

Number and Algebra: Patterns and Algebra: Codebreaker

Australian Curriculum

This lesson plan could be used to support the teaching and learning of the following Content Descriptions from the Australian Curriculum.

Y6: Number and Algebra: Patterns and Algebra

Continue and create sequences involving whole numbers, fractions and decimals. Describe the rule used to create the sequence (ACMNA133)

Child-Friendly Aim:

I can order and compare numbers up to 10 000 000.

Success Criteria:

I can order sequences of whole numbers, fractions and decimals.

I can place missing whole numbers, fractions and decimals on number lines.

Resources:

[Lesson Pack](#)

Key/New Words:

Sequence, order, pattern, increase, decrease, term, rule, number line, decimal, tenths, hundredths, thousandths.

Preparation:
















Differentiated [Crack the Code Activity Sheet](#) - per child

[Extra Challenge Activity Sheet](#) - as required

Prior Learning:

It will be helpful if children have covered sequences of numbers up to 1 000 000, and place value of decimal numbers up to three decimal places.

Learning Sequence

| | | |
|--|---|---|
|  | <p>Number Rules: Think of a rule about numbers, for example 'numbers with 5 in the hundredths place' or 'numbers higher than 10 000'. Can children work out the rule? Children write a number on their whiteboard and hold it up. Look around for any numbers that fit the rule you have thought of. Ask the children holding these numbers to stand up so others can see their numbers. Children look for what these numbers have in common, and write another number on their whiteboard that they think fits the rule. Repeat until all children have a number that fits the rule. Give clues about the rule if necessary!</p> |  |
|  | <p>Number Lines: Introduce sequences on number lines. Show children the number line on the Lesson Presentation. <i>Can children order the sequence of whole numbers and fractions on the number line?</i> Click each number to see it move to the correct place. Click to show the rule and a question. <i>Can children give the next odd whole number in the sequence?</i> Click to reveal the answer. Repeat for the following two number line sequences.</p> |  |
|  | <p>Missing Terms: Show the number line with missing terms on the Lesson Presentation. <i>Can children identify the missing terms?</i> Describe the rule and how to work out the missing terms. Repeat for the following two number line sequences with missing terms.</p> |  |
|  | <p>Decimal Sequences: Introduce a focus on trickier decimal sequences, showing the decimal number line sequence on the Lesson Presentation. Explain how to work out the missing terms from the ones that are given. Click to explain that we first need to work out the difference between the two terms that are next to each other. Click to show the difference on the number line, and click again to show how to add this amount to each term to find the next term. <i>Can children find the missing terms?</i> Click again to reveal the answers. Children choose one of the three decimal number line sequences shown on the Lesson Presentation and find the missing terms. Reveal and discuss the answers.</p> |  |
|  | <p>Crack the Code: Children find the missing terms for each sequence on the differentiated Crack the Code Activity Sheet, finding the code to open the safe. When they have finished, reveal the three different codes on the Lesson Presentation.</p> <div style="display: flex; justify-content: space-around;"> <div>  <p>Solve sequences involving numbers with up to two decimal places and terms that increase by simpler amounts. Children are given more terms to calculate with. Children place the specified terms in order from smallest to largest to find the safe code.</p> </div> <div>  <p>Solve sequences involving numbers with up to two decimal places and terms that increase by slightly trickier amounts. Children are given fewer terms to calculate with. Children place the specified terms in order from smallest to largest to find the safe code.</p> </div> <div>  <p>Solve sequences involving numbers with up to three decimal places and terms that increase by trickier amounts. Children are given even fewer terms to calculate with. Children place the specified terms in order from smallest to largest to find the safe code. An Extra Challenge Activity Sheet is provided as an extension activity if required.</p> </div> </div> |  |
|  | <p>Counting Challenge: Children work in pairs to count on from 0 in 0.2s. Children take turns to say a number each. Can children predict which partner will say 1.4? And which partner will be the first to say a number larger than 3? Then try counting back from 10 in 0.3s, answering the questions on the Lesson Presentation.</p> |  |

Masterit

Playit: Play a form of Number Tennis with your class. Tell children the rule of your sequence, for example subtract 0.4, or add $\frac{1}{2}$. Then say your starting number while making a tennis playing action! The idea is that you are serving the number to the children. Then they should mime hitting a tennis ball back to you, while saying the next number in the sequence. Continue with the sequence until someone makes a mistake, or you want to choose another sequence.

Buildit: Make some number cards with the terms of a sequence on them. Mix the number cards up so that the terms are out of order. Challenge children to build the sequence by laying the number cards in a line. You could make large number cards and do this activity outside or in the hall.



Mathematics

Number and Algebra

Codebreaker



Aim

- I can order and compare numbers up to 10 000 000.

Success Criteria

- I can order sequences of whole numbers, fractions and decimals.
- I can place missing whole numbers, fractions and decimals on number lines.

Number Rules



I am thinking of a rule about numbers. It might be 'numbers with a 5 in the hundredths place' or 'numbers higher than 10 000'.

Can you work out the rule I am thinking of?

I will ask the people who have written a number that follows the rule to stand up, holding their boards so everyone else can see their numbers.

Look around at the numbers.

- Can you spot the rule?
- What do all the numbers have in common?

Try to write a number that you think fits the rule.

We will repeat this until everyone has a number that fits the rule!

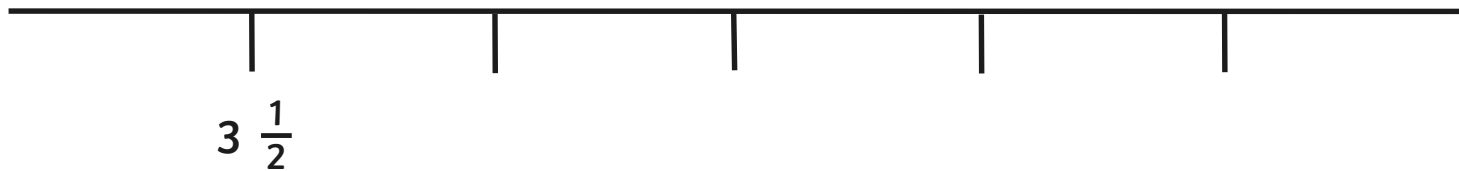


Number Lines



We can represent sequences using number lines. Sequences can be made up of whole numbers, fractions or decimals.

Here is part of a number line showing a sequence:



Can you use the number line to order these numbers in a sequence?

$4 \frac{1}{2}$

$5 \frac{1}{2}$

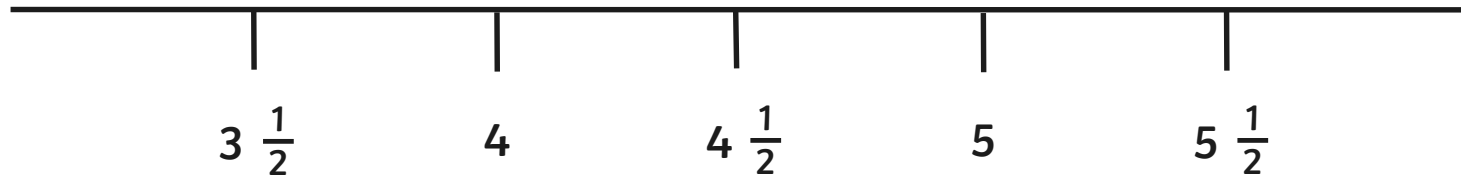
4

5

Number Lines



Can you give the rule for this sequence?



