

Maths Boot Camp: Session 1 Exercises

The Basics, Functions, and Logarithms

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This sheet collects further practice on Session 1's three blocks: numbers, intervals and sets; operators, expressions, equations and inequalities; and functions. A few of these problems were used as quick checks during the lecture — working through the full set again is good revision either way. Worked solutions are available on request from the author (m.antonetti@lse.ac.uk).

Topic 1: Numbers, Intervals, Sets, Operators

Example 1: Identifying Different Types of Numbers

Problem: Classify the following numbers into natural numbers, integers, rational numbers, and real numbers:

$$\{-3, \frac{5}{2}, 4, \sqrt{2}, 0\}$$

Example 2: Intervals on the Real Line

Problem: Express the following intervals in set notation:

$$(-\infty, 2], \quad [1, 4), \quad (-\infty, \infty)$$

Example 3: Set Operations

Problem: Given sets $A = \{1, 2, 3\}$ and $B = \{3, 4, 5\}$, find the union, intersection, and difference $A - B$.

Topic 2: Operations, Expressions, Equations and Inequalities

Example 1: Evaluating Logarithms

Problem: Evaluate the logarithm $\log_2 8$.

Example 2: Using Logarithm Properties

Problem: Simplify the expression $\log_3(9 \cdot 27)$.

Example 3: Solving Logarithmic Equations

Problem: Solve the equation $\log_5(x - 2) = 3$.

Example 4: Simplifying an Expression

Problem: Simplify the following expression:

$$3(x + 4) - 2(x - 3)$$

Example 5: Evaluating an Expression

Problem: Evaluate the expression $2a^2 - 3ab + b^2$ for $a = 2$ and $b = -1$.

Example 6: Solving a Linear Equation

Problem: Solve the linear equation $4x - 7 = 9$.

Example 7: Solving a Quadratic Equation

Problem: Solve the quadratic equation $x^2 - 4x - 5 = 0$ by factoring.

Example 8: Solving a Simple Inequality

Problem: Solve the inequality $2x - 3 > 7$.

Example 9: Solving a Compound Inequality

Problem: Solve the compound inequality $1 \leq 2x + 3 < 7$.

Topic 3: Functions (Introduction, Inverse, Roots)**Example 1: Evaluating a Function**

Problem: Given the function $f(x) = 2x^2 - 3x + 5$, evaluate $f(2)$.

Example 2: Finding the Roots of a Quadratic Function

Problem: Find the roots of the quadratic function $f(x) = x^2 - 5x + 6$.