IB Business Management SL 2026 — Operations Management

IB SL Study Guide

Contents

Videos on this page: Operations Methods · Lean Production & Quality Management

The Role of Operations Management

Operations management is the function responsible for transforming inputs (resources) into outputs (goods and services) as efficiently and effectively as possible. It sits at the core of every business — without operations, there is no product or service to sell, market, or finance. Operations management decisions directly affect costs, quality, capacity, and the business's ability to compete.

The Transformation Model

The transformation model frames operations as a system with three components:

- **Inputs** — the resources used in production. These fall into two categories:
  - *Transforming resources* (the tools of production): land, labour, capital, and enterprise — the four factors of production.
  - *Transformed resources* (what is worked on): raw materials, data, customers (in service operations), and information.
- **Transformation process** — the activities that convert inputs into outputs: manufacturing, assembly, chemical processing, information processing, or service delivery.
- **Outputs** — the finished goods or services delivered to customers.

The goal of operations management is to maximise the value added during the transformation — the difference between the cost of inputs and the value of outputs — while minimising waste, time, and cost.

Operations and the Value Chain

Operations management is central to **value creation**. Each stage of the transformation process should add *utility* — the value perceived by the customer:

- **Form utility** — changing the physical form of inputs (e.g., turning timber into furniture)
- **Time utility** — making the product available when the customer needs it (e.g., rapid delivery)
- **Place utility** — making the product available where the customer needs it (e.g., a convenience store)
- **Possession utility** — enabling the customer to own and use the product

Operations and Business Strategy

Operations does not exist in isolation — it must align with the business's competitive strategy:

- **Cost leadership strategy** — operations must focus on minimising unit costs through high-volume production, automation, and lean systems (e.g., IKEA's flat-pack global supply chain)
- **Differentiation strategy** — operations must prioritise quality, customisation, and speed, even at higher cost (e.g., bespoke furniture craftsmen, Rolls-Royce cars)

Key Operations Objectives

Objective	Description	Example trade-off
Cost	Minimise the unit cost of production	Low cost may compromise quality
Quality	Produce outputs that meet or exceed customer expectations	High quality typically raises cost
Speed	Deliver products quickly to customers	Speed may increase cost or reduce flexibility
Flexibility	Adapt production to changing demand or product specifications	Flexibility often increases unit cost
Dependability	Deliver reliably — right product, right time, every time	Hard to maintain under volatile demand
Sustainability	Minimise environmental impact; responsible resource use	May increase short-run cost

IB TIP

IB examiners frequently ask you to explain a conflict between operations objectives. Cost and quality are the most tested pair — a business cutting costs (e.g., using cheaper materials or reducing inspection stages) risks damaging quality, leading to customer complaints and reputational harm. Always identify the specific trade-off for the business in the question.

Operations Methods

Three main production methods exist: job, batch, and flow (mass) production. The correct choice depends on the nature of the product, the size of the market, the degree of standardisation required, and the capital available.

Job Production

In **job production**, each product is made individually to a unique specification, from start to finish, before the next item is started. The product is usually made to a specific customer's requirements.

Characteristics: highly customised; high skill requirement; small quantities; labour-intensive.

Advantages:

- Products can be tailored exactly to customer requirements — maximum flexibility
- High-quality craftsmanship is possible and expected
- Customer satisfaction from bespoke service; often commands premium prices
- Workers develop high levels of skill and variety in their work, which can improve motivation

Disadvantages:

- Very high unit costs — cannot achieve economies of scale
- Slow production — each product completed individually before the next begins
- Highly skilled (and therefore expensive) labour is required
- Difficult to achieve consistent output or expand rapidly to meet increased demand

Examples: bespoke wedding cakes, custom suits, cruise ships, individually designed architecture, specialised medical equipment, handmade jewellery, bespoke software development.

Batch Production

In **batch production**, a group (batch) of similar items is produced together, moving through each stage of production as a group before moving to the next stage. Each batch may be slightly different from the last — for example, a bakery produces a batch of white loaves, then resets machines and produces a batch of wholemeal loaves.