The terms in the sequence increase by $\frac{1}{2}$ each time.

If you continued the sequence, what would be the next odd whole number?

7 would be the next odd whole number.

Number Lines



Can you use the number line to order these numbers in a sequence?

1.3

2.1

1.7

2.9

2.5

What is the rule for the sequence?



Number Lines

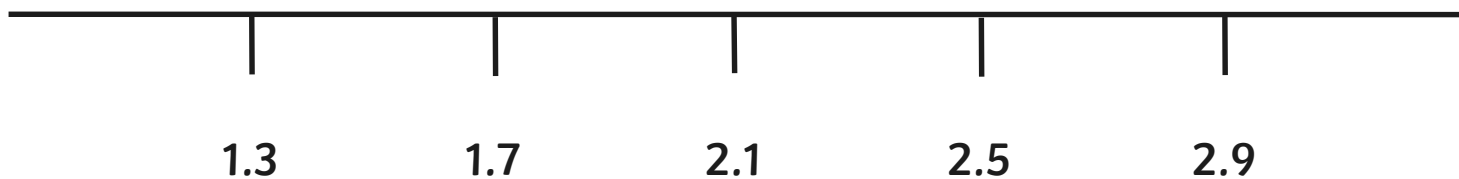


Mariam says that she has worked out the rule of the sequence.



The rule for this sequence is add 4 each time.

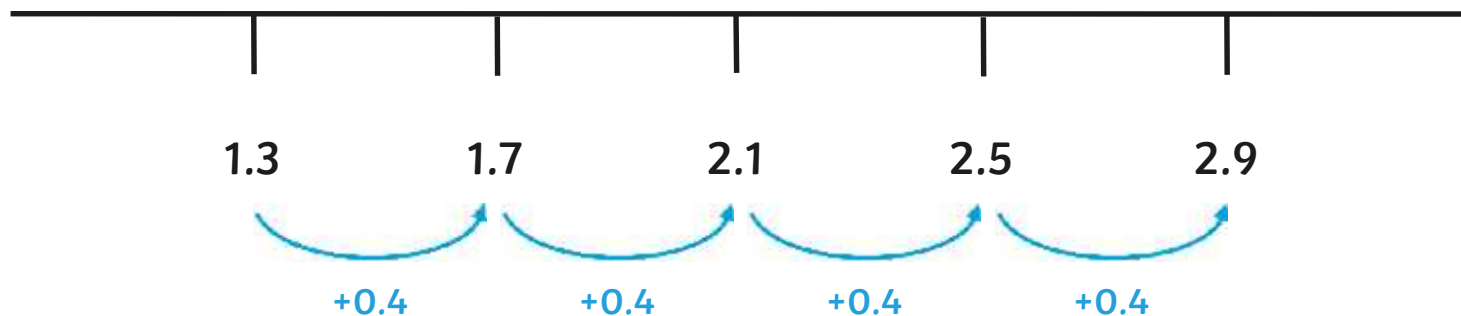
Can you explain why she is incorrect?



Number Lines



Mariam thought the sequence was increasing by four ones each time.



The sequence is actually increasing by four tenths each time.

To find the next term, we add 0.4 to the previous term.

Number Lines



Can you place the terms in order on the number line?

27.25

27.75

27

$26\frac{3}{4}$

28.5

$27\frac{1}{2}$

28

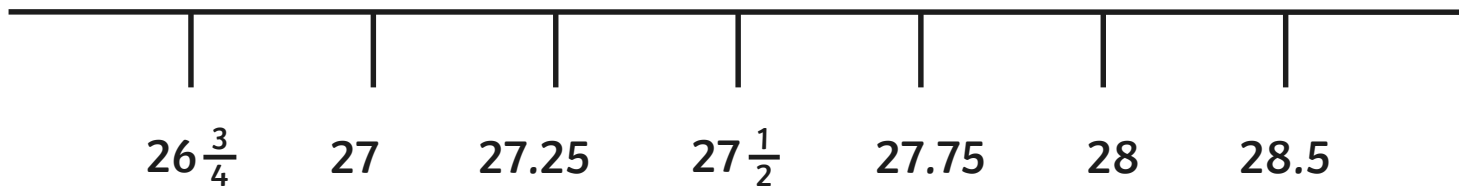
What is the rule of the sequence?



Number Lines



The sequence goes up in quarters, $\frac{1}{4}$ s or 0.25s.



Which equivalent decimals and fractions do you have to know to be able to order this sequence?

$$0.25 = \frac{1}{4}$$

$$0.5 = \frac{1}{2}$$

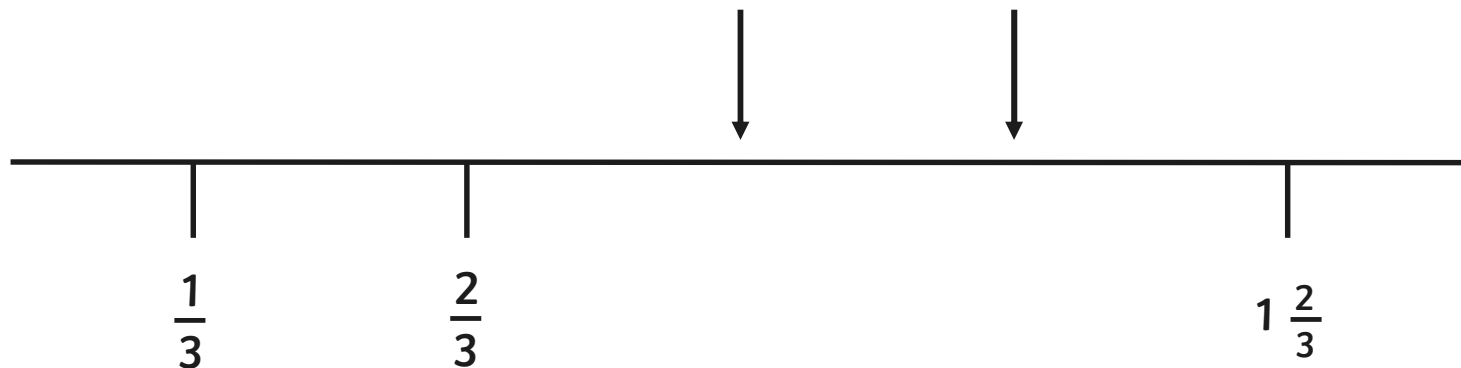
$$0.75 = \frac{3}{4}$$

Missing Terms



Some number lines have missing terms. You can use the rule of the sequence to work out the missing terms.

