

## Number Sense: Starters

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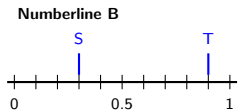
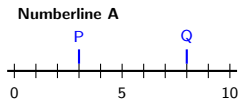
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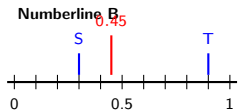
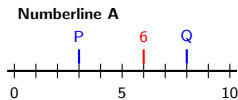
# Starter 1



|     |    |   |   |     |      |
|-----|----|---|---|-----|------|
| 100 | 10 | 1 | . | 0.1 | 0.01 |
| 4   | 0  | 7 | . | 5   | 2    |

1. On numberline A what numbers are marked by  $P$  and  $Q$ ?
2. On numberline B what numbers are marked by  $S$  and  $T$ ?
3. Mark 6 on Line A and 0.45 on Line B.
4. Sam says  $P = 4$ , as it is the 4th mark. What has he done wrong?
5. The chart shows 407.52. What is the 4 worth? And the 5?
6. Work out  $407.52 \times 10$  and  $407.52 \div 10$ .
7. A numberline goes 3.6 to 3.7 in 10 equal steps. What is 3 steps along from 3.6?
8. Use 7, 5, 4, 2 and a decimal point to make the largest number less than 100.

# Starter 1



|     |    |   |   |     |      |
|-----|----|---|---|-----|------|
| 100 | 10 | 1 | . | 0.1 | 0.01 |
| 4   | 0  | 7 | . | 5   | 2    |

- On numberline A what numbers are marked by  $P$  and  $Q$ ? **3 and 8**
- On numberline B what numbers are marked by  $S$  and  $T$ ? **0.3 and 0.9**
- Mark 6 on Line A and 0.45 on Line B.
- Sam says  $P = 4$ , as it is the 4th mark. What has he done wrong? **Counted marks, not steps:  $P = 3$**
- The chart shows 407.52. What is the 4 worth? And the 5? **400 and 0.5**
- Work out  $407.52 \times 10$  and  $407.52 \div 10$ .  
**4075.2 and 40.752**
- A numberline goes 3.6 to 3.7 in 10 equal steps. What is 3 steps along from 3.6? **3.63**
- Use 7, 5, 4, 2 and a decimal point to make the largest number less than 100. **75.42**

## Worked Solution: Starter 1, Question 1

**Question:** On numberline A what numbers are marked by  $P$  and  $Q$ ?

## Worked Solution: Starter 1, Question 1

**Question:** On numberline A what numbers are marked by  $P$  and  $Q$ ?

Solution: Numberline A runs from 0 to 10 with 10 equal steps, so each step is  $10 \div 10 = 1$ . Point  $P$  is 3 steps from 0, so  $P = 3$ . Point  $Q$  is 8 steps from 0, so  $Q = 8$ .

## Worked Solution: Starter 1, Question 2

**Question:** On numberline B what numbers are marked by  $S$  and  $T$ ?

## Worked Solution: Starter 1, Question 2

**Question:** On numberline B what numbers are marked by  $S$  and  $T$ ?

**Solution:** Numberline B runs from 0 to 1 in tenths, so each step is 0.1.  $S$  is 3 steps from 0, so  $S = 0.3$ .  $T$  is 9 steps from 0, so  $T = 0.9$ .

## Worked Solution: Starter 1, Question 3

**Question:** Mark 6 on Line A and 0.45 on Line B.

## Worked Solution: Starter 1, Question 3

**Question:** Mark 6 on Line A and 0.45 on Line B.

**Solution:** On Line A, 6 is  $\frac{6}{10}$  of the way from 0 to 10, so it lies on the 6th tick. On Line B, 0.45 is 4.5 tenths, i.e. halfway between 0.4 and 0.5. So mark it halfway between the 4th and 5th tenths ticks.

## Worked Solution: Starter 1, Question 4

**Question:** Sam says  $P = 4$ , as it is the 4th mark. What has he done wrong?

## Worked Solution: Starter 1, Question 4

**Question:** Sam says  $P = 4$ , as it is the 4th mark. What has he done wrong?

**Solution:** Sam counted marks rather than steps. The first mark is 0, the second is 1, the third is 2, and the fourth is 3. So the fourth mark has value  $P = 3$ , not 4. Each step is worth 1.