Characteristics: semi-customised; medium-scale; batches allow variety within a standardised system; machines are reset between batches.

Advantages:

- More efficient than job production — within a batch, the process is standardised
- Variety is possible — different batches can have different specifications
- Some economies of scale achievable within each batch
- More flexible than flow production — different product types can be produced in sequence

Disadvantages:

- Machine changeover (set-up) costs and time between batches — production is interrupted
- Partially completed stock (WIP — work-in-progress) accumulates between stages as batches wait to move forward
- Scheduling is complex — managing multiple product lines simultaneously
- Storage costs rise as completed batches await distribution or sale

Examples: bakeries (batch of loaves), pharmaceutical tablets and capsules, seasonal clothing runs, printed books, school furniture.

Flow (Mass) Production

In **flow (mass) production**, identical, standardised products move continuously along an assembly line, with each workstation performing a specific repetitive task. Production is continuous — the line never stops.

Characteristics: very high volume; fully standardised products; highly capital-intensive; requires large initial investment; very low unit costs.

Advantages:

- Very low unit costs due to economies of scale and high throughput
- Extremely fast output — products roll off the line continuously
- Consistent product quality — standardised process reduces variation
- Less skilled (and therefore lower-cost) labour required for individual tasks

Disadvantages:

- Very high initial capital investment in machinery and the production line itself
- Inflexible — changing the product specification requires costly re-engineering of the line
- Repetitive, routine work leads to low worker morale, high absenteeism, and turnover
- Vulnerable to machine breakdown — one failure can halt the entire line
- Large minimum production runs required — unsuitable for small markets

Examples: Ford car assembly, Coca-Cola bottling, microchip manufacturing, mass-market textbook printing.

Production Methods Comparison Table

Feature	Job Production	Batch Production	Flow (Mass) Production
Volume	Single unit	Groups (batches)	Continuous/very high
Customisation	Fully bespoke	Semi-customised	Standardised
Unit cost	Very high	Medium	Very low
Skill required	High	Medium	Low (per task)
Flexibility	Maximum	Moderate	Very low
Capital intensity	Low	Medium	Very high
Labour intensity	Very high	High	Low
Worker motivation	High (variety, skill)	Moderate	Low (repetition)
Examples	Bespoke suit, cruise ship	Bread batch, pharma tablets	Coca-Cola, microchips

Cell Production

Cell production is a hybrid approach in which the factory floor is organised into U-shaped work cells, each producing a complete product or sub-assembly from start to finish. Workers within a cell are multi-skilled and handle multiple stages of production.

Advantages: improves worker motivation (each cell has ownership of a complete product); encourages teamwork; reduces WIP stock between stages; quality responsibility lies with the cell team.

Disadvantages: workers require training in multiple skills; cells may have different throughput speeds, creating imbalances; initial reorganisation costs can be significant.

> ⚠ EXAM ALERT
>
> IB Paper 1 and Paper 2 questions often describe a business and ask which production method would be most appropriate. Always justify your choice using at least two characteristics of the business: volume needed, degree of customisation required, capital available, and the labour market. A one-word answer ("batch") without justification will not score evaluation marks.

▸**Watch: Operations Methods** VIDEO

Lean Production and Quality Management

Lean production is a philosophy of manufacturing that seeks to eliminate *all* forms of waste (known in Japanese as *muda*) from the production process. Originating in Japan's Toyota Production System (TPS) in the 1950s and 1960s, lean thinking transformed manufacturing worldwide.

Types of Waste (Muda)

Lean production identifies seven classical forms of waste:

1. **Overproduction** — making more than is currently needed, creating excess inventory
2. **Waiting** — idle time when workers or machines are not adding value
3. **Transport** — unnecessary movement of materials between locations
4. **Over-processing** — doing more work on a product than the customer values
5. **Inventory** — holding excess stock that ties up cash and risks obsolescence
6. **Motion** — unnecessary movement by workers (poor layout, missing tools)
7. **Defects** — producing faulty products that must be reworked or scrapped

Just-in-Time (JIT) Production

Just-in-Time (JIT) is a stock management and production philosophy in which materials and components are ordered or produced only when they are needed — not before. The goal is zero buffer stock: nothing sits in a warehouse waiting.