Here is part of a number line showing a sequence:

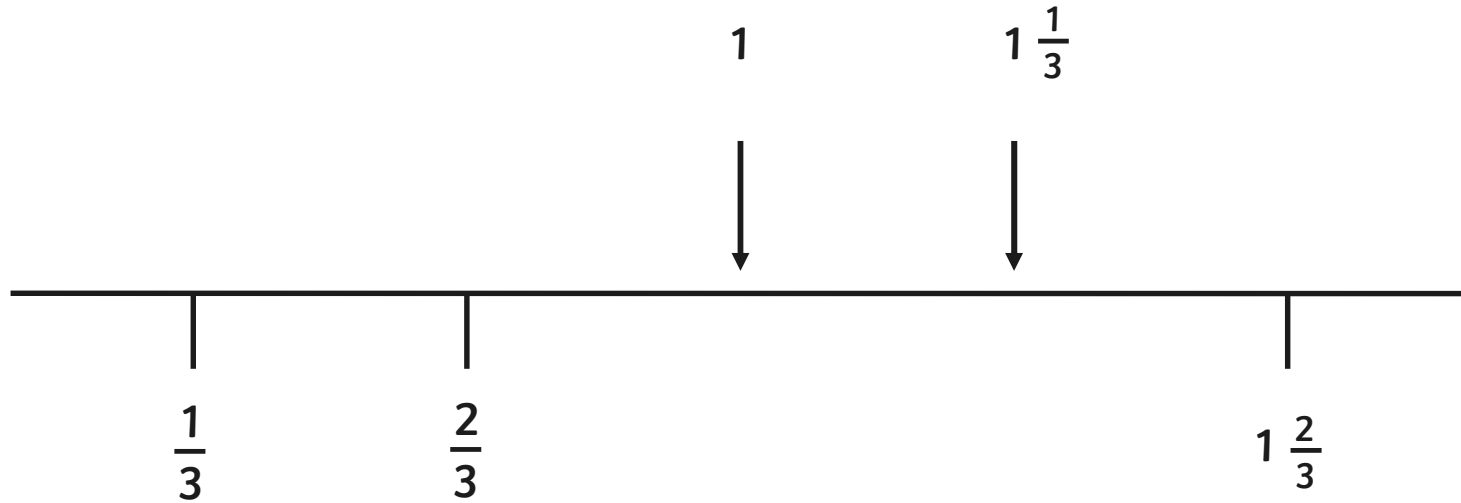


What is the rule of the sequence?

Missing Terms



How did you do?

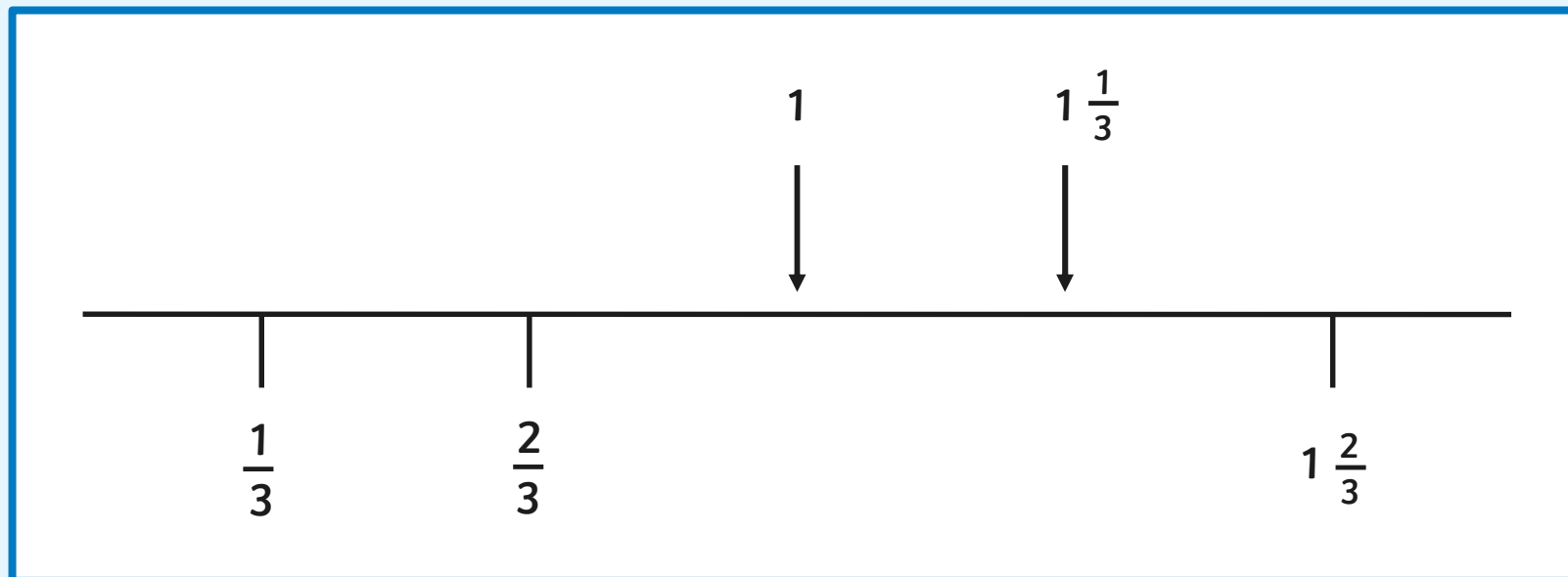


Can you explain how you found the missing terms?

Missing Terms

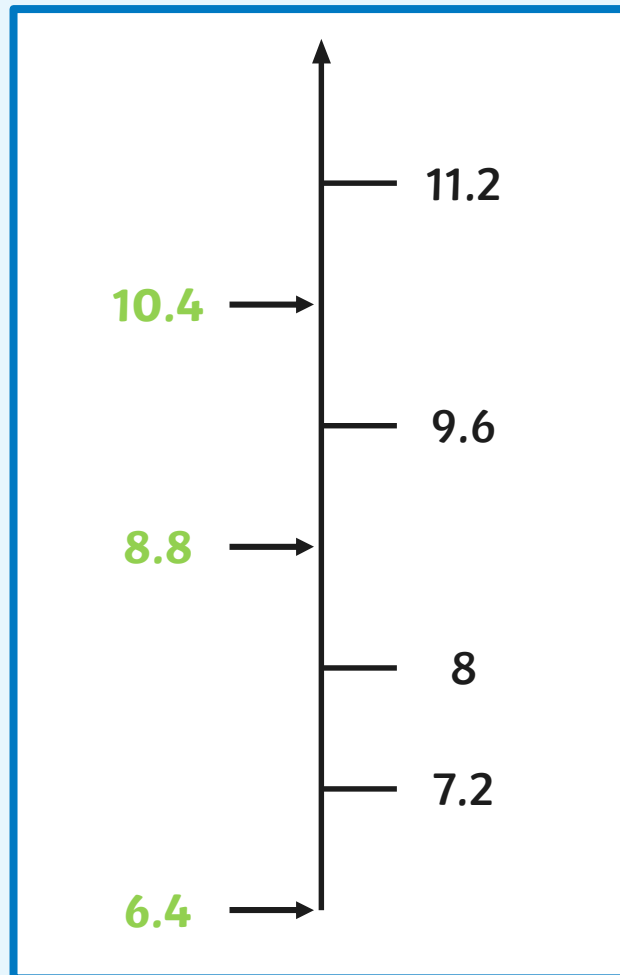


We can see that the sequence is increasing by one third each time. We know that $\frac{2}{3}$ add $\frac{1}{3}$ is $\frac{3}{3}$, or 1 whole one. We then can work out that 1 add $\frac{1}{3}$ is $1\frac{1}{3}$.



Can you find the missing terms for the next few number line sequences?