## Worked Solution: Starter 1, Question 5

**Question:** The chart shows 407.52. What is the 4 worth? And the 5?

## Worked Solution: Starter 1, Question 5

**Question:** The chart shows 407.52. What is the 4 worth? And the 5?

**Solution:** In 407.52, the 4 is in the hundreds column, so it is worth  $4 \times 100 = 400$ . The 5 is in the tenths column, so it is worth  $5 \times 0.1 = 0.5$ .

## Worked Solution: Starter 1, Question 6

**Question:** Work out  $407.52 \times 10$  and  $407.52 \div 10$ .

## Worked Solution: Starter 1, Question 6

**Question:** Work out  $407.52 \times 10$  and  $407.52 \div 10$ .

**Solution:** Multiplying by 10 shifts every digit one place to the left:  
 $407.52 \times 10 = 4075.2$ . Dividing by 10 shifts every digit one place to the right:  $407.52 \div 10 = 40.752$ .

## Worked Solution: Starter 1, Question 7

**Question:** A numberline goes 3.6 to 3.7 in 10 equal steps. What is 3 steps along from 3.6?

## Worked Solution: Starter 1, Question 7

**Question:** A numberline goes 3.6 to 3.7 in 10 equal steps. What is 3 steps along from 3.6?

**Solution:** The interval from 3.6 to 3.7 is 0.1. Divided into 10 equal steps, each step is  $0.1 \div 10 = 0.01$ . Three steps give  $3 \times 0.01 = 0.03$ . So the number is  $3.6 + 0.03 = 3.63$ .

## Worked Solution: Starter 1, Question 8

**Question:** Use 7, 5, 4, 2 and a decimal point to make the largest number less than 100.

## Worked Solution: Starter 1, Question 8

**Question:** Use 7, 5, 4, 2 and a decimal point to make the largest number less than 100.

**Solution:** To be less than 100, the number must have two digits before the decimal point (or one digit, but two digits is larger). The largest two-digit whole part we can make from the digits is 75. The remaining digits should be placed after the decimal point in descending order to make the fractional part as large as possible: 42. Hence the largest number is 75.42.

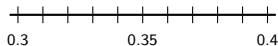
## Starter 2: Inequality Symbols & Ordering Decimals

1. Fill in  $<$  or  $>$ :

7    12  
30   3

6. Order, smallest first: 0.5, 0.45, 0.405, 0.54

Line A



Place value chart

| 1 | . | 0.1 | 0.01 | 0.001 |
|---|---|-----|------|-------|
| 0 | . | 4   |      |       |
| 0 | . | 3   | 5    |       |
| 0 | . | 4   | 0    | 5     |

2. In 0.405, what is the 4 worth?

3. On the place value chart, which is bigger, 0.4 or 0.35? Why?

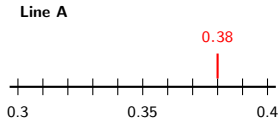
4. Fill in  $<$ ,  $>$  or  $=$   
0.4    0.40,  
0.6    0.06

5. Mark 0.38 on Line A. Is it nearer 0.3 or 0.4?

7. True or false: more digits *after* the decimal point means a bigger number? Give an example/counter-example.

8. Alfie says  $0.45 > 0.5$  as  $45 > 5$ . Explain his mistake, then write a decimal between 0.4 and 0.405.

## Starter 2: Inequality Symbols & Ordering Decimals



Place value chart

| 1 | . | 0.1 | 0.01 | 0.001 |
|---|---|-----|------|-------|
| 0 | . | 4   |      |       |
| 0 | . | 3   | 5    |       |
| 0 | . | 4   | 0    | 5     |

