

CAREERS THROUGH MATHS: OPERATIONS ANALYST



JOB DESCRIPTION

An Operations Analyst is a professional who uses data-driven techniques and mathematical modelling to improve the efficiency, productivity, and profitability of an organisation's internal processes. They act as the bridge between raw data and strategic decision-making, turning complex operational challenges into quantifiable and solvable problems. A typical day might involve extracting data from a company's SQL databases, analysing performance metrics in Excel or Python, building a simulation model to test a new warehouse layout, and presenting findings to senior management with clear, actionable recommendations.

The work environment is predominantly office-based, often within a central operations, supply chain, or business improvement team. They are employed across a vast range of UK industries, including the financial services hubs of London and Edinburgh, the manufacturing centres in the Midlands, the thriving retail and e-commerce sectors, and the National Health Service (NHS). For example, an analyst at Tesco might work on optimising delivery routes from regional distribution centres to minimise fuel costs and improve on-time delivery, while one at NHS England might analyse patient flow data to reduce A&E waiting times.

Mathematics is central to the role, providing the rigorous framework for analysis. It moves decision-making from intuition to evidence. An Operations Analyst doesn't just note that a process is slow; they use statistical analysis to identify the bottleneck, calculate its impact on throughput, and model the potential return on investment from proposed solutions. This could involve forecasting demand for a new product line at

Dyson, calculating the optimal number of call centre staff needed by British Telecom to meet service level agreements, or using linear programming to schedule production runs most efficiently at a Jaguar Land Rover factory.

HOW MATHEMATICS IS USED

- **Statistics and Probability:** This is the cornerstone of the role. Analysts use descriptive statistics (mean, median, standard deviation) to summarise operational performance and inferential statistics to make predictions and test hypotheses. For instance, they might conduct hypothesis testing to determine if a new packing process in an ASOS fulfilment centre has genuinely led to a statistically significant reduction in damaged goods. They also use probability distributions to model uncertainty, such as forecasting the likelihood of equipment failure in a National Grid power station to plan preventative maintenance schedules, thereby avoiding costly unplanned outages.
- **Linear Programming and Optimisation:** This area of mathematical programming is used to achieve the best outcome (such as maximum profit or lowest cost) in a mathematical model whose requirements are represented by linear relationships. A classic UK example is in logistics: an analyst for a company like Royal Mail would use linear programming to determine the most efficient routes for its delivery vans, considering constraints like vehicle capacity, driver working hours regulations, and delivery time windows, ultimately minimising total fuel costs and travel time.
- **Calculus:** While often working behind the scenes, calculus is fundamental for understanding rates of change and optimisation in continuous models. An analyst might use differential calculus to find the minimum of a cost function, determining the exact production volume at which a Unilever factory minimises its cost per unit. In supply chain management, integral calculus can be used to calculate total inventory held over a period, which is crucial for working capital analysis and warehousing costs.
- **Queueing Theory:** This is the mathematical study of waiting lines, or queues, and is vital for managing customer-facing services and internal processes. An Operations Analyst at Lloyds Bank might use queueing theory models to analyse customer wait times in call centres or branch networks. By modelling arrival rates

and service times, they can calculate the optimal number of service points (tellers or agents) required to keep wait times within acceptable targets without incurring excessive staff costs.

- **Statistical and Analytical Methods:** Beyond core theory, analysts employ a suite of practical methods. Time series analysis is used for forecasting demand for seasonal products like winter coats at John Lewis. Regression analysis helps identify key drivers of operational performance; for example, modelling how factors like weather, day of the week, and marketing campaigns affect daily passenger numbers on the London Underground. Simulation modelling, using software like Simul8, allows them to create digital twins of complex systems—such as a Heathrow Airport security checkpoint—to test changes and improvements without disrupting real-world operations.

KEY SKILLS & TOOLS

Skill/Tool	Application
Microsoft Excel & VBA	The ubiquitous tool for data manipulation, analysis, and prototyping models. Used for building complex financial models, performing scenario analysis using pivot tables and advanced functions like INDEX-MATCH, and automating routine reports with VBA macros. A UK analyst might use it to create a monthly performance dashboard for a regional sales team.
SQL (Structured Query Language)	Essential for extracting and manipulating large datasets from corporate databases (e.g., Oracle, Microsoft SQL Server). An analyst uses SQL queries to pull specific operational data, such as all customer orders from the last quarter from a retailer's system to analyse sales trends and stock levels.
Python/R for Data Science	Used for advanced statistical analysis, machine learning, and building sophisticated simulation models. In a UK context, an analyst might use Python libraries like Pandas and Scikit-learn to build a predictive model for customer churn for a mobile network like Vodafone, or use R to perform a detailed statistical analysis of clinical trial data for a pharmaceutical company like GSK.

Data Visualisation (Power BI/ Tableau)	Used to translate complex mathematical findings into intuitive, interactive dashboards for non-technical stakeholders. An analyst at HSBC might use Power BI to create a real-time dashboard showing key fraud detection metrics, enabling managers to spot anomalies quickly.
Discrete-Event Simulation Software	Tools like Simul8 or AnyLogic are used to build digital models of complex operational systems. For example, an analyst could simulate the patient journey through an NHS hospital's outpatient department to identify bottlenecks and test the impact of adding more consultation rooms before committing to a costly physical reorganisation.
Stakeholder Communication	The critical skill of explaining complex mathematical concepts and their business implications clearly and persuasively to managers, engineers, and company directors. This involves writing formal reports and delivering presentations that focus on the "so what?"—the business impact of the analytical findings.
Lean Six Sigma Methodology	A structured, data-driven approach to process improvement. Analysts use its mathematical toolkit, such as Statistical Process Control (SPC) charts, to monitor process stability and Measure, Analyse, Improve, Control (DMAIC) cycles to reduce defects and variation in manufacturing or service delivery, aligning with UK industry standards for quality.

Typical Pathway: A strong foundation in Mathematics at GCSE and A-Level (or Scottish Highers) is essential, with Further Mathematics being highly advantageous. The most common entry route is a bachelor's degree in a highly numerate discipline such as Mathematics, Operational Research, Economics, or Industrial Engineering from a UK university. Many top UK firms, including major banks and consultancies, offer structured graduate schemes specifically for Operations Analysts, which provide rotational placements and formal training. Career progression typically leads to senior analyst, operations manager, or specialised roles in data science or consultancy. Gaining professional qualifications, such as becoming a Chartered Mathematician (CMath) through the Institute of Mathematics and its Applications (IMA) or earning a Lean Six Sigma Green or Black Belt certification, significantly enhances career prospects and earning potential in the UK market.

Industry Demand: Demand for Operations Analysts in the UK is strong and growing, driven by the increasing availability of data and a focus on efficiency and cost-saving across all sectors. The UK government's Industrial Strategy highlights the importance

of data analytics and productivity, further fuelling demand. According to the Office for National Statistics (ONS), roles in business and financial project management—which include operations analysis—are projected to grow. Key growth areas include the UK's fintech sector, the digitalisation of the NHS, and complex logistics and supply chain management.

Real-World Impact: Operations Analysts make a tangible difference to the UK's economic competitiveness and public services. They have been instrumental in projects such as optimising the UK's renewable energy supply chain, streamlining parcel sorting and delivery for Royal Mail, and improving the efficiency of the UK's transport networks. By applying mathematical rigour, they help British businesses reduce waste, improve service quality, and make better strategic decisions, contributing directly to productivity growth, cost reduction for consumers, and the effective functioning of critical national infrastructure.