Missing Terms

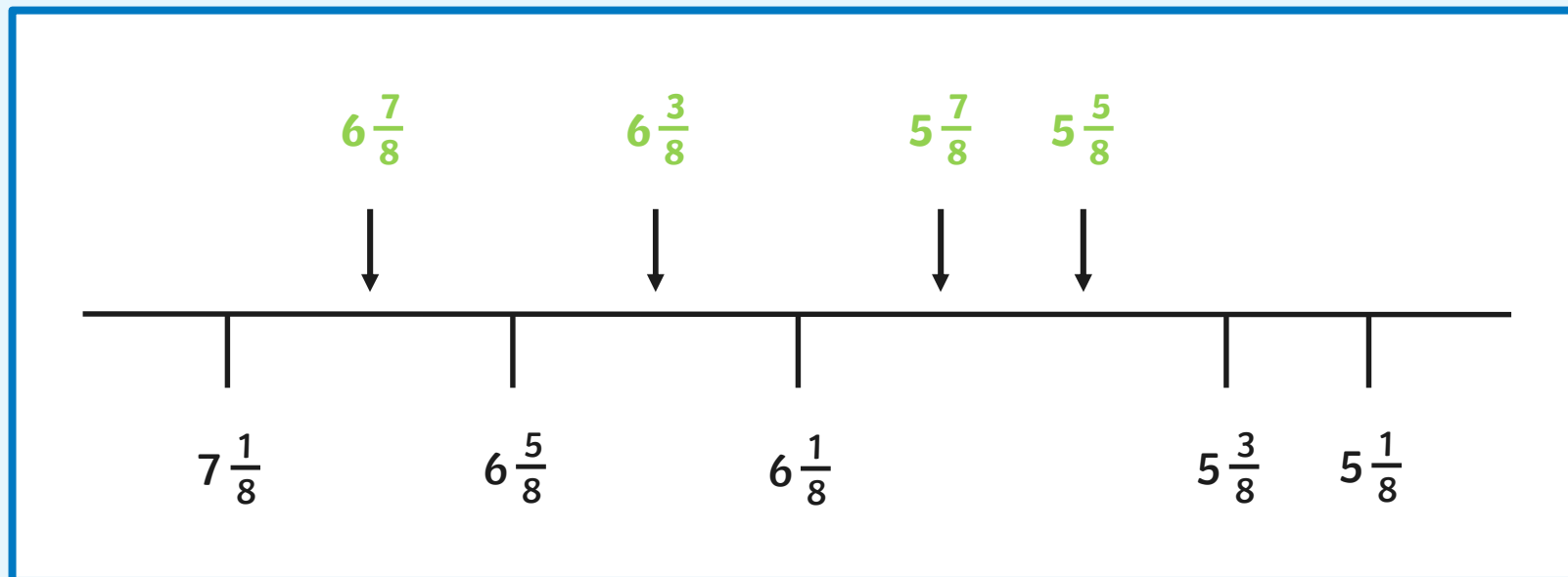


This sequence is increasing by 0.8 each time.

Missing Terms



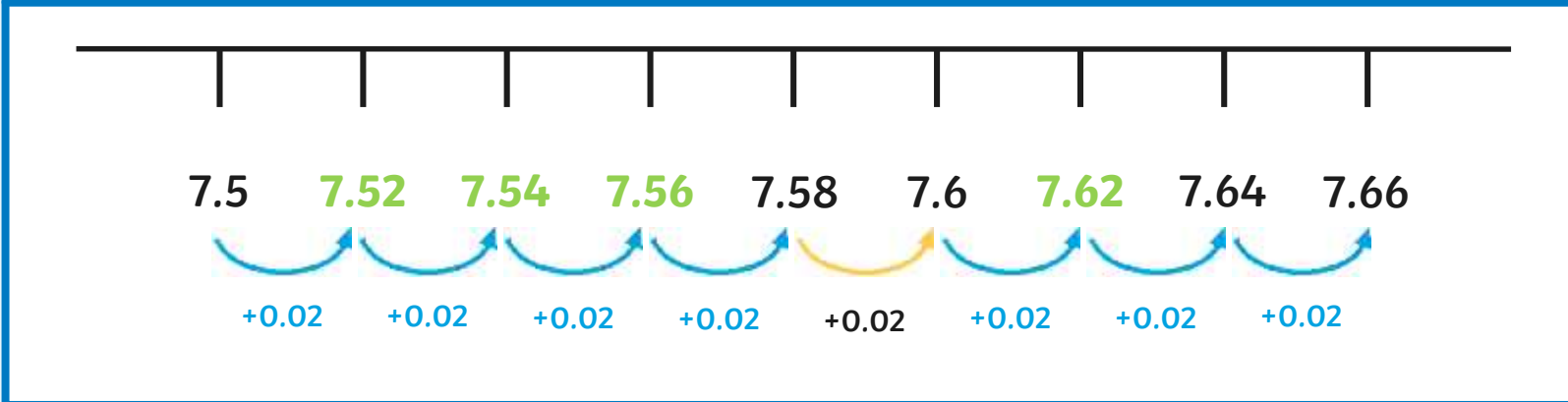
This sequence is decreasing by two eighths, or $\frac{2}{8}$ s, each time..



Decimal Sequences



Some decimal sequences can be trickier to solve. Look at this example.
Can you work out how it is increasing?



Look at the difference between the two terms that are next to each other.
How can we get from 7.58 to 7.6?

The difference between these two terms is 0.02.

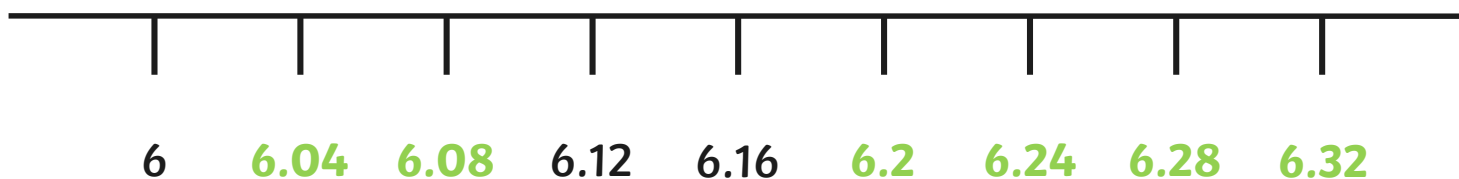
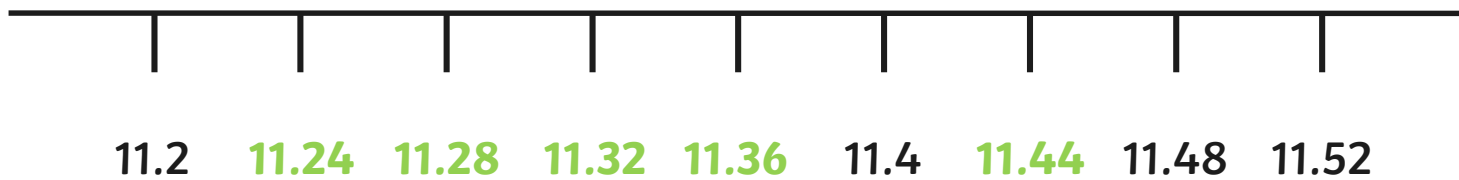
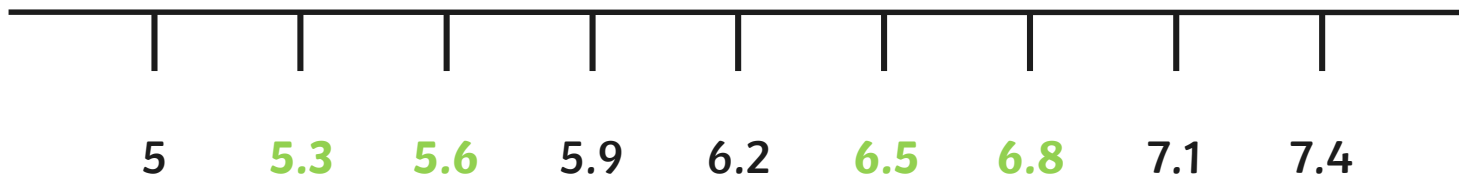
So we know the sequence is increasing in 0.02s.

