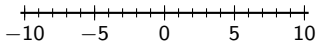


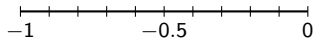
Negative Numbers, Powers & BIDMAS: Retrieve and Connects

Retrieve and Connect: Ordering Negative Numbers

Number line A



Number line B



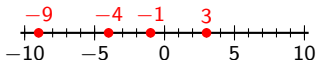
Bus stop for Q3

$$8 \overline{) 7.000}$$

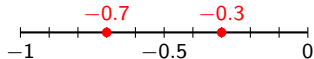
1. 3.8×100
2. $45 \div 1000$
3. Complete the bus stop division to write $\frac{7}{8}$ as a decimal.
4. At midday it is -4°C in Oslo, -9°C in Moscow, 3°C in London and -1°C in Reykjavík. Mark these on number line A. Write them in order, coldest first.
Write $<$ or $>$ in each box.
5. $-9 \square -4$
6. $-1 \square -10$
7. $0 \square -0.5$
8. How many degrees warmer is London than Moscow?
9. Mark -0.3 and -0.7 on number line B. Which is greater?
10. Round -4.7 to the nearest integer.
11. Round -1.46 to 1 decimal place.
12. (Challenge) List the integers n with $-3 < n \leq 1$.

Retrieve and Connect: Ordering Negative Numbers

Number line A



Number line B



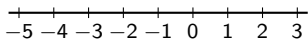
Bus stop for Q3

$$\begin{array}{r} 0.875 \\ 8 \overline{) 7.706040} \end{array}$$

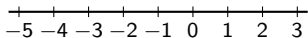
- $3.8 \times 100 = 380$
- $45 \div 1000 = 0.045$
- Complete the bus stop division to write $\frac{7}{8}$ as a decimal. 0.875
- At midday it is -4°C in Oslo, -9°C in Moscow, 3°C in London and -1°C in Reykjavík. Mark these on number line A. Write them in order, coldest first. $-9, -4, -1, 3$
Write $<$ or $>$ in each box.
- $-9 < -4$
- $-1 > -10$
- $0 > -0.5$
- How many degrees warmer is London than Moscow? 12 degrees
- Mark -0.3 and -0.7 on number line B. Which is greater? -0.3 , because it is further right
- Round -4.7 to the nearest integer. -5
- Round -1.46 to 1 decimal place. -1.5
- (Challenge) List the integers n with $-3 < n \leq 1$. $-2, -1, 0, 1$

Retrieve and Connect: Adding & Subtracting Across Zero

Number line A



Number line B



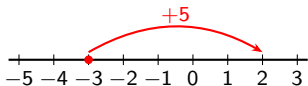
Bus stop for Q3

$$\begin{array}{r} 3 \overline{) 2.0000} \end{array}$$

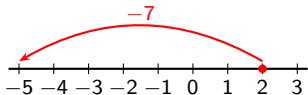
1. $12.4 - 3.75$
 2. Round 6.349 to 1 decimal place.
 3. Complete the bus stop division for $2 \div 3$. What do you notice? Write the answer with a recurring dot, and to 2 decimal places.
 4. Work out $-3 + 5$ by drawing the jump on number line A.
 5. Work out $2 - 7$ by drawing the jump on number line B.
 6. $-6 + 4$
 7. $-2 - 5$
 8. $-8 + 8$
 9. The temperature is -4°C . It rises by 7 degrees, then falls by 10 degrees. What is the temperature now?
 10. Amir has £3.50 in his bank account. He spends £5.20. What is his balance now?
 11. $-2.5 + 1.2$
 12. $-0.6 - 0.8$
- (Challenge) Find the missing numbers.
13. $-3 + \square = 4.5$
 14. $\square - 6 = -2$

