

# **BRADLEY'S MATHS**

## **GCSE Higher Level Mathematics**

## **NUMBER**

### **1.1: Natural Numbers and Integers**

**William Bradley**

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#### **Abstract**

This worksheet and answer sheet are, together, a stand alone teaching and learning document aimed directly at the GCSE syllabus item N1 1. order positive and negative integers, decimals and fractions; use the symbols  $=$ ,  $\neq$ ,  $<$ ,  $>$ ,  $\leq$ ,  $\geq$ . NB Decimals and Fractions are dealt with on a later worksheet.

This booklet has been fully updated with our unique colour coded box system to facilitate teaching and learning:

- Violet for Deeper Insights into the subject matter
- Green for Methods and Examples
- Blue for Pro-Tips - how to approach questions
- Yellow for Caution - avoiding common pitfalls
- Cyan for Reminders

The worksheets have been designed with enough space for students to answer the questions directly in the booklet.

### **1.1 NATURAL NUMBERS AND INTEGERS WORKSHEET AND ANSWER SHEET**

# Instructions

- Answer all questions.
  - Show all your working clearly in the spaces provided.
  - The number of marks for each question or part question is shown in brackets [ ].
  - Do not use an electronic calculator for this worksheet.
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## Key Concepts: Natural Numbers and Integers

This worksheet covers the basic number sets used in mathematics, how to order them, and how to perform simple calculations with them. Understanding these core ideas is essential for all the topics that follow.

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### 1. Natural Numbers ( $\mathbb{N}$ )

#### Definition: Natural Numbers

These are the positive whole numbers that you first learned to count with. They are also known as the "counting numbers". The special symbol for this set of numbers is  $\mathbb{N}$ .

$$\mathbb{N} = \{1, 2, 3, 4, 5, \dots\}$$

### 2. Integers ( $\mathbb{Z}$ )

#### Definition: Integers

Integers include all the natural numbers, their negative opposites, and zero. The special symbol for this set of numbers is  $\mathbb{Z}$ .

$$\mathbb{Z} = \{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$$

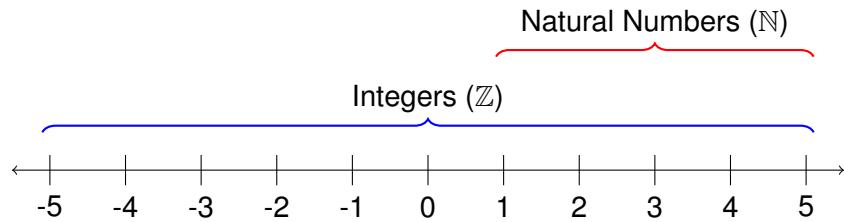
#### Caution: The Role of Zero

A very common point of confusion is zero. Remember:

- Zero **is an integer**.
- Zero **is NOT a natural number**. Natural numbers start from 1.

### 3. Visualising and Ordering Integers on a Number Line

The number line is the most important tool for understanding integers.



### Key Principle: Ordering

When comparing two numbers on the number line, the number on the **right is always greater**.

- Example:  $2 > -3$  because 2 is to the right of -3.
- Example:  $-5 < -1$  because -5 is to the left of -1.

1. From the list below, identify:

$$-5, \quad 7, \quad 0, \quad 1.5, \quad 100, \quad -12, \quad \frac{1}{2}, \quad 3$$

(a) the natural numbers. [1]

(b) the integers. [1]

(c) the numbers that are integers but not natural numbers. [1]

**Total: [3]**

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2. State whether each of the following statements is True (T) or False (F). [1 mark each]

(a)  $-10$  is an integer.

(b)  $0$  is a natural number.

(c) All natural numbers are integers.

(d)  $7.1$  is an integer.

(e) The smallest natural number is  $1$ .

**Total: [5]**

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3. Place the following integers in order, starting with the smallest:

$$-8, \quad 5, \quad 0, \quad -3, \quad 2, \quad -10$$

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**Total: [2]**

4. List all the integers  $x$  such that:

(a)  $-4 < x \leq 1$  [2]

(b)  $0 \leq x < 5$  [2]

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**Total: [4]**

5. Work out the following:

(a)  $5 - 8$  [1]

(b)  $-3 + 10$  [1]

(c)  $-4 - 7$  [1]

(d)  $-6 \times 3$  [1]

(e)  $(-2) \times (-5)$  [1]

(f)  $12 \div (-4)$  [1]

**Total: [6]**

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6. The temperature at midday was  $4^{\circ}\text{C}$ . By midnight, the temperature had dropped by  $9^{\circ}\text{C}$ . What was the temperature at midnight? [1]

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**Total: [1]**

7. A submarine is at a depth of 150 metres below sea level. It rises by 60 metres. What is its new depth relative to sea level? (Represent depth below sea level as a negative integer). [2]

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**Total: [2]**

8. Sarah has \$50 in her bank account. She withdraws \$75. What is her new bank balance? [1]

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**Total: [1]**

9. Find the difference between  $-7$  and  $4$ . [1]

**Total: [1]**

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### End of Worksheet

- 1) a) 3, 7, 100  
b)  $-12, -5, 0, 3, 7, 100$   
c)  $-12, -5, 0$
- 2) a) T  
b) F  
c) T  
d) F  
e) T
- 3)  $-10, -8, -3, 0, 2, 5$
- 4) a)  $-3, -2, -1, 0, 1$   
b)  $0, 1, 2, 3, 4$
- 5)

#### Method: Handling Negative Results

When subtracting a larger number from a smaller one, you can reverse the subtraction and make the result negative. For example:  $a - b = -(b - a)$ .

- a)  $5 - 8 = -(8 - 5)$   
 $= -3$
- b)  $-3 + 10 = 10 - 3$   
 $= 7$
- c)  $-4 - 7 = -(4 + 7)$   
 $= -11$
- d)  $-18$
- e)  $10$
- f)  $-3$
- 6)  $4 - 9 = -(9 - 4)$   
 $= -5^{\circ}\text{C}$

$$7) -150 + 60 = -(150 - 60)$$

$$= -90$$

$$8) 50 - 75 = -(75 - 50)$$

$$= -\text{£}25$$

9)

#### Reminder: The Subtraction Rule

The difference between two numbers is the larger number minus the smaller number. Be careful with the double negative sign.

$$\text{Difference} = 4 - (-7)$$

$$= 4 + 7$$

$$= 11$$

#### Deeper Insight: Difference as Distance on a Number Line

You can also think of the 'difference' as the total distance between the two numbers.

- From  $-7$  to  $0$  is a distance of  $7$  units.
- From  $0$  to  $4$  is a distance of  $4$  units.
- Total Distance =  $7 + 4 = 11$ .