Can you find the missing terms?

Decimal Sequences



Can you solve one of these decimal number line sequences?

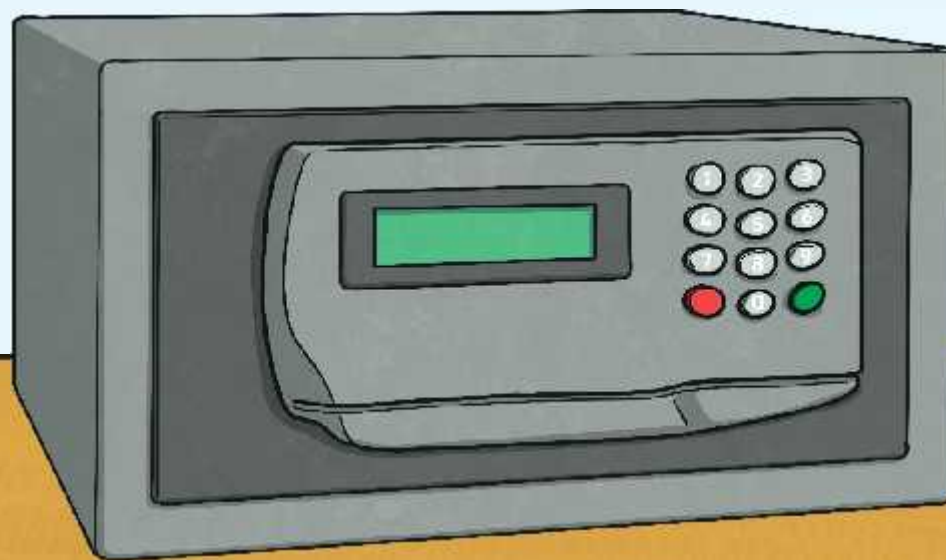


Crack the Code



On your **Crack the Code Activity Sheet**, you will see a picture of a safe. It is locked and your job is to crack the code and open it!

You need to solve the eight sequences to find the numbers to crack the code and open the safe.



Crack the Code



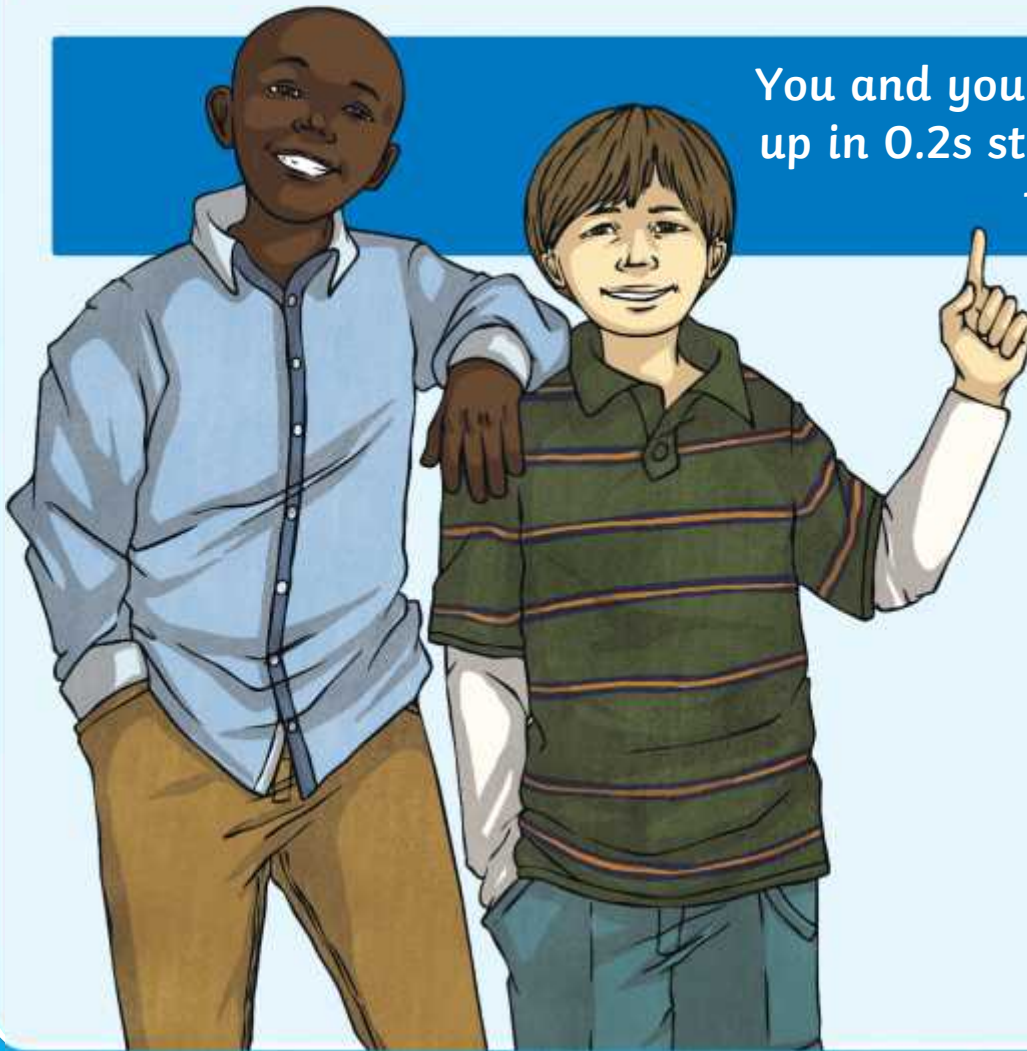
Did you crack the code?



Counting Challenge



You and your partner are going to count up in 0.2s starting from 0. You will take turns to say a number each.



Decide who is going to start counting.

Which partner do you think will say 1.4?

Who will be the first to say a number greater than 3?

Now, start counting!

Counting Challenge



Now try counting back in 0.3s from 10. You will take turns to say a number each.

Decide who is going to start counting.

Which partner do you think will say 8.5?

Who will be the first to say a number smaller than 5?

Now, start counting!



Aim



- I can order and compare numbers up to 10 000 000.

Success Criteria

- I can order sequences of whole numbers, fractions and decimals.
- I can place missing whole numbers, fractions and decimals on number lines.