Retrieve and Connect: Adding & Subtracting Across Zero

Number line A



Number line B



Bus stop for Q3

$$\begin{array}{r} 0.6666\dots \\ 3 \overline{) 2.202020} \end{array}$$

1. $12.4 - 3.75 = 8.65$
2. Round 6.349 to 1 decimal place. 6.3
3. Complete the bus stop division for $2 \div 3$. What do you notice? Write the answer with a recurring dot, and to 2 decimal places. **The remainder is always 2.** $0.\dot{6} \approx 0.67$
4. Work out $-3 + 5$ by drawing the jump on number line A. 2
5. Work out $2 - 7$ by drawing the jump on number line B. -5
6. $-6 + 4 = -2$
7. $-2 - 5 = -7$
8. $-8 + 8 = 0$
9. The temperature is -4°C . It rises by 7 degrees, then falls by 10 degrees. What is the temperature now? $-4 + 7 - 10 = -7$, so -7°C
10. Amir has £3.50 in his bank account. He spends £5.20. What is his balance now?
 $5.20 - 3.50 = 1.70$, so his balance is $-\text{£}1.70$
11. $-2.5 + 1.2 = -1.3$
12. $-0.6 - 0.8 = -1.4$
- (Challenge) Find the missing numbers.
13. $-3 + 7.5 = 4.5$
14. $4 - 6 = -2$

Retrieve and Connect: Adding & Subtracting Negatives

Three baguettes



Pattern for Q4

$$5 - 2 = 3$$

$$5 - 1 = \boxed{}$$

$$5 - 0 = \boxed{}$$

$$5 - (-1) = \boxed{}$$

$$5 - (-2) = \boxed{}$$

1. $-4 + 9$

2. $-4 - 9$

3. $6.05 - 2.8$

4. Complete the pattern on the left. What is subtracting -1 the same as?

5. $6 + (-4)$

6. $-3 - (-8)$

7. It is 5°C at the foot of a mountain and -12°C at the top. How much colder is the top? Write this as a subtraction.

8. Three baguettes are shared equally between teachers A, B, C and D. Show on the diagram how to cut them. What fraction of a baguette does each teacher get?

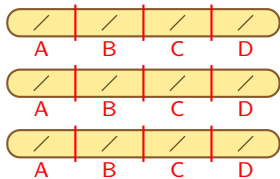
9. Write $3 \div 4$ as a fraction.

10. Write $3 \div 4$ as a decimal.

11. (Challenge) Seven baguettes are shared equally between three teachers. Write each share as a division, a fraction and a recurring decimal.

Retrieve and Connect: Adding & Subtracting Negatives

Three baguettes



Pattern for Q4

$$5 - 2 = 3$$

$$5 - 1 = 4$$

$$5 - 0 = 5$$

$$5 - (-1) = 6$$

$$5 - (-2) = 7$$

1. $-4 + 9 = 5$ 2. $-4 - 9 = -13$ 3. $6.05 - 2.8 = 3.25$

4. Complete the pattern on the left. What is subtracting -1 the same as? **Adding 1**

5. $6 + (-4) = 6 - 4 = 2$ 6. $-3 - (-8) = -3 + 8 = 5$

7. It is 5°C at the foot of a mountain and -12°C at the top. How much colder is the top? Write this as a subtraction. **$5 - (-12) = 17$ degrees**

8. Three baguettes are shared equally between teachers A, B, C and D. Show on the diagram how to cut them. What fraction of a baguette does each teacher get? **Three quarters of a baguette**

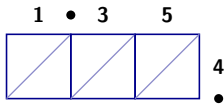
9. Write $3 \div 4$ as a fraction. **$\frac{3}{4}$** 10. Write $3 \div 4$ as a decimal. **0.75**

11. (Challenge) Seven baguettes are shared equally between three teachers. Write each share as a division, a fraction and a recurring decimal.

$$7 \div 3 = \frac{7}{3} = 2.\dot{3}$$

Retrieve and Connect: Multiplying & Dividing Negatives

Lattice for Q9



or

Scaling to whole numbers

$$1.35 \times 100 = 135$$

$$135 \times 4 = \boxed{}$$

We multiplied by 100, so

$$1.35 \times 4 = \boxed{}$$

Pattern for Q4

$$(-3) \times 2 = -6$$

$$(-3) \times 1 = -3$$

$$(-3) \times 0 = \boxed{}$$

$$(-3) \times (-1) = \boxed{}$$

$$(-3) \times (-2) = \boxed{}$$

1. $-7 + 3$

2. $4 - (-6)$

3. Use bus stop division to work out $5 \div 6$.

4. Complete the pattern on the left. Is a negative number multiplied by a negative number positive or negative?

5. $5 \times (-4)$

6. $(-6) \times (-3)$

7. $-20 \div 5$

8. $-18 \div (-2)$

9. Find the cost of 4 baguettes at £1.35 each. Use one of the two methods on the left.

10. The staff room fund has £5.00, and pays for the four baguettes. What is its balance now?

11. $-4.8 \div 0.6 = \frac{-4.8}{0.6} = \frac{-4.8 \times 10}{0.6 \times 10} = \frac{\boxed{}}{\boxed{}} = \boxed{}$

