

GCSE MATHS

Number essentials

Long workbook

Questions on GCSE Maths topics, including challenges beyond typical exam questions.

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Topic recap

Place value

Each place is ten times the value of the place to its right. Compare negative numbers by their positions on a number line.

Inverse operations

Addition and subtraction undo each other; multiplication and division undo each other. Keep signs attached to their numbers.

Operation order

Evaluate brackets, then powers, then multiplication and division from left to right, then addition and subtraction from left to right.

Rounding

For significant figures, start at the first non-zero digit. Keep extra digits until the final answer.

Work without a calculator. Use one afterwards to check your calculations.

1. Place value and ordering

Example Problem 1

★

Put -0.6 , -0.06 , 0.006 , -0.16 in ascending order.

The idea

1. Among negative numbers, the number farther to the left on the number line is smaller.

Worked Solution

$$-0.6 < -0.16 < -0.06 < 0.006$$

Start with the number furthest left on a number line.

1 Place value and ordering

**

Q1 The digits 7 and 2 in 5.072 are swapped. Does the number increase or decrease, and by how much?

**

Q2 Work out 0.0048×1000 .

*

Q3 Put -3.2 , -3.02 , -3.12 , -2.99 in ascending order.

*

Q4 Find the number halfway between -4.8 and 1.6 .

**

Q5 Use each digit 0, 2, 5 and 7 once to make the smallest four-digit number.

**

Q6 Use the digits 0, 2, 4 and 7 once each to fill $\square.\square\square\square$. Find the greatest number less than 2 that you can make.

**

2. Arithmetic and signed numbers

Example Problem 2

**

Calculate $4.8 \div 0.06$.

The idea

1. Multiply both numbers by 100 to make the divisor an integer.

Worked Solution

$$4.8/0.06 = 480/6$$

The quotient does not change when both values are scaled equally.

$$480/6 = 80$$

Divide.

2 Arithmetic and signed numbers

**

Q7 Calculate $7.06 - 2.875$.

*

Q8 Calculate 3.6×0.45 .

**

Q9 Calculate $5.04 \div 0.07$.

**

Q10 The temperature is -7° Celsius and rises by 12° . Find the new temperature.

*

Q11 Calculate $-18 - (-7) + (-5)$.

**

Q12 A lift starts on floor -3 , rises 8 floors, then drops 11 floors. On which floor does it finish?

**

3. Powers, roots and operation order

Example Problem 3

**

Calculate $18 - 2(3^2 - 5)$.

The idea

1. Evaluate the power inside the brackets before multiplying.

Worked Solution

$$3^2 - 5 = 9 - 5 = 4$$

Complete the brackets.

$$18 - 2(4) = 18 - 8 = 10$$

Multiply, then subtract.

3 Powers, roots and operation order

Q13 Calculate $(-4)^2 - 4^2$.

**

Q14 Calculate $-3^2 + (-3)^3$.

**

Q15 Calculate $\sqrt{196} + \sqrt[3]{-125}$.

**

Q16 Calculate $48 \div 6 \times 2 + 3^2$.

**

Q17 Insert one pair of brackets into $18 - 6 \div 3$ to make the answer 4.

Q18 Find the smallest positive integer n for which $n^2 > 150$.

4. Rounding and estimation

Example Problem 4

**

Estimate $\frac{19.8 \times 4.12}{0.51}$ by rounding each number to 1 significant figure.

The idea

1. Round every given number before calculating the estimate.

Worked Solution

$$19.8 \approx 20$$

$$4.12 \approx 4$$

$$0.51 \approx 0.5$$

$$\frac{20 \times 4}{0.5} = 160$$

Round to 1 significant figure.

Dividing by one half doubles the numerator.

4 Rounding and estimation

Q19 Round 0.007846 to 2 significant figures.

*

Q20 Round 39,950 to 2 significant figures.

**

Q21 Estimate $\frac{39.7 \times 0.203}{1.96}$ using 1 significant figure for each number.

**

Q22 A whole number rounds to 480 to the nearest ten and to 500 to the nearest hundred. Find the greatest possible number.

Q23 187 pupils need transport. Each minibus holds 16 pupils. Find the minimum number of minibuses.

**

Q24 Two positive integers differ by 1. Their product is greater than 200 but less than 240. Find the integers.

Solving principles

1. Estimate first

Use rounded numbers to predict the size and sign of an answer.

2. Check with an inverse

Multiply back after division or add back after subtraction.

3. Keep the place value

Write decimal points in a column for addition or subtraction.

4. Test the boundary

For a greatest or least integer, check the neighbouring integer.