

# Negative Numbers

## Solutions

For AQA GCSE Mathematics (8300) • Foundation tier

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Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

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**1** (5 marks)

Work out

(a)  $-3 + 8$

Start at  $-3$  on a number line.

Adding 8 means move 8 to the right.

$-3 \rightarrow 0$  is 3 steps, then 5 more steps takes you to 5.

**Answer:** 5

(b)  $-4 - 6$

Start at  $-4$  on a number line.

Subtracting 6 means move 6 to the left.

You end up at  $-10$ .

**Answer:**  $-10$

(c)  $5 - (-2)$

Subtracting a negative is the same as adding.

$$\text{So } 5 - (-2) = 5 + 2$$

$$= 7$$

**Answer:** 7

(d)  $-6 \times -4$

First multiply the numbers:  $6 \times 4 = 24$

Then the sign: negative  $\times$  negative = positive.

**Answer:** 24

(e)  $-20 \div 5$

First divide the numbers:  $20 \div 5 = 4$

Then the sign: negative  $\div$  positive = negative.

**Answer:**  $-4$

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**2** (1 mark)

Circle the lowest of these temperatures.

Options:  $-3.5^{\circ}\text{C}$ ,  $0.2^{\circ}\text{C}$ ,  $-6^{\circ}\text{C}$ ,  $-0.8^{\circ}\text{C}$

The lowest temperature is the one furthest below zero.

In order:  $-6 < -3.5 < -0.8 < 0.2$

So  $-6^{\circ}\text{C}$  is the lowest.

**Answer:**  $-6^{\circ}\text{C}$

**Tip:** For negative numbers, the bigger the number after the minus sign, the colder it is.  $-6$  is colder than  $-0.8$ .

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**3** (1 mark)

The temperature was  $-11^{\circ}\text{C}$  and **increases** by  $5^{\circ}\text{C}$ .

Work out the new temperature.

“Increases” means add, so move up (to the right) on a number line.

$$-11 + 5 = -6$$

**Answer:**  $-6^{\circ}\text{C}$

**Tip:** When the temperature goes up from  $-11$ , it gets closer to zero. Common wrong answers are  $-16$  and  $6$ .

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**4** (1 mark)

Circle the answer to  $-3 \times 5$

Options: 15,  $-15$ ,  $-8$ , 2

First multiply the numbers:  $3 \times 5 = 15$

Then the sign: negative  $\times$  positive = negative.

**Answer:**  $-15$

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**5** (2 marks)

The table shows the temperature in two cities.

| City   | Temperature          |
|--------|----------------------|
| Moscow | $-9^{\circ}\text{C}$ |
| Cairo  | $24^{\circ}\text{C}$ |

Work out the difference in temperature between Moscow and Cairo.

Difference = higher temperature  $-$  lower temperature.

$$24 - (-9) = 24 + 9$$

$$= 33$$

Or on a number line: 9 degrees up to 0, then 24 more up to 24.  $9 + 24 = 33$

**Answer:**  $33^{\circ}\text{C}$

**Tip:** The difference between a negative and a positive temperature means you go through zero.  
So you add:  $9 + 24$ , not  $24 - 9$ .

*Marks:* 1 mark for  $24 - (-9)$  or  $24 + 9$ . 1 mark for 33.

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**6** (1 mark)

Write these temperatures in order, starting with the coldest.

$3^{\circ}\text{C}$     $-8^{\circ}\text{C}$     $-2^{\circ}\text{C}$     $0^{\circ}\text{C}$     $-12^{\circ}\text{C}$

The coldest is the furthest left on a number line.

$-12$  is the coldest, then  $-8$ , then  $-2$ .

Then 0, then 3.

**Answer:**  $-12, -8, -2, 0, 3$

**Tip:** Check which end the question asks you to start from, and check you have used every number once.

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**7** (2 marks)

$$a = -3 \quad b = 4$$

Work out the value of  $-ab$

$ab$  means  $a \times b$ .

$$ab = (-3) \times 4 = -12$$

$-ab$  means the negative of  $ab$ .

$$-ab = -(-12) = 12$$

**Answer:** 12

**Tip:** Put negative numbers in brackets when you substitute, e.g.  $(-3) \times 4$ . Then deal with the extra minus sign at the end.

*Marks:* 1 mark for  $ab = -12$ . 1 mark for 12.

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**8** (1 mark)

Work out the missing number.

$$-7 - \boxed{\phantom{00}} = 2$$

To get from  $-7$  up to 2 you must add 9.

Subtracting a negative is the same as adding.

So the box is  $-9$ .

Check:  $-7 - (-9) = -7 + 9 = 2$  ✓

**Answer:**  $-9$

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**9** (2 marks)

Write a number in each box to make the calculation correct.

(a)  $-4 \times \boxed{\phantom{00}} = 28$

$4 \times 7 = 28$ , so the number part is 7.

The answer 28 is positive, and  $-4$  is negative.

Negative  $\times$  negative = positive, so the box must be negative.

Check:  $-4 \times (-7) = 28$  ✓

**Answer:**  $-7$

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(b)   $\div (-3) = 5$

Use the inverse: box =  $5 \times (-3)$

$$5 \times (-3) = -15$$

Check:  $-15 \div (-3) = 5$  ✓

**Answer:** -15

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**10** (2 marks)

Work out  $(-3)^2 \times (-2)$

Do the power first.

$$(-3)^2 = (-3) \times (-3) = 9$$

Then multiply:  $9 \times (-2) = -18$

**Answer:** -18

**Tip:** The square of a negative number is positive:  $(-3)^2 = 9$ , not  $-9$ .

*Marks:* 1 mark for 9. 1 mark for -18.

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**11** (1 mark)

Luke says,

‘When you add a negative number and a positive number, the answer is always negative.’

Is Luke correct? Tick a box.

Give an example to support your answer.

Try some examples.

$$-5 + 3 = -2, \text{ which is negative.}$$

But  $-2 + 5 = 3$ , which is positive.

So the answer is not always negative. Luke is wrong.

**Answer:** No, e.g.  $-2 + 5 = 3$

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**12** (2 marks)

The temperatures at midnight on four nights were  $-4^{\circ}\text{C}$ ,  $2^{\circ}\text{C}$ ,  $-7^{\circ}\text{C}$ ,  $1^{\circ}\text{C}$

Work out the mean temperature.

Mean = total  $\div$  number of values.

Total:  $-4 + 2 + (-7) + 1$

$$-4 + 2 = -2$$

$$-2 - 7 = -9$$

$$-9 + 1 = -8$$

$$\text{Mean: } -8 \div 4 = -2$$

**Answer:**  $-2^{\circ}\text{C}$

Marks: 1 mark for the total,  $-8$ . 1 mark for  $-2$ .

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**13** (2 marks)

Here is a list of six numbers.

$-8$      $-3$      $-1$      $2$      $5$      $9$

Use two numbers from the list to complete each statement.

Two numbers that add to make  $-4$  are \_\_\_\_\_ and \_\_\_\_\_

Two numbers that multiply to make 24 are \_\_\_\_\_ and \_\_\_\_\_

Add to make  $-4$ :

$$-3 + (-1) = -4 \quad \checkmark$$

Multiply to make 24:

No two positive numbers in the list multiply to make 24.

But negative  $\times$  negative = positive, and  $8 \times 3 = 24$ .

So  $-8 \times (-3) = 24$  ✓

**Answer:**  $-3$  and  $-1$ ;  $-8$  and  $-3$

*Marks:* 1 mark for each correct pair.

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