

## 2.13 Exponential and Logarithmic Equations and Inequalities

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Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 9 marks

### Objective

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Build the skills to answer exam questions on **exponential and logarithmic equations and inequalities**.

You must be able to:

- solve  $b^x = c$  by taking a **logarithm** 对数
- solve  $\log_b(x) = c$  by rewriting in exponential form, and check the **domain** 定义域

### 1 Worked examples

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

#### ■ Solving

- $b^x = c \Rightarrow x = \log_b c$ ;
- $\log_b(x) = c \Rightarrow x = b^c$ .

Always check a log solution lies in the domain (the argument must be  $> 0$ ).

#### ■ Example

$\log_2(x) = 5 \Rightarrow x = 2^5 = 32$  (and  $32 > 0$ , so it is valid).

### 2 Practice

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2.1 Solve  $10^x = 1000$ . [1]

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2.2 Solve  $\log_2(x) = 5$ . [2]

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**2.3** State the domain restriction to check for a log equation. [1]

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### 3 Exam-style questions

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**3.1** To solve  $2^x = 20$ , you take [1]

- **A** log base 2 of both sides
  - **B** the square root
  - **C** the reciprocal
  - **D** nothing
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**3.2** The solution of  $\log_3(x) = 2$  is [1]

- **A** 6
  - **B** 8
  - **C** 9
  - **D** 5
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**3.3** Solve  $\log_5(x) = 3$ .

(a) Rewrite in exponential form. [1]

(b) Evaluate. [1]

(c) Confirm the domain is satisfied. [1]

### 4 Go further

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- work through the **2.13 Exponential and Logarithmic Equations and Inequalities** lesson on the **Learn** page;
- read the **Exponential and Logarithmic Functions** section of the AP Precalculus handout on the **Know** page.

## Solutions

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**2.1**  $x = 3$ .

**2.2**  $x = 2^5 = 32$ .

**2.3** the argument of the log must be positive ( $x > 0$ ).

**3.1** A.

**3.2** C.

**3.3** (a)  $x = 5^3$ . (b) 125. (c)  $125 > 0$ , so it is valid.