How JIT works: Production is demand-driven ("pull" system) — products are made only when a customer order is received or a downstream workstation signals a need. Suppliers are closely integrated and must deliver small quantities frequently, precisely when needed (known as "kanban" signalling).

Advantages of JIT:

- Significantly reduces storage and warehousing costs (no large buffer stock needed)
- Reduces working capital tied up in inventory
- Defects are identified immediately — a faulty component cannot hide in a pile of stock
- Waste (overproduction, excess inventory) is minimised
- Improves cash flow — the business pays for inputs closer to when it receives revenue

Disadvantages of JIT:

- Entirely dependent on **reliable suppliers** who can deliver exact quantities at precise times
- No buffer stock means any supply chain disruption halts production immediately
- Vulnerable to unexpected surges in demand — cannot quickly increase output
- Requires very close supplier relationships and sophisticated communication systems
- Higher ordering and delivery frequency may increase unit transport costs

> ⚠ **EXAM ALERT**
>
> A classic IB question: "Discuss whether JIT is appropriate for [company X]." The key evaluation point is supply chain reliability. JIT was exposed during COVID-19: manufacturers with zero buffer stock (e.g., automotive plants) were forced to halt production when global supply chains failed. Always weigh the cost savings of JIT against the vulnerability to supply disruption — the answer depends on how reliable and diversified the business's supply chain is.

Kaizen (Continuous Improvement)

Kaizen (Japanese: "change for the better") is the philosophy of continuous, incremental improvement involving *all* employees at every level of the organisation — not just management or engineers.

Core principles of Kaizen:

- Small improvements are made constantly, every day, by everyone
- Every employee is empowered to identify inefficiencies and suggest solutions
- No improvement is too small to matter
- Changes are made, measured, and refined in a cycle (Plan-Do-Check-Act / PDCA)

Kaizen events (or "blitzes") are focused, short-duration improvement sessions where a small team concentrates on eliminating waste in a specific process over a few days.

Kaizen vs Innovation:

	Kaizen	Innovation
Type of change	Many small, incremental steps	Few large, radical leaps
Driven by	All employees	R&D teams, senior management
Risk	Very low	High
Cost	Low	High
Speed	Gradual, sustained	Sudden, disruptive
Example	Reducing machine set-up time by 3 minutes	Introducing a completely new robotic assembly line

> **IB TIP**
>
> IB evaluations of Kaizen should note that it requires a genuine culture shift — workers must trust that suggesting improvements will not result in job losses. If employees fear that efficiency gains will lead to redundancy, they will withhold ideas. The cultural dimension is as important as the technical one.

Total Quality Management (TQM)

Total Quality Management (TQM) is a management philosophy in which every employee at every stage of the production process takes responsibility for quality. Rather than detecting defects at the end of the line, TQM builds quality into the process from the start.

Core TQM principles:

- **Zero defect target** — the objective is to get it right first time, every time
- **Customer focus** — quality is defined by what the customer values, not internal standards
- **Continuous improvement** — quality is never "good enough"; improvement is always possible
- **Employee involvement** — every worker is a quality inspector for their own output

Quality circles are a practical TQM tool: small groups of employees (typically 5–10) who meet regularly (often weekly) to identify quality problems in their area, analyse causes, and propose solutions. Participation is voluntary; recommendations are presented to management for approval. Quality circles bridge the gap between operational workers (who see day-to-day problems) and management (who have authority to implement changes).