1. Fill in  $<$  or  $>$ :  
 $7 < 12$   
 $30 > 3$
2. In 0.405, what is the 4 worth? **4 tenths, 0.4**
3. On the place value chart, which is bigger, 0.4 or 0.35? Why? **0.4: 4 tenths is greater than 3 tenths**
4. Fill in  $<$ ,  $>$  or  $=$   
 $0.4 = 0.40$ ,  
 $0.6 > 0.06$
5. Mark 0.38 on Line A. Is it nearer 0.3 or 0.4? **nearer 0.4**
6. Order, smallest first: 0.5, 0.45, 0.405, 0.54 **0.405, 0.45, 0.5, 0.54**
7. True or false: more digits *after* the decimal point means a bigger number? Give an example/counter-example. **False:  $0.9 > 0.1234$**
8. Alfie says  $0.45 > 0.5$  as  $45 > 5$ . Explain his mistake, then write a decimal between 0.4 and 0.405. **0.5 has 5 tenths; e.g. 0.402**

## Worked Solution: Starter 2, Question 1

**Question:** Fill in  $<$  or  $>$ :  $7 \text{ } 12$ ;  $30 \text{ } 3$ .

## Worked Solution: Starter 2, Question 1

**Question:** Fill in  $<$  or  $>$ :  $7$   $12$ ;  $30$   $3$ .

**Solution:**  $7 < 12$  because 7 is less than 12.  $30 > 3$  because 30 is greater than 3.

## Worked Solution: Starter 2, Question 2

**Question:** In 0.405, what is the 4 worth?

## Worked Solution: Starter 2, Question 2

**Question:** In 0.405, what is the 4 worth?

**Solution:** The digit 4 is in the tenths place, so it is worth 4 tenths, i.e. 0.4.

## Worked Solution: Starter 2, Question 3

**Question:** On the place value chart, which is bigger, 0.4 or 0.35? Why?

## Worked Solution: Starter 2, Question 3

**Question:** On the place value chart, which is bigger, 0.4 or 0.35? Why?

**Solution:** 0.4 is bigger. Write  $0.4 = 0.40$ , which is 4 tenths and 0 hundredths. 0.35 is 3 tenths and 5 hundredths. Comparing tenths, 4 tenths is greater than 3 tenths, so  $0.4 > 0.35$ .

## Worked Solution: Starter 2, Question 4

**Question:** Fill in  $<$ ,  $>$  or  $=$ : 0.4 0.40, 0.6 0.06.

## Worked Solution: Starter 2, Question 4

**Question:** Fill in  $<$ ,  $>$  or  $=$ :  $0.4$   $0.40$ ,  $0.6$   $0.06$ .

**Solution:**  $0.4 = 0.40$  because the trailing zero does not change the value.  $0.6 = 0.60$ , which is 60 hundredths, while  $0.06$  is 6 hundredths; so  $0.6 > 0.06$ .

## Worked Solution: Starter 2, Question 5

**Question:** Mark 0.38 on Line A. Is it nearer 0.3 or 0.4?

## Worked Solution: Starter 2, Question 5

**Question:** Mark 0.38 on Line A. Is it nearer 0.3 or 0.4?

**Solution:** 0.38 is 8 hundredths from 0.3 and 2 hundredths from 0.4. Since 2 is less than 8, 0.38 is nearer 0.4. On the line it lies two small ticks before 0.4.

## Worked Solution: Starter 2, Question 6

**Question:** Order, smallest first: 0.5, 0.45, 0.405, 0.54.

## Worked Solution: Starter 2, Question 6

**Question:** Order, smallest first: 0.5, 0.45, 0.405, 0.54.

**Solution:** Write all to three decimal places:

0.500, 0.450, 0.405, 0.540. Comparing these gives

$0.405 < 0.450 < 0.500 < 0.540$ . So the order is

0.405, 0.45, 0.5, 0.54.

## Worked Solution: Starter 2, Question 7

**Question:** True or false: more digits *after* the decimal point means a bigger number? Give an example/counter-example.

## Worked Solution: Starter 2, Question 7

**Question:** True or false: more digits *after* the decimal point means a bigger number? Give an example/counter-example.

**Solution:** False. The value depends on place value, not the number of digits. For example,  $0.9 > 0.1234$ : 0.9 is 9 tenths, while 0.1234 is only slightly more than 1 tenth.

## Worked Solution: Starter 2, Question 8

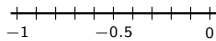
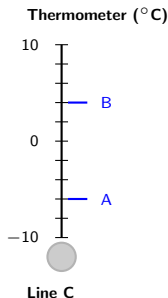
**Question:** Alfie says  $0.45 > 0.5$  as  $45 > 5$ . Explain his mistake, then write a decimal between 0.4 and 0.405.