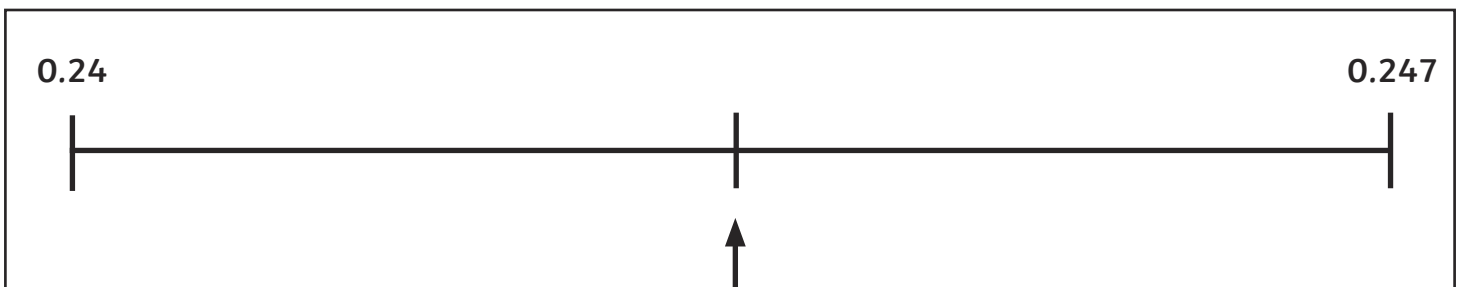
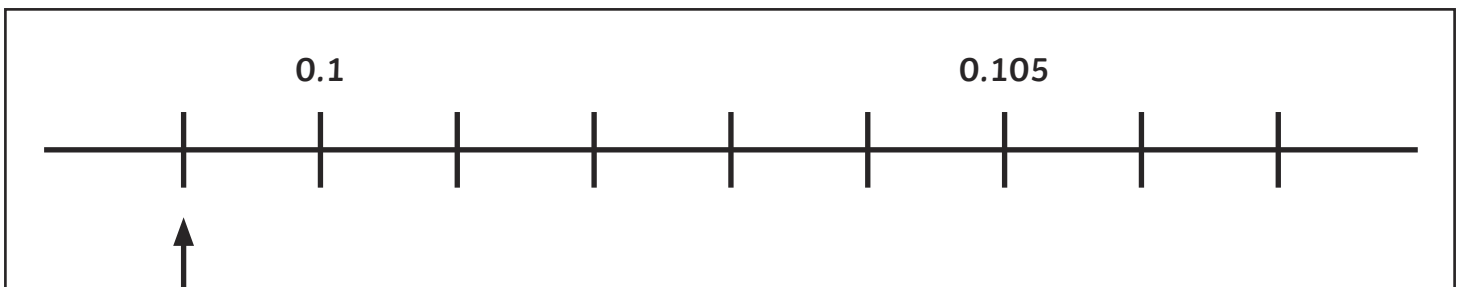
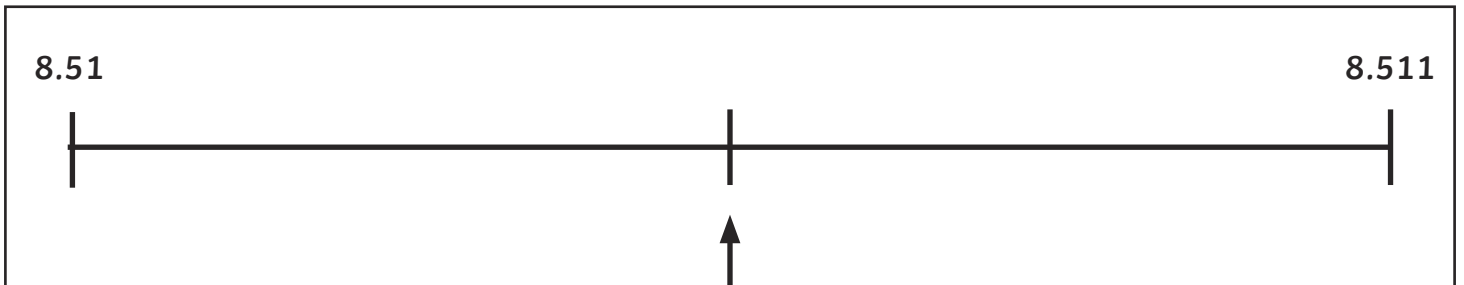
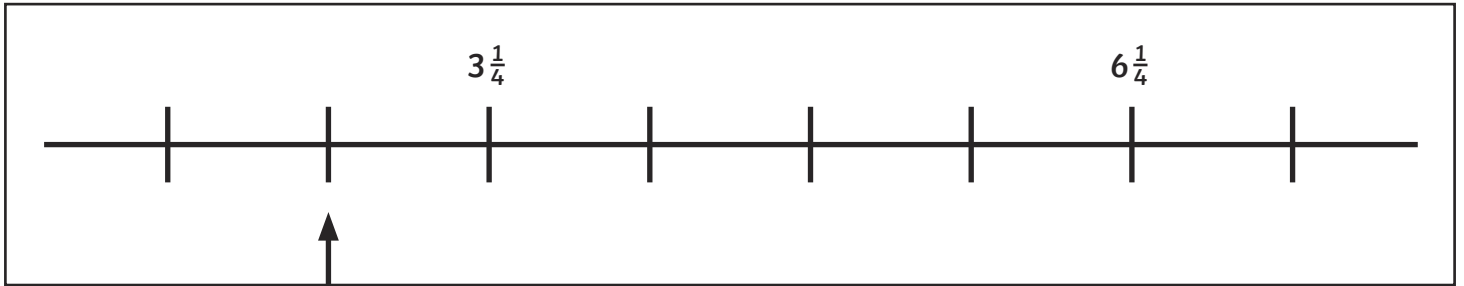
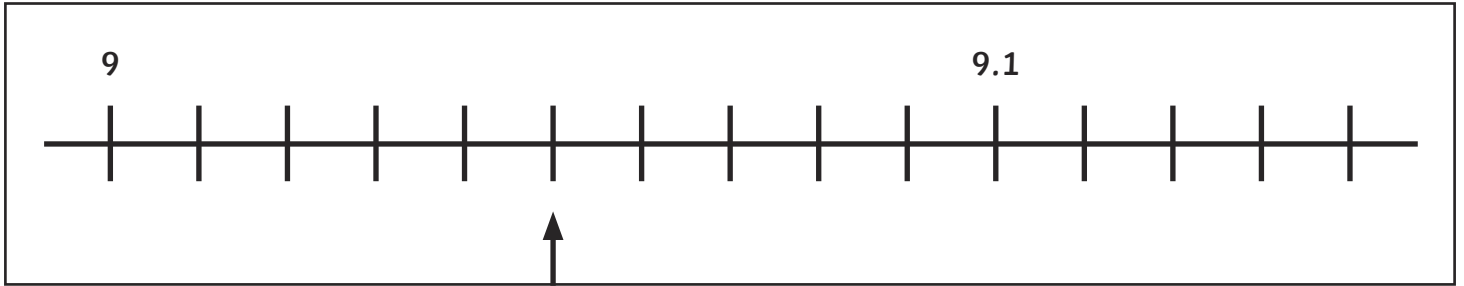