Quality Control vs Quality Assurance vs TQM

This is one of the most frequently tested distinctions in Unit 5:

	Quality Control (QC)	Quality Assurance (QA)	Total Quality Management (TQM)
Definition	Inspecting finished products AFTER production to identify defects	Systems and processes throughout production to PREVENT defects occurring	Company-wide philosophy where every employee is responsible for quality at every stage
Approach	Reactive — detects defects	Proactive — prevents defects	Cultural — embeds quality in all activities
When applied	End of production line	Throughout the production process	At every stage, by everyone
Who is responsible?	Quality inspectors (specialist)	All staff involved in the process	Every employee
Waste	Defective units already produced — resources wasted	Fewer defective units — less waste	Zero defect target — minimum waste
Cost	High — scrapping/reworking defective units	Lower long-run cost	High cultural investment but lower long-run defect cost
Example	Final inspection at end of assembly line	ISO 9001 certification; documented processes	Toyota Production System; Kaizen culture

MEMORISE THIS

QC vs QA one-liner:

Quality Control detects defects — it is the guard at the exit. Quality Assurance prevents defects — it is the process design that ensures the guard is rarely needed. TQM makes quality the personal responsibility of every person in the building.

EXAM ALERT

IB examiners frequently ask "which approach to quality is better — QC or QA?" The IB model answer consistently favours QA over QC for two reasons: (1) QA prevents wasted resources (a defect prevented costs nothing; a defect discovered at the end wastes all the inputs already used); (2) QA is proactive, catching problems at source. However, credit is given for recognising that QC is simpler, cheaper to implement, and appropriate where processes are already highly reliable. Always evaluate both sides.

▸Watch: Lean Production & Quality Management VIDEO

Location of Production

Where a business locates its operations is a strategic decision with long-lasting consequences. Location affects costs, market access, labour availability, legal

environment, and brand perception. The wrong location choice can be difficult and expensive to reverse.

Why Location Matters

Location decisions directly affect:

- **Fixed costs** (rent and property prices vary enormously between locations)
- **Labour costs and availability** (wage rates, skill levels, and the size of the local labour pool)
- **Transport costs** (proximity to raw materials, suppliers, and customers)
- **Market access** (ability to reach target customers quickly and cheaply)
- **Legal and regulatory environment** (tax rates, planning regulations, environmental law)

Quantitative Factors

Quantitative factors are measurable in monetary terms and can be compared directly across locations:

- **Land and property costs** — the biggest cost difference between locations, especially for manufacturing and warehousing. Urban sites cost far more than rural or overseas alternatives.
- **Labour costs and availability** — wage rates differ significantly between countries and regions. Low-cost manufacturing in South-East Asia vs higher-cost operations in Western Europe.
- **Infrastructure** — quality of transport networks (roads, ports, rail), energy supply, broadband connectivity. Poor infrastructure raises transport costs and reduces efficiency.
- **Government incentives** — grants, tax breaks, subsidised premises, and enterprise zones offered by governments to attract investment into target areas.
- **Proximity to raw materials** — critical for primary and secondary sector businesses. A steel plant near iron ore deposits avoids expensive transport costs.
- **Proximity to markets (customers)** — critical for businesses where quick delivery is important (fresh food, retail) or where transport costs are high relative to product value.

Qualitative Factors

Qualitative factors are harder to measure in monetary terms but can be decisive:

- **Quality of life** — areas with good schools, housing, amenities, and natural environment attract skilled workers and senior managers
- **Political stability** — risk of expropriation, corruption, or sudden regulatory changes in some international locations
- **Cultural factors** — language barriers, business customs, and attitudes toward employment relations vary across countries

- **Personal preferences of owner** — particularly for small businesses, the owner's desire to operate in a particular location (e.g., near home) may override financial considerations

The Weighted Scoring Model

The **weighted scoring model** is a quantitative decision-making tool that allows a business to systematically compare locations by assigning different levels of importance (weights) to each factor.