## Worked Solution: Starter 2, Question 8

**Question:** Alfie says  $0.45 > 0.5$  as  $45 > 5$ . Explain his mistake, then write a decimal between 0.4 and 0.405.

**Solution:** Alfie compared the digits 45 and 5 as whole numbers, ignoring their place values. In 0.5, the 5 is in the tenths place, so  $0.5 = 0.50$ , which is greater than 0.45 (4 tenths and 5 hundredths). A decimal between 0.4 and 0.405 is, for example, 0.402.

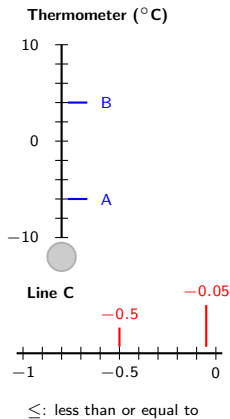
# Starter 3: Ordering Negative Numbers



$\leq$ : less than or equal to

1. Which is colder,  $4^{\circ}\text{C}$  or  $-4^{\circ}\text{C}$ ?
2. What is each mark on the thermometer worth? Write the temperatures at A and B.
3. Which is colder,  $-3$  or  $-8$ ? Fill in:  $-3$  ?  $-8$
4. Order, smallest first:  $-2$ ,  $5$ ,  $-7$ ,  $0$ ,  $-1$
5. Mark  $-0.5$  and  $-0.05$  on Line C. Which is larger?
6. Fill in  $<$  or  $>$ :  
 $-4.5$  ?  $-4.05$ ,  
 $-0.3$  ?  $0.03$
7. (Extension) Order, smallest first:  
 $-0.08$ ,  $0.7$ ,  $-0.8$ ,  $-0.75$
8. (Challenge) List the integers  $n$ :  
 $-3 \leq n < 2$ . Write a number between  $-0.5$  and  $-0.4$ .

# Starter 3: Ordering Negative Numbers



- Which is colder,  $4^{\circ}\text{C}$  or  $-4^{\circ}\text{C}$ ?  
 $-4^{\circ}\text{C}$
- What is each mark on the thermometer worth? Write the temperatures at A and B.  $2^{\circ}\text{C}$  per mark; A =  $-6$ , B =  $4$
- Which is colder,  $-3$  or  $-8$ ? Fill in:  
 $-3 > -8$  ( $-8$  is colder)
- Order, smallest first:  $-2, 5, -7, 0, -1$   
( $-7, -2, -1, 0, 5$ )
- Mark  $-0.5$  and  $-0.05$  on Line C. Which is larger?  
 $-0.05$
- Fill in  $<$  or  $>$ :  
 $-4.5 < -4.05$ ,  
 $-0.3 < 0.03$
- (Extension) Order, smallest first:  
 $-0.08, 0.7, -0.8, -0.75$  ( $-0.8, -0.75, -0.08, 0.7$ )
- (Challenge) List the integers  $n$ :  
 $-3 \leq n < 2$ . Write a number between  $-0.5$  and  $-0.4$ .  
 $-3, -2, -1, 0, 1$ ;  
e.g.  $-0.45$

## Worked Solution: Starter 3, Question 1

**Question:** Which is colder,  $4^{\circ}\text{C}$  or  $-4^{\circ}\text{C}$ ?

## Worked Solution: Starter 3, Question 1

**Question:** Which is colder,  $4^{\circ}\text{C}$  or  $-4^{\circ}\text{C}$ ?

**Solution:**  $-4^{\circ}\text{C}$  is colder. Negative temperatures are below zero, so  $-4^{\circ}\text{C}$  is 4 degrees below freezing, whereas  $4^{\circ}\text{C}$  is 4 degrees above freezing.

