AP STATISTICS • EXERCISE SHEET

# 1.10 The Normal Distribution

Name: _____ Class: _____ Date: _____ **Total: 10 marks**

**KEY WORDS** normal distribution • -score • empirical rule • mean • standard deviation

## Objective

Build the skills to answer exam questions on **the normal distribution**.

**You must be able to:**

- describe the **normal distribution** as a symmetric, bell-shaped model with mean $\mu$ and standard deviation $\sigma$
- apply the **empirical rule** (68–95–99.7)
- calculate a $z$**-score** $z$ and use the standard normal distribution

## 1 Key knowledge and worked examples

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

### The normal distribution

Symmetric and bell-shaped, fully described by its **mean** $\mu$ (center) and **standard deviation** $\sigma$ (spread).

### The empirical rule

For a normal distribution, about **68%** of values lie within $1\sigma$, **95%** within $2\sigma$, and **99.7%** within $3\sigma$ of the mean.

### The z-score

$$z = \frac{x - \mu}{\sigma}$$

gives how many standard deviations $x$ is from the mean. With $\mu = 100$, $\sigma = 15$, $x = 130$: $z = 2$.

## 2 Practice

**2.1** State the three percentages of the empirical rule. [2]

**2.2** A normal distribution has $\mu = 50$, $\sigma = 5$. Find the $z$-score of $x = 60$. [2]

**2.3** State the two parameters that define a normal distribution. [1]

## 3 Exam-style questions

**3.1** The empirical rule says about 95% of data lie within [1]

- **A** 1
- **B** 2
- **C** 3
- **D** 4

standard deviations of the mean.

**3.2** A $z$-score measures [1]

☐ **A** the mean
**B** how many standard deviations a value is from the mean
**C** the median
**D** the range

**3.3** IQ scores are normal with $\mu = 100$ and $\sigma = 15$.

(a) Find the $z$-score for $x = 115$. [2]

(b) State the percentage of scores within 1 standard deviation of the mean. [1]