Steps:

1. List the key location factors
2. Assign a weight to each factor — the weights must sum to 100 (or 1.0)
3. Score each location on each factor (e.g., 1–10, where 10 is best)
4. Multiply each score by its weight to produce a weighted score
5. Sum the weighted scores for each location — the highest total wins

WORKED EXAMPLE

Worked Example — Weighted Scoring Model for a New Factory

A food manufacturer is choosing between two locations: City A and City B. The decision criteria and scores are as follows:

Factor	Weight	City A Score	City A Weighted	City B Score	City B Weighted
Labour costs	30	6	180	9	270
Proximity to market	25	8	200	5	125
Land/property costs	20	5	100	8	160
Transport infrastructure	15	7	105	6	90
Government incentives	10	4	40	7	70
Total	**100**		**625**		**715**

Result: City B scores 715 vs City A's 625. On a purely weighted-scoring basis, City B is preferred — its lower labour costs and property costs more than compensate for its weaker market proximity.

Evaluation: However, the result is only as reliable as the weights and scores assigned. If proximity to market is actually more critical than weighted here (e.g., the product is perishable), City A may be the better choice in practice. The model is a structured framework, not a definitive answer.

IB TIP

IB evaluations of the weighted scoring model must acknowledge its limitations: (1) weights are subjective — different managers would assign different weights; (2)

scores are assigned subjectively — two people may score the same location differently on "quality of infrastructure"; (3) qualitative factors are difficult to quantify meaningfully. Always recommend that the model be used alongside qualitative judgement rather than treated as the sole basis for the decision.

Globalisation, Offshoring, and Outsourcing

Offshoring is the relocation of production or business functions to a different country, typically one with lower operating costs.

	Advantages of Offshoring	Disadvantages of Offshoring
Costs	Lower labour costs (e.g., manufacturing in Vietnam vs UK)	Higher transport and logistics costs
Market access	Closer to growing markets in Asia, Latin America	Trade barriers, tariffs, customs delays
Quality	May access specialist skills	Harder to monitor and control quality at distance
Reputation	—	Reputational risk if poor labour conditions are exposed
Communication	—	Time zone and language barriers increase coordination cost
Control	—	Intellectual property risk in some jurisdictions

Outsourcing is contracting out a business function or process to an external provider, rather than performing it in-house. The function may be outsourced domestically or overseas.

Advantages of outsourcing:

- Access to specialist expertise that the business cannot develop internally
- Cost savings — the external provider can spread costs across many clients
- Flexibility — contracts can be renegotiated or ended as needs change
- Allows management to focus on core competencies

Disadvantages of outsourcing:

- Loss of direct control over the quality of the outsourced function
- Dependence on the supplier — if they fail, the business cannot easily bring the function back in-house quickly
- Risk of confidential information being shared beyond the business
- Potential job losses damage employee morale and public reputation

⚠ EXAM ALERT

Do not confuse offshoring and outsourcing. **Offshoring** = relocating a business function to another country (it may still be done by the business itself). **Outsourcing** = contracting out a function to a third party (it may be done domestically). A business can offshore without outsourcing (e.g., opening its own factory in Vietnam) or outsource without offshoring (e.g., hiring a UK accounting firm). They can also do both simultaneously (e.g., contracting a Vietnamese call centre).

Break-even Analysis in Operations Context

Break-even analysis was introduced in Unit 3 (Finance and Accounts) as a financial planning tool. In the operations context, it serves a direct function: helping production managers decide minimum output targets, evaluate the financial impact of capacity decisions, and assess the effect of changing input costs on viability.

Key Definitions

MEMORISE THIS

Break-even Formulas — Operations Management

$$\text{Contribution per unit} = \text{Selling price per unit} - \text{Variable cost per unit}$$

$$\text{BEP} = \frac{\text{Fixed Costs}}{\text{Contribution per unit}}$$

$$\text{Margin of Safety} = \text{Actual output} - \text{Break-even output}$$

$$\text{Margin of Safety \%} = \frac{\text{Margin of Safety}}{\text{Actual output}} \times 100$$

$$\text{Profit} = \text{Margin of Safety} \times \text{Contribution per unit}$$

- **Fixed costs (FC)** — costs that do not change with the level of output: rent, insurance, management salaries, equipment leasing, loan repayments.
- **Variable costs (VC)** — costs that vary directly with output: raw materials, direct labour (if paid per unit), packaging, energy used in production.
- **Total costs (TC)** = FC + (VC per unit × Quantity)
- **Revenue (TR)** = Selling price × Quantity
- **Contribution per unit** = Selling price – Variable cost per unit. This is the amount each unit sold contributes first toward covering fixed costs, then toward profit.
- **Break-even point (BEP)** = the output level at which TR = TC — no profit and no loss.
- **Margin of Safety (MoS)** = current output – BEP = the number of units by which actual output can fall before the business makes a loss.