## Worked Solution: Starter 3, Question 2

**Question:** What is each mark on the thermometer worth? Write the temperatures at A and B.

## Worked Solution: Starter 3, Question 2

**Question:** What is each mark on the thermometer worth? Write the temperatures at A and B.

**Solution:** The thermometer goes from  $-10$  to  $10$ , a total of  $20$  degrees, with  $10$  equal intervals. So each mark is  $20 \div 10 = 2^{\circ}\text{C}$ . Point A is  $2$  marks above  $-10$ :  $-10 + 2 \times 2 = -6^{\circ}\text{C}$ . Point B is  $2$  marks above  $0$ :  $0 + 2 \times 2 = 4^{\circ}\text{C}$ .

## Worked Solution: Starter 3, Question 3

**Question:** Which is colder,  $-3$  or  $-8$ ? Fill in:  $-3$   $-8$ .

## Worked Solution: Starter 3, Question 3

**Question:** Which is colder,  $-3$  or  $-8$ ? Fill in:  $-3$   $-8$ .

**Solution:**  $-8$  is colder because it is further below zero. On a number line,  $-8$  is to the left of  $-3$ , so  $-3 > -8$ . The correct symbol is  $>$ .

## Worked Solution: Starter 3, Question 4

**Question:** Order, smallest first:  $-2$ ,  $5$ ,  $-7$ ,  $0$ ,  $-1$ .

## Worked Solution: Starter 3, Question 4

**Question:** Order, smallest first:  $-2$ ,  $5$ ,  $-7$ ,  $0$ ,  $-1$ .

**Solution:** On a number line, more negative numbers are smaller.  
The negative numbers in order are  $-7$ ,  $-2$ ,  $-1$ . Then come  $0$  and  $5$ . So the order is  $-7$ ,  $-2$ ,  $-1$ ,  $0$ ,  $5$ .

## Worked Solution: Starter 3, Question 5

**Question:** Mark  $-0.5$  and  $-0.05$  on Line C. Which is larger?

## Worked Solution: Starter 3, Question 5

**Question:** Mark  $-0.5$  and  $-0.05$  on Line C. Which is larger?

**Solution:** Line C goes from  $-1$  to  $0$  in tenths.  $-0.5$  is halfway between  $-1$  and  $0$ .  $-0.05$  is very close to  $0$ , just 5 hundredths to the left of  $0$ . Since  $-0.05$  is closer to  $0$ , it is larger:  $-0.05 > -0.5$ .

## Worked Solution: Starter 3, Question 6

**Question:** Fill in  $<$  or  $>$ :  $-4.5$   $-4.05$ ,  $-0.3$   $0.03$ .

## Worked Solution: Starter 3, Question 6

**Question:** Fill in  $<$  or  $>$ :  $-4.5$   $-4.05$ ,  $-0.3$   $0.03$ .

**Solution:**  $-4.5$  is more negative than  $-4.05$ , so  $-4.5 < -4.05$ .  
Any negative number is less than any positive number, so  
 $-0.3 < 0.03$ .

## Worked Solution: Starter 3, Question 7

**Question:** (Extension) Order, smallest first:  $-0.08$ ,  $0.7$ ,  $-0.8$ ,  $-0.75$ .

## Worked Solution: Starter 3, Question 7

**Question:** (Extension) Order, smallest first:  $-0.08$ ,  $0.7$ ,  $-0.8$ ,  $-0.75$ .

**Solution:** First order the negative numbers:

$-0.8 < -0.75 < -0.08$ . The positive number  $0.7$  is larger than all of them. So the order is  $-0.8, -0.75, -0.08, 0.7$ .

## Worked Solution: Starter 3, Question 8

**Question:** (Challenge) List the integers  $n$ :  $-3 \leq n < 2$ . Write a number between  $-0.5$  and  $-0.4$ .

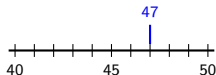
## Worked Solution: Starter 3, Question 8

**Question:** (Challenge) List the integers  $n$ :  $-3 \leq n < 2$ . Write a number between  $-0.5$  and  $-0.4$ .

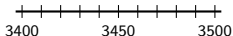
**Solution:** The integers satisfying  $-3 \leq n < 2$  are  $-3, -2, -1, 0, 1$ . (The value 2 is not included because the inequality is strict.) A number between  $-0.5$  and  $-0.4$  is, for example,  $-0.45$ .

