually adjusted display stands for a local exhibition. Each stand has a different height. Existing adjustable hand tools can make all six. A proposed batch line needs dedicated tooling and a new setup for each height. No repeat orders are expected. Explain why one-off production is suitable and why the proposed batch production may be less suitable.

(Total for Question 1 is 4 marks)

2 An order is for 240 identical panels, due within 2 days. Method A makes batches of 40; setup is 25 minutes once per batch and each panel takes 2 minutes. Method B uses one setup of 100 minutes for the order and each panel takes 1.5 minutes. One line is available, no parallel production, and 9 hours are available. Decide which method meets the time limit.

(Total for Question 2 is 4 marks)

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3 A firm needs 500 identical tags. Method P has a setup cost of £40 once per order and costs £0.90 per tag. Method Q has a setup cost of £8 per batch of 100 tags and costs £0.72 per tag. Setup is charged once for each batch; no production runs in parallel. Decide which has the lower total cost and state the saving.

(Total for Question 3 is 4 marks)

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4 A community group orders 37 identical stools. Option S makes one at a time: setup 10 minutes once and 22 minutes per stool. Option B makes batches of 12: setup 30 minutes per batch and 16 minutes per stool. One workstation is available, parallel work is not allowed, and 15 hours are available. For B, a final partial batch is allowed and still needs a full setup. Decide which option meets the time limit and is quicker.

(Total for Question 4 is 4 marks)

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5 A school orders 80 identical plywood storage trays. The workshop can use a reusable cutting jig, but making each tray individually would need repeated measuring. After this order, the workshop must return to making other products on the same equipment. Explain why batch production may suit this order.

(Total for Question 5 is 4 marks)

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6 A company receives a forecast for 12,000 identical cable clips each month for a year. A dedicated production line would need substantial setup investment. Explain why larger-scale production could be economical, and give one reason the company should still check before choosing it.

(Total for Question 6 is 4 marks)

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7 A maker has an order for 45 personalised name plaques, each with different text. Explain why a single large-scale automated run may not be the best choice, even though the total quantity is 45.

(Total for Question 7 is 4 marks)

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8 A batch of 40 wooden hooks needs a setup time of 35 minutes, then a cycle time of 4 minutes per hook. Setup occurs once for the whole batch. Calculate the total production time in minutes.

(Total for Question 8 is 3 marks)

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9 A small laser-cut order has a setup charge of £18 once per order and a material cost of £2.40 per unit. Calculate the total cost for 25 units and the cost per unit.

(Total for Question 9 is 3 marks)

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10 A press has a setup time of 50 minutes and a cycle time of 3 minutes per casing. Setup occurs once. One press is available and production cannot run in parallel. Calculate the total time for 70 casings in hours and minutes.

(Total for Question 10 is 3 marks)

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11 A workshop makes 120 identical brackets in batches of 30. Each batch has a setup cost of £12, charged once per batch. Unit material and processing cost is £1.85. Calculate total cost and average cost per bracket.

(Total for Question 11 is 3 marks)

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12 Order A is 18 identical desk organisers, due in 3 days. Method X: setup 20 minutes once, then 18 minutes per unit on one machine. Method Y: setup 90 minutes once, then 7 minutes per unit on one machine. No parallel production is allowed. Decide which meets the deadline if 6 hours of machine time are available.

(Total for Question 12 is 4 marks)

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Mark scheme · 1.16 Production Planning and Costs

Question 1

one-off production can adapt each stand to its required individual height	B1
using existing hand tools avoids investment in the dedicated tooling required by the batch line	B1
the different heights require repeated batch-line setups, reducing the time benefit of repeating one setup	B1
with only six stands and no repeat orders, batch-line setup investment cannot be spread over a long run to reduce its cost per stand	B1

Answer: One-off production can adapt each stand to its individual height using the existing hand tools, avoiding dedicated tooling investment. The proposed batch line would need a fresh setup for each height. With only six stands and no repeat orders, its setup investment cannot be spread over a long run to reduce cost per stand.

Question 2

A has 240 / 40 = 6 batches	B1
A time = 6 x 25 + 240 x 2 = 630 minutes, so it misses 540	B1
B time = 100 + 240 x 1.5 = 460 minutes	B1
choose B as it meets 540 minutes; batch setup counted six times for A and once for B	B1

Answer: A takes 630 minutes and misses the 540-minute limit. B takes 460 minutes and meets it, so choose B.

Question 3

P total = £40 + 500 x £0.90 = £490	B1
Q requires 5 batches and setup costs 5 x £8 = £40	B1
Q total = £40 + 500 x £0.72 = £400	B1
Q is cheaper by £490 - £400 = £90	B1

Answer: Method Q costs £400; P costs £490. Q saves £90.

Question 4

S time = 10 + 37 x 22 = 824 minutes	B1
B requires ceiling(37 / 12) = 4 batches, including a partial final batch	B1
B time = 4 x 30 + 37 x 16 = 712 minutes	B1
both are below 900 minutes and B is quicker by 112 minutes	B1

Answer: Both meet 900 minutes. S takes 824 minutes; B takes 712 minutes because four setups are needed. B is quicker by 112 minutes.

Question 5

80 identical trays can share the same jig setup	B1
batching reduces repeated measuring or setup	B1
the setup cost/time is spread across many trays	B1
the finite batch can stop after 80 trays and the equipment can be changed over to other products	B1

Answer: The 80 identical trays can share one jig setup, avoiding repeated measuring for each tray. The setup effort is spread across 80 units, reducing setup effort per tray. Once the batch is complete, the workshop can change over the equipment to make the other products.

Question 6

large repeated quantity can spread the dedicated setup cost over many units	B1
a specialised line may reduce time or cost per unit after setup	B1
the forecast is repeated over a year, supporting continued use	B1
check demand certainty or setup investment/recovery before committing	B1

Answer: A dedicated line could spread its setup investment over many clips and reduce later unit cost. The company should check that the forecast is reliable enough to recover the investment.

Question 7

the order contains different personalisation rather than identical units	B1
large-scale setup may be designed for repeated identical output	B1
changing settings or handling each variation can add time/cost	B1
a small batch or individually made plaques may fit the order better	B1

Answer: The 45 plaques are not identical because each has different text. Repeated changes may add time and cost, so small batches or individual production may fit better than one large-scale run.

Question 8

40 x 4 = 160 minutes of cycle time	M1
adds setup once: 160 + 35	M1
195 minutes	M1

Answer: 195 minutes

Question 9

variable cost = 25 x £2.40 = £60	M1
total cost = £60 + £18 = £78	M1
unit cost = £78 / 25 = £3.12	M1

Answer: Total £78; £3.12 per unit

Question 10

cycle time = 70 x 3 = 210 minutes	M1
total = 210 + 50 = 260 minutes	M1
260 minutes = 4 hours 20 minutes	M1

Answer: 4 hours 20 minutes

Question 11

number of batches = 120 / 30 = 4	M1
total = 4 x £12 + 120 x £1.85 = £48 + £222 = £270	M1
average = £270 / 120 = £2.25 per bracket	M1

Answer: Total £270; average £2.25 per bracket

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Question 12

X time = 20 + 18 x 18 = 344 minutes	**B1**
Y time = 90 + 7 x 18 = 216 minutes	**B1**
X: 344 minutes is within 6 x 60 = 360 minutes, so X meets the deadline	**B1**
Y: 216 minutes is within 6 x 60 = 360 minutes, so Y meets the deadline	**B1**

Answer: Both methods meet the deadline: X takes 344 minutes and Y takes 216 minutes, each within the available 360 minutes.

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