The Break-even Chart

A break-even chart plots costs and revenue against output level:

- **X-axis:** output / sales volume (units)
- **Y-axis:** costs and revenue (currency, e.g., $)
- **Fixed cost line:** horizontal — starts from the y-axis at the FC value; does not slope because fixed costs do not change with output
- **Total cost line:** starts from the same point as FC on the y-axis (because at zero output, total costs = fixed costs) and slopes upward; the gradient = variable cost per unit
- **Revenue line:** starts from the origin (zero revenue at zero output) and slopes upward; the gradient = selling price per unit
- **Break-even point:** where the total cost line and revenue line intersect
- **Profit area:** to the right of the BEP — revenue exceeds total costs
- **Loss area:** to the left of the BEP — total costs exceed revenue

WORKED EXAMPLE

Worked Example — Full Break-even Calculation with Margin of Safety

A sports equipment manufacturer makes gym bags. Data:

- Fixed costs: $60,000 per month
- Variable cost per bag: $8
- Selling price per bag: $20
- Current monthly output: 7,000 bags

Step 1 — Contribution per unit:

$$\text{Contribution} = \$20 - \$8 = \$12 \text{ per bag}$$

Step 2 — Break-even output:

$$\text{BEP} = \frac{60{,}000}{12} = 5{,}000 \text{ bags per month}$$

Step 3 — Margin of Safety:

$$\text{MoS} = 7{,}000 - 5{,}000 = 2{,}000 \text{ bags}$$

$$\text{MoS\%} = \frac{2{,}000}{7{,}000} \times 100 = 28.6\%$$

Step 4 — Monthly profit at current output:

$$\text{Profit} = \text{MoS} \times \text{Contribution per unit} = 2{,}000 \times \$12 = \$24{,}000$$

Verification: Revenue = $20 × 7,000 = $140,000. Total costs = $60,000 + ($8 × 7,000) = $60,000 + $56,000 = $116,000. Profit = $140,000 – $116,000 = $24,000. ✓

Interpretation: The business must sell at least 5,000 bags per month to cover all costs. It currently sells 7,000 — 2,000 bags above break-even, representing a 28.6% margin of safety. Monthly profit is $24,000. Sales would need to fall by more than 28.6% before the business makes a loss.

The Effect of Changing Variables

IB examiners frequently ask how a change in fixed costs, variable costs, or selling price affects the break-even point. The key relationships are:

Change	Effect on BEP	Visual effect on chart
Fixed costs increase	BEP rises (more units needed to cover higher FC)	FC and TC lines shift upward; BEP moves right
Fixed costs decrease	BEP falls	FC and TC lines shift down; BEP moves left
Variable cost per unit increases	Contribution falls → BEP rises	TC line becomes steeper; BEP moves right
Selling price increases	Contribution rises → BEP falls	Revenue line becomes steeper; BEP moves left
Selling price decreases	Contribution falls → BEP rises	Revenue line becomes less steep; BEP moves right

Limitations of Break-even Analysis in Operations

- **Assumes all output is sold** — in reality, unsold finished goods inventory means revenue does not equal price × output produced
- **Assumes price is constant** — operations managers may need to discount to shift excess stock or respond to competitive pressure
- **Assumes variable costs are perfectly proportional** — economies of scale mean variable costs per unit often fall at higher volumes; bulk purchase discounts also reduce material costs
- **Static model** — the chart reflects one moment in time and cannot capture the dynamic changes in a real production environment
- **Single product assumption** — multi-product factories must allocate fixed costs across product lines, making a simple break-even chart inaccurate

⚠ EXAM ALERT

Break-even calculations appear in almost every IB Business Paper 2 exam. Common calculation errors: (1) using total variable costs instead of VC per unit in the contribution formula; (2) forgetting that the revenue line starts at the origin, not at the FC level; (3) confusing margin of safety (units) with margin of safety percentage. Always show all working steps — method marks are awarded even if the final answer is wrong.