## Starter 4: Rounding Integers

Line A

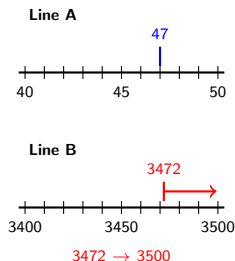


Line B



1. Fill in  $<$  or  $>$ :  
 $-6 ? -2$
2. Line A: is 47 nearer 40 or 50? Round it to the nearest 10.
3. Round to the nearest 10: 32, 85
4. Mark 3472 on Line B, then round it to the nearest 100.
5. Round 3472 to the nearest 10; to the nearest 1000.
6. Round 4950 to the nearest 100.
7. Zoe rounds 8449 to the nearest 100:  
 $8449 \rightarrow 8450 \rightarrow 8500$ . What is her mistake?
8. A number rounded to the nearest 10 is 250. What is the smallest it could be? The largest?

## Starter 4: Rounding Integers



1. Fill in  $<$  or  $>$ :  
 $-6 < -2$
2. Line A: is 47 nearer 40 or 50? Round it to the nearest 10.  
nearer 50, so 50
3. Round to the nearest 10: 32, 85  
(30 and 90)
4. Mark 3472 on Line B, then round it to the nearest 100.
5. Round 3472 to the nearest 10; to the nearest 1000. 3470 and 3000
6. Round 4950 to the nearest 100. 5000
7. Zoe rounds 8449 to the nearest 100: 8449 → 8450 → 8500. What is her mistake? Rounded twice: only the tens digit 4 counts, so 8400
8. A number rounded to the nearest 10 is 250. What is the smallest it could be? The largest? 245 and 254

## Worked Solution: Starter 4, Question 1

**Question:** Fill in  $<$  or  $>$ :  $-6$   $-2$ .

## Worked Solution: Starter 4, Question 1

**Question:** Fill in  $<$  or  $>$ :  $-6$   $-2$ .

**Solution:**  $-6$  is to the left of  $-2$  on a number line, so  $-6 < -2$ .  
The correct symbol is  $<$ .

## Worked Solution: Starter 4, Question 2

**Question:** Line A: is 47 nearer 40 or 50? Round it to the nearest 10.

## Worked Solution: Starter 4, Question 2

**Question:** Line A: is 47 nearer 40 or 50? Round it to the nearest 10.

**Solution:** 47 is 7 away from 40 and 3 away from 50. Since 3 is less than 7, it is nearer 50. Rounding to the nearest 10 gives 50.

## Worked Solution: Starter 4, Question 3

**Question:** Round to the nearest 10: 32, 85.

## Worked Solution: Starter 4, Question 3

**Question:** Round to the nearest 10: 32, 85.

**Solution:** For 32, the units digit is 2, which is less than 5, so round down to 30. For 85, the units digit is 5, so round up to 90.

## Worked Solution: Starter 4, Question 4

**Question:** Mark 3472 on Line B, then round it to the nearest 100.

## Worked Solution: Starter 4, Question 4

**Question:** Mark 3472 on Line B, then round it to the nearest 100.

**Solution:** Line B goes from 3400 to 3500 in steps of 10. 3472 is between 3470 and 3480. To round to the nearest 100, look at the tens digit, which is 7. Since  $7 \geq 5$ , round up to 3500. It is also nearer 3500 than 3400.

## Worked Solution: Starter 4, Question 5

**Question:** Round 3472 to the nearest 10; to the nearest 1000.

## Worked Solution: Starter 4, Question 5

**Question:** Round 3472 to the nearest 10; to the nearest 1000.

**Solution:** To the nearest 10: look at the units digit 2, so  $3472 \rightarrow 3470$ . To the nearest 1000: look at the hundreds digit 4. Since  $4 < 5$ , round down to 3000. (It is 472 from 3000 and 528 from 4000.)

## Worked Solution: Starter 4, Question 6

**Question:** Round 4950 to the nearest 100.

## Worked Solution: Starter 4, Question 6

**Question:** Round 4950 to the nearest 100.

**Solution:** To round to the nearest 100, look at the tens digit, which is 5. Since  $5 \geq 5$ , round up. So  $4950 \rightarrow 5000$ .