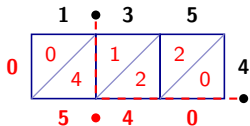
(Challenge)

12. $(-0.3) \times (-0.4)$

13. $-1.2 \div (-0.04)$

Retrieve and Connect: Multiplying & Dividing Negatives

Lattice for Q9



or

Scaling to whole numbers

$$1.35 \times 100 = 135$$

$$135 \times 4 = 540$$

We multiplied by 100, so

$$1.35 \times 4 = 5.40$$

Pattern for Q4

$$(-3) \times 2 = -6$$

$$(-3) \times 1 = -3$$

$$(-3) \times 0 = 0$$

$$(-3) \times (-1) = 3$$

$$(-3) \times (-2) = 6$$

$$1. -7 + 3 = -4$$

$$2. 4 - (-6) = 10$$

$$3. \text{ Use bus stop division to work out } 5 \div 6. 0.8\bar{3}$$

$$4. \text{ Complete the pattern on the left. Is a negative number multiplied by a negative number positive or negative? Positive}$$

$$5. 5 \times (-4) = -20$$

$$6. (-6) \times (-3) = 18$$

$$7. -20 \div 5 = -4$$

$$8. -18 \div (-2) = 9$$

$$9. \text{ Find the cost of 4 baguettes at } \pounds 1.35 \text{ each. Use one of the two methods on the left. } \pounds 5.40$$

$$10. \text{ The staff room fund has } \pounds 5.00, \text{ and pays for the four baguettes. What is its balance now?}$$

$$5.00 - 5.40 = -0.40, \text{ so } -\pounds 0.40$$

$$11. -4.8 \div 0.6 = \frac{-4.8}{0.6} = \frac{-4.8 \times 10}{0.6 \times 10} = \frac{-48}{6} = -8$$

(Challenge)

$$12. (-0.3) \times (-0.4) = 0.12$$

$$13. -1.2 \div (-0.04) = \frac{-120}{-4} = 30$$

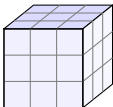
Retrieve and Connect: Squares, Cubes & Roots

Square A



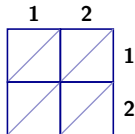
?

Cube B



3 cm

Lattice for Q10



1

2

or

Scaling to whole numbers

$$1.2 \times 10 = 12$$

$$12 \times 12 = \boxed{}$$

We multiplied by 10×10 , so

$$1.2^2 = \boxed{}$$

1. $(-4) \times (-5)$
2. $-24 \div 6$
3. Round 7.482 to 1 d.p.
4. Square A has area 49 cm^2 . Find its side length, using $\sqrt{}$.
5. Cube B is made of centimetre cubes. Find its volume, written as a power.
6. 6^2
7. 4^3
8. $\sqrt{81}$
9. $\sqrt[3]{1000}$
10. Work out $1.2^2 = 1.2 \times 1.2$ using one method on the left. On the lattice, mark the decimal points yourself.
11. $(-3)^2$
12. $(-2)^3$
13. (Challenge) Find two numbers whose square is 64.
14. (Challenge) Is there a number whose square is -64 ?

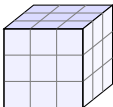
Retrieve and Connect: Squares, Cubes & Roots

