35. Ratio, Proportion and Rates of Change

Assessing the impact of supply chain inflation on smartphone production.

Smartphone production requires a number of key raw materials and components. However, as some of these raw materials and components are only found in a small number of countries or are produced by a handful of companies, they are prone to large price increases during periods of high inflation. You are an apprentice in the finance department of a global smartphone maker and have been tasked with assessing the impact of these price increases on the cost of producing smartphones.

1. Last year, the price of lithium, which is used in smartphone production, was £40/kg. This year, the price of lithium has increased by 10%. Calculate the new price per kilogram of lithium.

New price per kilogram = £40 + (£40 x 0.10) = £44/kg

2. A smartphone manufacturer needs 20g of high-grade glass to make each phone. The cost of high-grade glass was £50/kg last year but has since increased by 15%. Calculate how much it now costs to use high-grade glass in each smartphone.

200g = 20% of 1kg.
20% x £50 = £10 for 200g last year.
£10 + (£10 x 0.15) = £11.50 per smartphone

3. The price of a key component in smartphone production, which accounts for 20% of the total cost of producing a smartphone, has recently increased by 8%. Calculate the percentage increase in the total cost of producing a smartphone due to this component's price increase.

Percentage increase in the total cost = 20% x 8% = 1.6%

4. The price of a critical semiconductor used in smartphone manufacturing was £15 last year. Due to a global shortage of semiconductors, the price is increasing at a rate of 20% each quarter (i.e. a period of three months). Calculate the price of the component if this rate of price increase persists for an entire year.

Price of the component after 1 year = £15 x $(1 + 0.20)^4 \approx$ £31.10

5. A smartphone manufacturer has a profit margin of 30% on each smartphone sold (meaning that for every £1 of sales that the company generates, 30p is profit and 70p is cost). If the total cost of producing a smartphone increased by 12% due to commodity price increases, calculate the new profit margin percentage after the cost increase.

Cost = 70% of the price of a phone

70% x 12% = 8.4% increase in cost

New total cost = 70% + 8.4% = 78.4% of total price

100-78.4 = 21.6% new profit margin

6. The cost of a rare mineral that is used in smartphone batteries has increased by 25% each year for the last three years. If this mineral constituted 10% of the total manufacturing cost of a smartphone three years ago, what is the overall percentage increase in the total manufacturing cost of a smartphone following the price increases of the last three years?

Percentage increase in manufacturing cost due to mineral price increase =
10% x $(1 + 0.25)^3$ = 9.53%

7. The smartphone manufacturer is undertaking a nine-month project to automate its assembly process. The automation project will decrease assembly time by 3.5% each month during its first six months and by 2% each month during its final three months. Assuming that assembly took 12 hours per phone prior to the automation project, how long will assembly take after the project is complete?

Time taken after six months = 12 x 1 ÷ $(1 + 0.035)^6$ = 9.762

After a further three months 9.762 x 1 ÷ $(1 + 0.02)^3$ = 9.2 hours (9 hours and 12 minutes)