## Worked Solution: Starter 4, Question 7

**Question:** Zoe rounds 8449 to the nearest 100:  
 $8449 \rightarrow 8450 \rightarrow 8500$ . What is her mistake?

## Worked Solution: Starter 4, Question 7

**Question:** Zoe rounds 8449 to the nearest 100:  
 $8449 \rightarrow 8450 \rightarrow 8500$ . What is her mistake?

**Solution:** Zoe rounded twice. To round directly to the nearest 100, look only at the tens digit. In 8449, the tens digit is 4, and  $4 < 5$ , so 8449 rounds down to 8400. The first rounding to 8450 should not be used again.

## Worked Solution: Starter 4, Question 8

**Question:** A number rounded to the nearest 10 is 250. What is the smallest it could be? The largest?

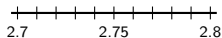
## Worked Solution: Starter 4, Question 8

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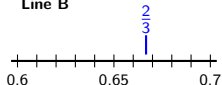
**Solution:** For a whole number, the values that round to 250 are those from 245 up to 254. 245 rounds up to 250, and 254 rounds down to 250. So the smallest is 245 and the largest is 254.

# Starter 5: Rounding Decimals & Never-Ending Decimals

Line A



Line B



## Never-ending decimals

$$\frac{2}{3} = 0.6666\dots = 0.\dot{6}$$

$$\frac{1}{7} = 0.142857142857\dots$$

$$\pi = 3.14159265\dots$$

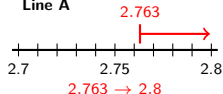
$$\sqrt{2} = 1.41421356\dots$$

$$0.1010010001\dots$$

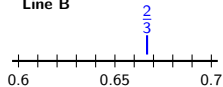
1. Round 4738 to the nearest 100.
2. Round to the nearest whole number: 4.6, 12.348
3. Mark 2.763 on Line A. Round it to 1 decimal place (d.p.).
4. Round to 1 d.p.: 4.62, 0.95. Why is 0.95 not 1?
5. Round 12.348 to 2 d.p., then to 1 d.p. Why not 12.4?
6. Line B shows  $\frac{2}{3} = 0.\dot{6}$ . Round it to 1 d.p. and 2 d.p.
7. (Extension) Write  $\frac{1}{3}$  in dot notation, then round  $\frac{1}{7}$  to 3 d.p.
8. (Challenge) Which listed decimals never settle into a repeating block? Can one still be a fraction?

# Starter 5: Rounding Decimals & Never-Ending Decimals

Line A



Line B



## Never-ending decimals

$$\frac{2}{3} = 0.6666\dots = 0.\dot{6}$$

$$\frac{1}{7} = 0.142857142857\dots$$

$$\pi = 3.14159265\dots$$

$$\sqrt{2} = 1.41421356\dots$$

$$0.1010010001\dots$$

1. Round 4738 to the nearest 100. **4700**
2. Round to the nearest whole number: 4.6, 12.348 (**5 and 12**)
3. Mark 2.763 on Line A. Round it to 1 decimal place (d.p.).
4. Round to 1 d.p.: 4.62, 0.95. Why is 0.95 not 1? **4.6, 1.0 — 1 d.p. needs one decimal digit**
5. Round 12.348 to 2 d.p., then to 1 d.p. Why not 12.4? **12.35, 12.3 — never round twice**
6. Line B shows  $\frac{2}{3} = 0.\dot{6}$ . Round it to 1 d.p. and 2 d.p. **0.7 and 0.67**
7. (Extension) Write  $\frac{1}{3}$  in dot notation, then round  $\frac{1}{7}$  to 3 d.p.  **$0.\dot{3}$  and 0.143**
8. (Challenge) Which listed decimals never settle into a repeating block? Can one still be a fraction?  $\pi$ ,  $\sqrt{2}$ , **0.101001...; yes:  $0.\dot{3} = \frac{1}{3}$**

## Worked Solution: Starter 5, Question 1

**Question:** Round 4738 to the nearest 100.

## Worked Solution: Starter 5, Question 1

**Question:** Round 4738 to the nearest 100.

**Solution:** To round to the nearest 100, look at the tens digit. In 4738, the tens digit is 3. Since  $3 < 5$ , round down to 4700.