Square A



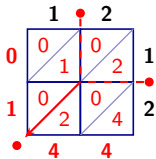
7 cm

Cube B



3 cm

Lattice for Q10



or

Scaling to whole numbers

$$1.2 \times 10 = 12$$

$$12 \times 12 = 144$$

We multiplied by 10×10 , so

$$1.2^2 = 1.44$$

$$1. (-4) \times (-5) = 20 \quad 2. -24 \div 6 = -4 \quad 3. \text{Round } 7.482 \text{ to 1 d.p. } 7.5$$

$$4. \text{ Square A has area } 49 \text{ cm}^2. \text{ Find its side length, using } \sqrt{}. \sqrt{49} = 7 \text{ cm}$$

$$5. \text{ Cube B is made of centimetre cubes. Find its volume, written as a power. } 3^3 = 27 \text{ cm}^3$$

$$6. 6^2 = 36 \quad 7. 4^3 = 64 \quad 8. \sqrt{81} = 9 \quad 9. \sqrt[3]{1000} = 10$$

$$10. \text{ Work out } 1.2^2 = 1.2 \times 1.2 \text{ using one method on the left. On the lattice, mark the decimal points yourself. } 1.44$$

$$11. (-3)^2 = 9$$

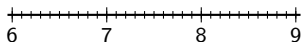
$$12. (-2)^3 = -8$$

$$13. (\text{Challenge}) \text{ Find two numbers whose square is } 64. \text{ } 8 \text{ and } -8$$

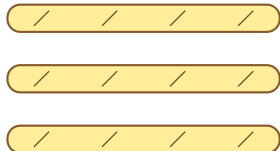
$$14. (\text{Challenge}) \text{ Is there a number whose square is } -64? \text{ No: a square is never negative.}$$

Retrieve and Connect: Powers & Estimating Roots

Number line A



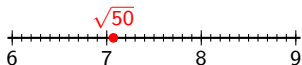
Three baguettes



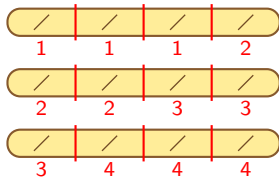
1. 7^2
2. $\sqrt{144}$
3. $-2.4 + 5$
4. $-3 \times (-1.5)$
5. Write $2 \times 2 \times 2 \times 2 \times 2$ as a power, and work it out.
Write $<$ or $>$ between 2^5 and 5^2 .
6. 10^4
7. 3.7×10^3
8. Complete $\square < \sqrt{50} < \square$, and mark $\sqrt{50}$ on number line A.
9. 0.7^2
10. $\sqrt{0.49}$
11. Each teacher eats 0.75 of a baguette. Show on the diagram how many teachers 3 baguettes can feed.
$$3 \div 0.75 = \frac{3}{0.75} = \frac{\square}{\square} = \square$$
12. (Challenge) A baguette is 0.6 m long. Each teacher's portion is 0.15 m long. How many portions can be cut from 3 baguettes?

Retrieve and Connect: Powers & Estimating Roots

Number line A



Three baguettes



1. $7^2 = 49$
2. $\sqrt{144} = 12$
3. $-2.4 + 5 = 2.6$
4. $-3 \times (-1.5) = 4.5$
5. Write $2 \times 2 \times 2 \times 2 \times 2$ as a power, and work it out.
Write $<$ or $>$ between 2^5 and 5^2 . $2^5 = 32 > 25$
6. $10^4 = 10\,000$
7. $3.7 \times 10^3 = 3700$
8. Complete $7 < \sqrt{50} < 8$, and mark $\sqrt{50}$ on number line A. Just above 7, as 50 is near 49
9. $0.7^2 = 0.49$
10. $\sqrt{0.49} = 0.7$
11. Each teacher eats 0.75 of a baguette. Show on the diagram how many teachers 3 baguettes can feed.
$$3 \div 0.75 = \frac{3}{0.75} = \frac{300}{75} = 4$$
12. (Challenge) A baguette is 0.6 m long. Each teacher's portion is 0.15 m long. How many portions can be cut from 3 baguettes?
$$0.6 \div 0.15 = \frac{60}{15} = 4; \quad 3 \times 4 = 12 \text{ portions}$$

Retrieve and Connect: BIDMAS

Receipt

Staff Room Café	
3 baguettes	£1.20 each
2 coffees	£2.45 each
Total	£ ?

- $4^2 - \sqrt{9}$
- $(-12) \div 2 \times 3$
- $3 + 4 \times 5$
- $(3 + 4) \times 5$
- $20 - 12 \div 3$
- $(20 - 12) \div 3$, as a recurring decimal
- $\frac{18 + 6}{4}$
- $18 + 6 \div 4$
- Three teachers buy the items on the receipt. Write one calculation for the total cost, and work it out.
- They share the cost equally. Write one calculation, with brackets, for each share, to the nearest penny.