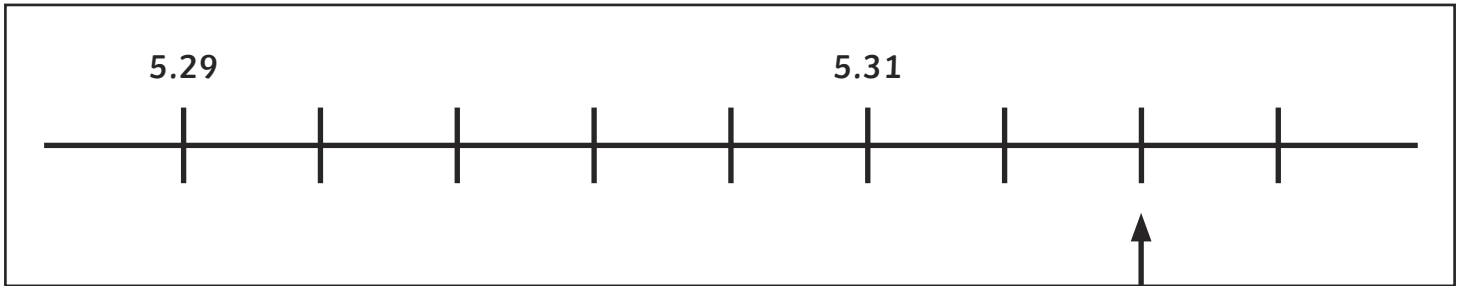
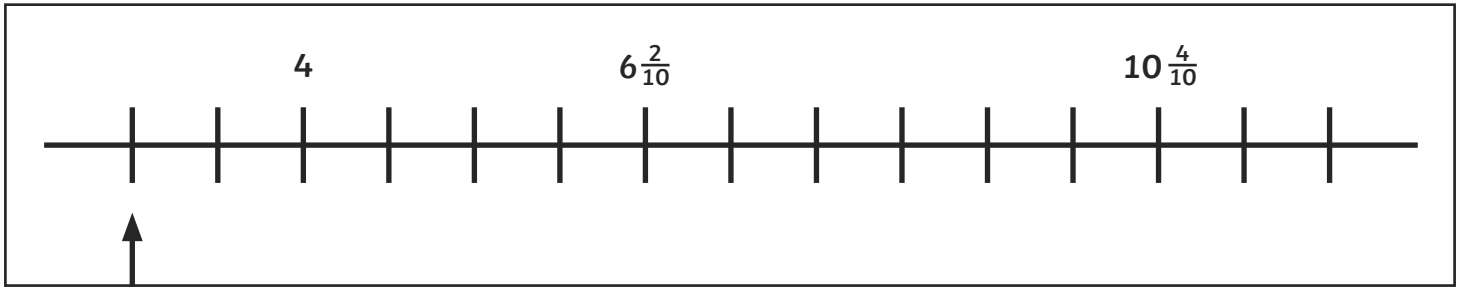
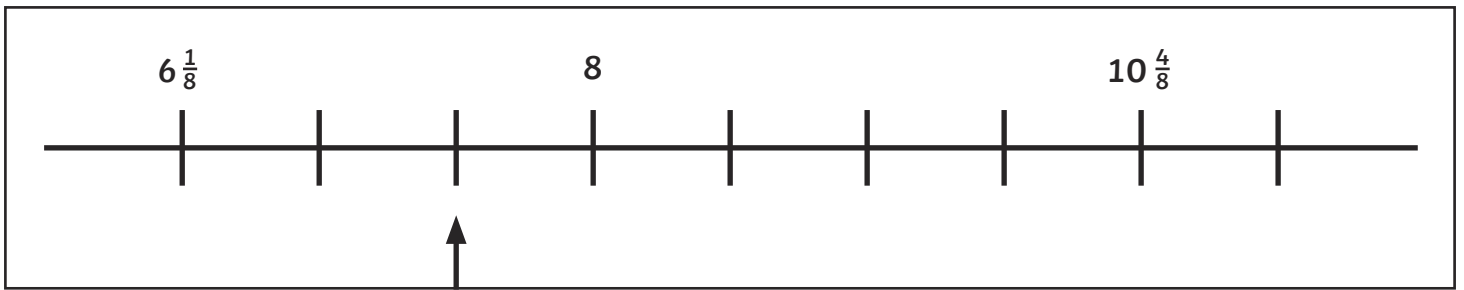
Crack the Code Extra Challenge

I can use number lines to order sequences of whole numbers, fractions and decimals.



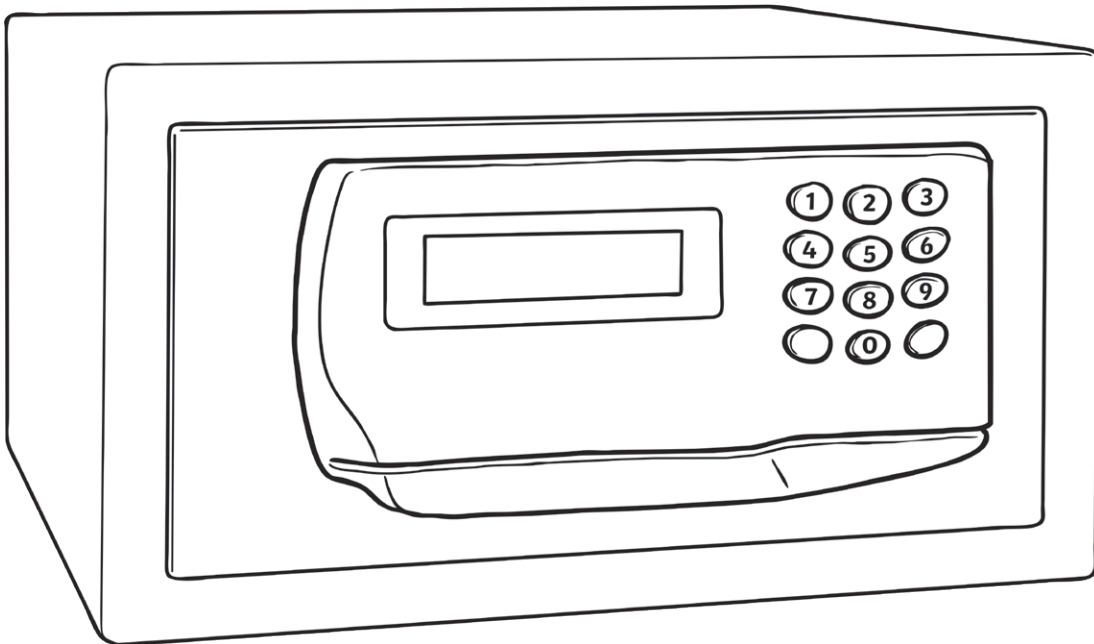
Find the missing terms in the sequences below. Use the missing terms that the arrows are pointing at to crack the code and open the safe.





Put the numbers that the arrows are pointing to in order from smallest to biggest. The highlighted number below is the code for the safe!