## Worked Solution: Starter 5, Question 2

**Question:** Round to the nearest whole number: 4.6, 12.348.

## Worked Solution: Starter 5, Question 2

**Question:** Round to the nearest whole number: 4.6, 12.348.

**Solution:** For 4.6, the tenths digit is 6, so round up to 5. For 12.348, the tenths digit is 3, so round down to 12.

## Worked Solution: Starter 5, Question 3

**Question:** Mark 2.763 on Line A. Round it to 1 decimal place (d.p.).

## Worked Solution: Starter 5, Question 3

**Question:** Mark 2.763 on Line A. Round it to 1 decimal place (d.p.).

**Solution:** Line A goes from 2.7 to 2.8 in hundredths. 2.763 lies between 2.76 and 2.77, closer to 2.76. To round to 1 d.p., look at the hundredths digit: in 2.763, the tenths digit is 7 and the hundredths digit is 6. Since  $6 \geq 5$ , round up to 2.8.

## Worked Solution: Starter 5, Question 4

**Question:** Round to 1 d.p.: 4.62, 0.95. Why is 0.95 not 1?

## Worked Solution: Starter 5, Question 4

**Question:** Round to 1 d.p.: 4.62, 0.95. Why is 0.95 not 1?

Solution: 4.62 to 1 d.p.: the hundredths digit is 2, so  $4.62 \rightarrow 4.6$ .  
0.95 to 1 d.p.: the hundredths digit is 5, so round up; 0.9 becomes 1.0. It is written as 1.0 rather than 1 because 1 d.p. requires exactly one digit after the decimal point.

## Worked Solution: Starter 5, Question 5

**Question:** Round 12.348 to 2 d.p., then to 1 d.p. Why not 12.4?

## Worked Solution: Starter 5, Question 5

**Question:** Round 12.348 to 2 d.p., then to 1 d.p. Why not 12.4?

**Solution:** To 2 d.p., look at the third decimal digit in 12.348, which is 8. So  $12.348 \rightarrow 12.35$ . To 1 d.p., round the original number directly: the hundredths digit in 12.348 is 4, so  $12.348 \rightarrow 12.3$ . It is not 12.4 because you should not round twice ( $12.348 \rightarrow 12.35 \rightarrow 12.4$  is double rounding).

## Worked Solution: Starter 5, Question 6

**Question:** Line B shows  $\frac{2}{3} = 0.\dot{6}$ . Round it to 1 d.p. and 2 d.p.

## Worked Solution: Starter 5, Question 6

**Question:** Line B shows  $\frac{2}{3} = 0.\dot{6}$ . Round it to 1 d.p. and 2 d.p.

**Solution:**  $0.\dot{6} = 0.6666\dots$  To 1 d.p., look at the hundredths digit 6, so round up: 0.7. To 2 d.p., look at the third decimal digit 6, so round up: 0.67.

## Worked Solution: Starter 5, Question 7

**Question:** (Extension) Write  $\frac{1}{3}$  in dot notation, then round  $\frac{1}{7}$  to 3 d.p.

## Worked Solution: Starter 5, Question 7

**Question:** (Extension) Write  $\frac{1}{3}$  in dot notation, then round  $\frac{1}{7}$  to 3 d.p.

Solution:  $\frac{1}{3} = 0.3333\dots = 0.\dot{3}$ .  $\frac{1}{7} = 0.142857142857\dots$  To 3 d.p., look at the fourth decimal digit, which is 8, so round up: 0.143.

## Worked Solution: Starter 5, Question 8

**Question:** (Challenge) Which listed decimals never settle into a repeating block? Can one still be a fraction?

## Worked Solution: Starter 5, Question 8

**Question:** (Challenge) Which listed decimals never settle into a repeating block? Can one still be a fraction?

**Solution:** The decimals that never settle into a repeating block are  $\pi$ ,  $\sqrt{2}$ , and  $0.1010010001\dots$ . These are non-repeating, non-terminating. A never-ending decimal can still be a fraction if it repeats, for example  $0.\dot{3} = \frac{1}{3}$ . The non-repeating ones are irrational and cannot be written as fractions.