Production Planning

Production planning ensures that the right quantities of the right products are available at the right time, while minimising costs. Two core planning tools are stock control and Gantt charts.

Stock Control

Stock (inventory) is any material or goods held by a business for future use — raw materials, partially completed goods (WIP), and finished goods. Holding stock costs

money (storage, insurance, obsolescence risk), but holding too little stock risks production stoppages or lost sales.

Key Stock Control Concepts

MEMORISE THIS

Stock Control Definitions

- **Maximum stock level** — the largest amount of stock held at any time; constrained by storage space and holding costs
- **Minimum stock level (safety/buffer stock)** — the lowest stock level maintained as a cushion against unexpected demand surges or supply delays; the business will always aim to stay above this level
- **Reorder level** — the stock level at which a new order is placed with a supplier; set above the safety stock to account for lead time
- **Lead time** — the time between placing an order and receiving the delivery; determines how far above safety stock the reorder level must be set
- **Reorder quantity** — the amount ordered each time stock is replenished; chosen to balance holding costs and ordering costs

Formula for reorder level (given constant usage rate):

$$\text{Reorder level} = \text{Safety stock} + (\text{Daily usage} \times \text{Lead time in days})$$

The Stock Control Chart

A stock control chart (also called a stock profile diagram) is a graph showing how stock levels change over time:

- **X-axis:** time (days, weeks, months)
- **Y-axis:** stock level (units)
- The stock level falls in a straight downward slope as stock is consumed at a constant rate
- When stock reaches the **reorder level**, a new order is placed
- After the **lead time** passes, the delivery arrives and stock jumps back up by the reorder quantity
- This creates the characteristic **sawtooth pattern**

Key lines on the chart:

- Maximum stock level (horizontal dashed line at top)
- Minimum/safety stock level (horizontal dashed line at bottom)
- Reorder level (horizontal dashed line in the middle)
- Stock profile (the diagonal sawtooth line)

Economic Order Quantity (EOQ)

The **Economic Order Quantity (EOQ)** is the optimal order size that minimises the total cost of stock management — the combination of **holding costs** (storage, insurance, deterioration — higher for larger order quantities) and **ordering costs** (administrative, delivery costs per order — higher for more frequent, smaller orders).

$$\text{EOQ} = \sqrt{\frac{2 \times \text{Annual demand} \times \text{Ordering cost per order}}{\text{Holding cost per unit per year}}}$$

(Note: IB SL students are not required to calculate EOQ using this formula but should understand the trade-off it resolves.)

As order size increases: holding costs rise (more stock held on average) but ordering costs fall (fewer orders placed per year). The EOQ is the order size at the intersection — the minimum total cost point.

JIT Stock Control vs Buffer Stock

A fundamental operations debate for IB essays:

	Buffer Stock Approach	JIT Approach
Safety stock held	Yes — deliberately maintained above zero	No — target is zero buffer stock
Storage costs	High	Very low
Cash tied up in stock	High	Very low
Supply chain disruption risk	Low — buffer absorbs disruptions	Very high — any disruption stops production
Supplier relationships	Less critical	Critical — suppliers must be reliable and closely integrated
Demand flexibility	Higher — buffer allows quick response	Lower — must forecast demand precisely
Best for	Unpredictable demand; unreliable supply chain	Stable demand; highly reliable, integrated supply chain

IB TIP

When evaluating JIT vs buffer stock in an IB essay, always bring in a real-world example. The COVID-19 pandemic is the most powerful: car manufacturers using JIT (e.g., Toyota, Ford) had to shut assembly lines for weeks or months due to semiconductor shortages, because they held zero buffer stock of chips. This is strong evidence for the buffer stock approach in industries with complex global supply chains.

