

6.2 Modelling applications

Syllabus 2026 - 2028

WHAT YOU NEED TO KNOW

- Computer modelling, including personal finance, bridge and building design, flood water management, traffic management and weather forecasting
- Advantages and disadvantages of using computer modelling rather than humans

What is computer modelling?

A computer model is a program that copies the behaviour of a real system using mathematical rules and data. The user changes variables (for example, the interest rate or the amount of rain) and the computer shows what is likely to happen. This is called a **what-if** analysis or a **simulation**.

- Real data is collected and the rules of the system are decided
- The model is built, usually in a spreadsheet or specialist software
- Different values are entered and the results are examined
- The results are compared with what happens in real life, and the model is improved

Examples of computer modelling

Application	What the model does
Personal finance	A spreadsheet predicts savings, loan repayments and budgets. Changing the income, interest rate or spending shows the effect on the person's finances.
Bridge and building design	Tests how a structure copes with weight, wind and earthquakes before anything is built, so weaknesses can be fixed in the design.
Flood water management	Uses rainfall, river levels and land shape to predict where and when flooding will happen, so barriers can be built and people warned.
Traffic management	Simulates the flow of vehicles to test traffic light timings, new roads and one-way systems before changing the real roads.
Weather forecasting	Data from satellites, weather stations and sensors is fed into powerful computers, which run models to predict temperature, rain and storms.

Computer modelling compared with humans

Advantages	Disadvantages
+ Cheaper and safer: no need to build a real bridge or crash a real car to test it	- The results are only as good as the data and rules in the model
+ Dangerous or extreme situations can be tested safely	- A model cannot include every real-life factor, so results may differ from reality
+ Results are fast and many different options can be tried quickly	- Powerful computers, software and skilled staff are expensive
+ Tests can be repeated as often as needed with different variables	- People may trust the model too much and ignore human judgement
+ Very large amounts of data can be processed accurately	- Models of complicated systems, such as the weather, can be wrong

EXAM TIP

Always link the advantage or disadvantage to the example in the question. For flood management, say that the model can predict flooding without waiting for a real flood, but that it may be wrong if the rainfall data is inaccurate.

Key terms

Term	Meaning
Model	A computer program that copies the behaviour of a real system.
Simulation	Using a model to see what would happen in different situations.
Variable	A value in the model that can be changed, such as the interest rate.
What-if analysis	Changing values in a model to see the effect on the results.