

3.16 Simulations

Name: _____ Class: _____ Date: _____

Total: 8 marks

Objective

Build the skills to answer exam questions on **simulations**.

You must be able to:

- explain how a **simulation** 模拟 models a real-world **phenomenon** 现象
- describe how simulations use **abstraction** to simplify reality
- identify benefits such as lower cost and reduced **risk** 风险
- recognize the **limitations** 局限性 of a simulation

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ What a simulation is

A **simulation** is a program that **models a real-world phenomenon**, using **abstraction** to simplify and represent reality.

■ Benefits

It can be **cheaper** and **safer** than a real trial, and **randomness** can make it more realistic.

■ Limitations

A simulation leaves out detail through its assumptions, so its results may not perfectly match reality.

2 Practice

2.1 Define a simulation.

[1]

2.2 State one benefit of a simulation over a real trial.

[1]

2.3 State one limitation of a simulation. [1]

3 Exam-style questions

3.1 A simulation is a program that [1]

- **A** stores data
 - **B** models a real-world phenomenon
 - **C** compresses files
 - **D** sorts a list
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3.2 One benefit of a simulation is [1]

- **A** more risk
 - **B** lower cost and reduced risk
 - **C** guaranteed perfect accuracy
 - **D** having no assumptions
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3.3 Engineers simulate a bridge design before building it.

(a) State one benefit of doing this. [1]

(b) State how randomness could make the simulation more realistic. [1]

(c) State one limitation of the simulation. [1]

4 Go further

- work through the **3.16 Simulations** lesson on the **Learn** page;
- read the **Algorithms and Programming** section of the AP Computer Science Principles handout on the **Know** page.

Solutions

2.1 a program that models a real-world phenomenon.

2.2 it is cheaper or safer than a real trial.

2.3 it simplifies reality through its assumptions, so it may miss real details.

3.1 B.

3.2 B.

3.3 (a) lower cost or less risk than building and testing a real bridge. (b) it could model varied loads or weather conditions. (c) its simplifying assumptions may leave out real-world factors.