Gantt Charts

A **Gantt chart** is a horizontal bar chart used to plan and schedule complex projects or production processes. Each task is shown as a bar spanning its planned start date to its planned end date.

Features of a Gantt chart:

- **X-axis:** time (days, weeks, or months)
- **Y-axis:** tasks or activities in the project
- Each **horizontal bar** represents one task; the length of the bar shows the task duration
- Tasks that can be performed simultaneously are shown overlapping on the chart
- **Dependencies** can be shown — some tasks cannot start until another is complete

Advantages:

- Visual, easy to understand at a glance — managers can immediately see project status
- Easy to update as tasks are completed or delayed
- Facilitates resource planning — shows when labour, machinery, and materials are needed simultaneously
- Useful for communicating the project plan to all stakeholders

Disadvantages:

- Does not show task interdependencies or complexity in detail (unlike a Critical Path Analysis network diagram)
- Can become very complex for large projects with hundreds of tasks
- Must be continuously updated to remain useful — static charts quickly become inaccurate

WORKED EXAMPLE

Worked Example — Reading a Gantt Chart

A business is launching a new product in 8 weeks. The project tasks are:

Task	Duration	Starts
Market research	2 weeks	Week 1
Product design	3 weeks	Week 2
Supplier sourcing	2 weeks	Week 3
Trial production run	1 week	Week 5
Marketing campaign design	2 weeks	Week 4
Product launch	1 week	Week 8

From this chart, management can see that market research and product design overlap (research informs design), and that the marketing campaign and trial production run proceed simultaneously in Weeks 4–5, saving time. The longest sequence — market research → product design → supplier sourcing → trial production → launch — determines the earliest possible completion date. (Identifying task dependencies formally requires a Critical Path Analysis network diagram, which is a separate HL tool.)

November 2026 Exam Predictions

Based on recent IB marking schemes and examiner reports, the following topics carry the highest probability of appearing in the November 2026 examination:

Paper 1 (Data response — SL and HL):

- Production method selection with justification for a described business (job vs batch vs flow)
- Break-even calculation from given data: BEP, margin of safety, and profit — full working required
- Quality management distinction: QC vs QA with recommendation
- JIT advantages and disadvantages evaluated for a given business

Paper 2 (Extended response — SL):

- Evaluate the decision to offshore or outsource production, weighing cost savings against quality and reputational risks
- Discuss whether JIT is appropriate for a business facing volatile demand (evaluate supply chain reliability, cost savings, and demand uncertainty)
- Discuss the importance of location for a new business — quantitative and qualitative factors with weighted scoring model
- Compare two production methods for a business context and recommend one

High-yield calculation topics:

- Break-even: BEP, margin of safety (units and percentage), profit calculation — appears on virtually every exam
- Stock control chart reading: identify safety stock, reorder level, lead time from a given chart
- Weighted scoring model: calculate weighted scores and recommend a location

> **IB TIP**
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> For Paper 2 “discuss” or “evaluate” questions on operations, always: (1) define the key concept clearly; (2) analyse advantages of the approach; (3) analyse disadvantages or counterarguments; (4) make a justified recommendation that links to the specific business context in the question. Generic answers that do not reference the case study data will not access the top mark bands.

Practice Questions

The following questions cover all sections of Unit 5. Attempt each before revealing the model answer.

▶ Question 1 — Production Methods: Recommend the most appropriate method (concept + justification)

▶ Question 2 — Break-even: Full calculation with margin of safety (calculation)
▶ Question 3 — JIT vs Buffer Stock: Essay evaluation (evaluation)
▶ Question 4 — Location: Weighted Scoring Model (calculation + evaluation)
▶ Question 5 — Quality Management: QC vs QA recommendation (concept + evaluation)
▶ Question 6 — Break-even Chart: Effect of cost change (concept)
▶ Question 7 — Stock Control: Reading the chart (concept)
▶ Question 8 — Operations Strategy: Evaluate outsourcing (evaluation)