Chapter 5

Positive and negative numbers

Learn the ideas below, follow each worked example, then attempt the practice before checking the answers.

5.1 Directed quantities

A sign gives direction relative to a chosen zero. Positive and negative values can describe temperatures, heights, movements and balances. State what zero and each direction mean in the context. An increase is represented by a positive change and a decrease by a negative change.

Worked example A submarine at −18 m rises 7 m. Its new position is −18 + 7 = −11 m. It is still below sea level, but it is closer to zero.

5.2 Adding signed numbers

To add numbers with the same sign, add their absolute values and keep the sign. With different signs, subtract the smaller absolute value from the larger and keep the sign of the number with larger absolute value. Opposite numbers sum to zero.

Worked example −8 + (−5) = −13. For −8 + 5, subtract 5 from 8 and keep the negative sign, giving −3. Also, −8 + 8 = 0.

5.3 Subtracting signed numbers

Subtracting a number is the same as adding its opposite. Rewrite the subtraction first, then use addition rules. Brackets help separate the operation symbol from a negative sign. On a number line, subtracting a negative moves right.

Worked example 6 − (−4) = 6 + 4 = 10. Also, −3 − 7 = −3 + (−7) = −10, and −3 − (−7) = −3 + 7 = 4.

5.4 Multiplying and dividing signed numbers

For multiplication and division, equal signs give a positive result and different signs give a negative result. Work out the sign separately from the absolute values. A product with an even number of negative factors is positive; an odd number gives a negative product.

Worked example $(-6) \times (-4) = 24$, while $24 \div (-6) = -4$. The product $(-2) \times (-3) \times (-5) = -30$ because it has three negative factors.

5.5 Signs brackets and powers

A negative sign outside brackets applies to the whole bracket. Powers act on their stated base. Brackets determine whether the negative sign is part of that base. Write each stage clearly before combining terms.

Worked example $(-3)^2 = (-3) \times (-3) = 9$. In contrast, $-3^2 = -(3 \times 3) = -9$. Also, $-(5 - 8) = -(-3) = 3$.

Chapter 5 practice

Work in your notebook. Show your method and include units where needed.

1. Calculate −14 + 9.
2. Calculate −5 − (−12).
3. Calculate (−7) × 8.
4. Calculate (−48) ÷ (−6).
5. A temperature rises from −6°C to 4°C. Find the rise.

Answers with methods

1. The absolute values differ by 5, and −14 has the larger absolute value, so the answer is −5.

2. −5 + 12 = 7.

3. Different signs give a negative result: −56.

4. Equal signs give a positive result: 8.

5. 4 − (−6) = 10°C.

Common mistake to avoid

The rule about equal signs applies to multiplication and division. It does not mean that adding two negatives makes a positive.