(Challenge) Put brackets into $2 + 6 \times 5 - 3$ to make each number.
- 16
- 37

Retrieve and Connect: BIDMAS

Receipt

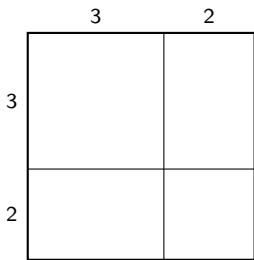
Staff Room Café	
3 baguettes	£1.20 each
2 coffees	£2.45 each

Total	£8.50

- $4^2 - \sqrt{9}$
 $= 16 - 3 = 13$
- $(-12) \div 2 \times 3$
 $= -6 \times 3 = -18$
- $3 + 4 \times 5$
 $= 3 + 20 = 23$
- $(3 + 4) \times 5$
 $= 7 \times 5 = 35$
- $20 - 12 \div 3$
 $= 20 - 4 = 16$
- $(20 - 12) \div 3$, as a recurring decimal
 $= 8 \div 3 = 2.\dot{6}$
- $\frac{18 + 6}{4} = \frac{24}{4} = 6$
- $18 + 6 \div 4$
 $= 18 + 1.5 = 19.5$
- Three teachers buy the items on the receipt. Write one calculation for the total cost, and work it out.
 $3 \times 1.20 + 2 \times 2.45 = 3.60 + 4.90 = \text{£}8.50$
- They share the cost equally. Write one calculation, with brackets, for each share, to the nearest penny.
 $(3 \times 1.20 + 2 \times 2.45) \div 3 = 2.833... \approx \text{£}2.83$
(Challenge) Put brackets into $2 + 6 \times 5 - 3$ to make each number.
- 16 $(2 + 6) \times (5 - 3)$ 12. 37 $(2 + 6) \times 5 - 3$

Retrieve and Connect: BIDMAS with Powers & Negatives

Square with side $3 + 2$



1. $5 + 3 \times 2.5$

2. $\sqrt{64} - 2^3$

3. -3^2

4. $(-3)^2$

5. Explain why your answers to Q3 and Q4 are different.

6. 2×5^2

7. $(2 \times 5)^2$

8. $(3 + 2)^2$

9. $3^2 + 2^2$

10. Use the diagram to explain why your answers to Q8 and Q9 are different.

11. $\frac{4^2 + 2^3}{-9}$, as a recurring decimal

12. $\sqrt{36 + 64}$

13. $\sqrt{36} + \sqrt{64}$

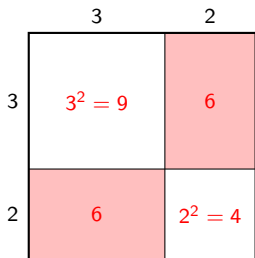
(Challenge) Use 2, 3 and 4 once each, with any operations, powers or brackets, to make each number.

14. -10

15. 36

Retrieve and Connect: BIDMAS with Powers & Negatives

Square with side $3 + 2$



- $5 + 3 \times 2.5 = 5 + 7.5 = 12.5$
 - $\sqrt{64} - 2^3 = 8 - 8 = 0$
 - $-3^2 = -9$
 - $(-3)^2 = 9$
 - Explain why your answers to Q3 and Q4 are different. In -3^2 only the 3 is squared.
 - $2 \times 5^2 = 2 \times 25 = 50$
 - $(2 \times 5)^2 = 10^2 = 100$
 - $(3 + 2)^2 = 25$
 - $3^2 + 2^2 = 13$
 - Use the diagram to explain why your answers to Q8 and Q9 are different. $3^2 + 2^2$ leaves out the two 3×2 rectangles.
 - $\frac{4^2 + 2^3}{-9}$, as a recurring decimal $= \frac{24}{-9} = -2.\dot{6}$
 - $\sqrt{36 + 64} = \sqrt{100} = 10$
 - $\sqrt{36} + \sqrt{64} = 6 + 8 = 14$
- (Challenge) Use 2, 3 and 4 once each, with any operations, powers or brackets, to make each number.
- 10 for example $2 - 3 \times 4$
 - 36 for example $3^2 \times 4$