| | | | | | | | |
|--|--|--|--|--|--|--|--|
| | | | | | | | |
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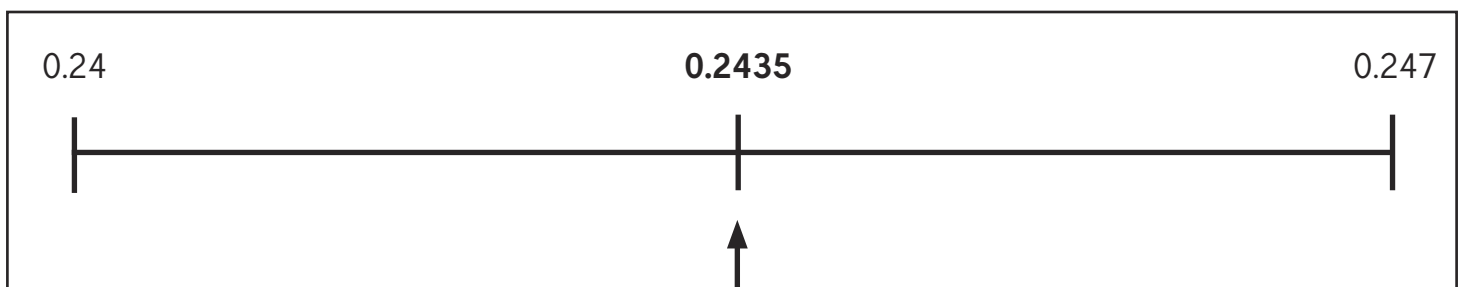
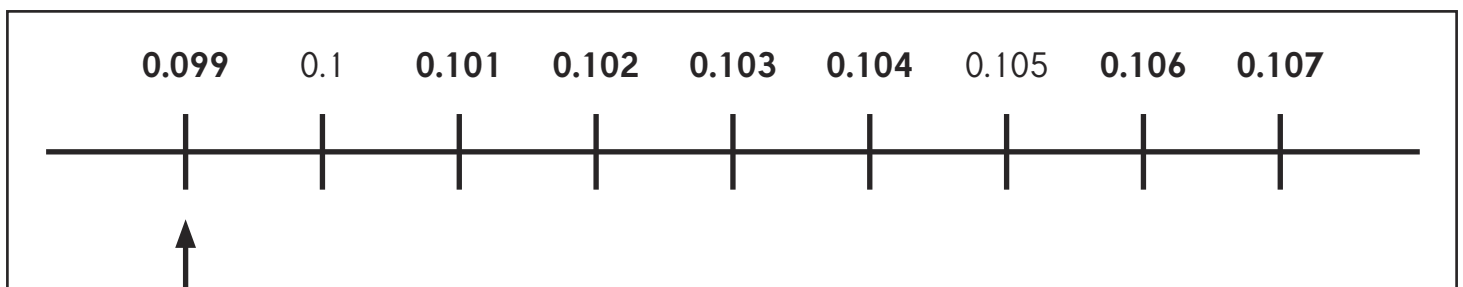
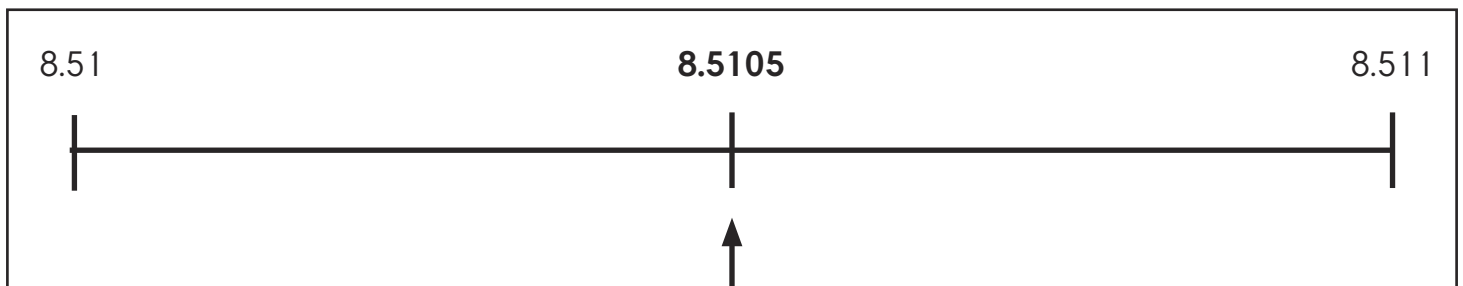
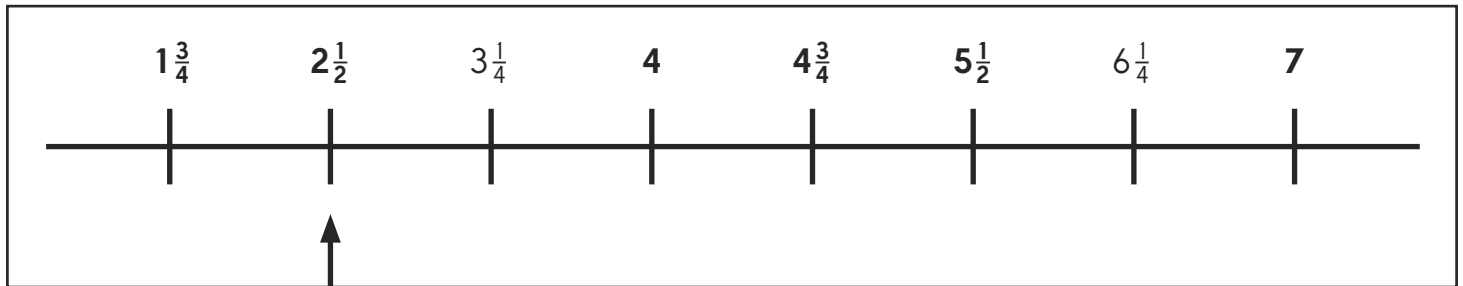
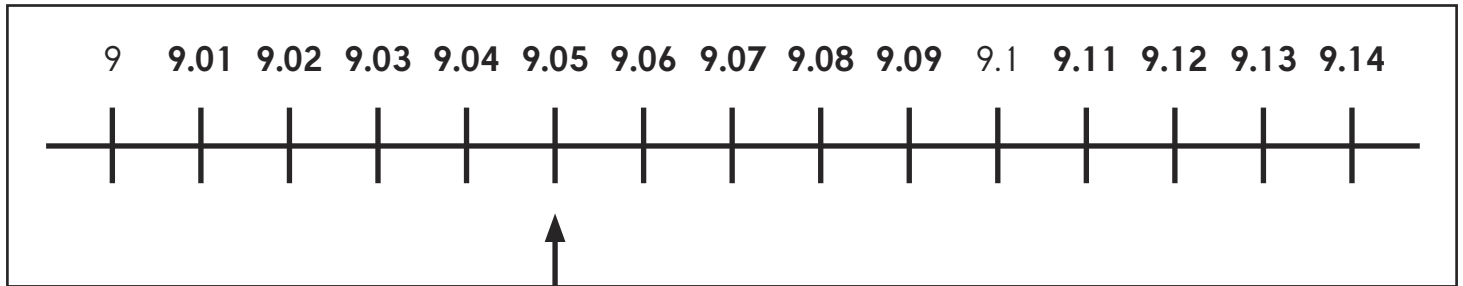
Write the code onto the display panel of the safe.

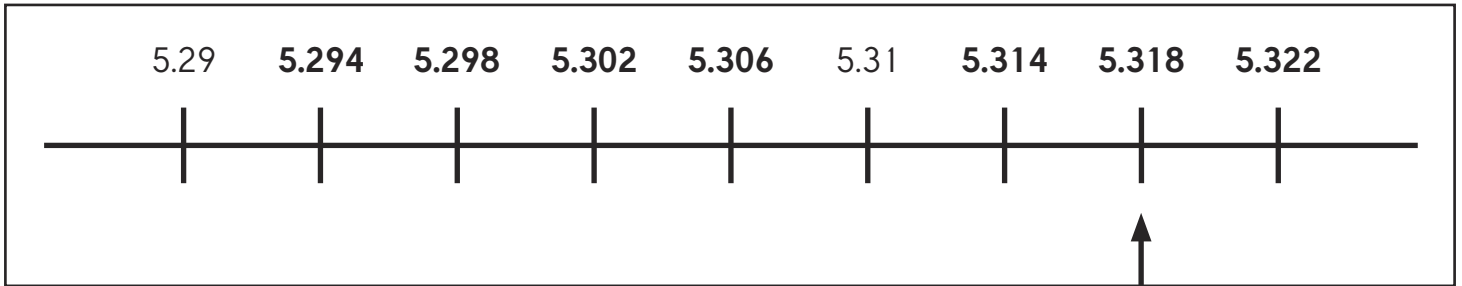
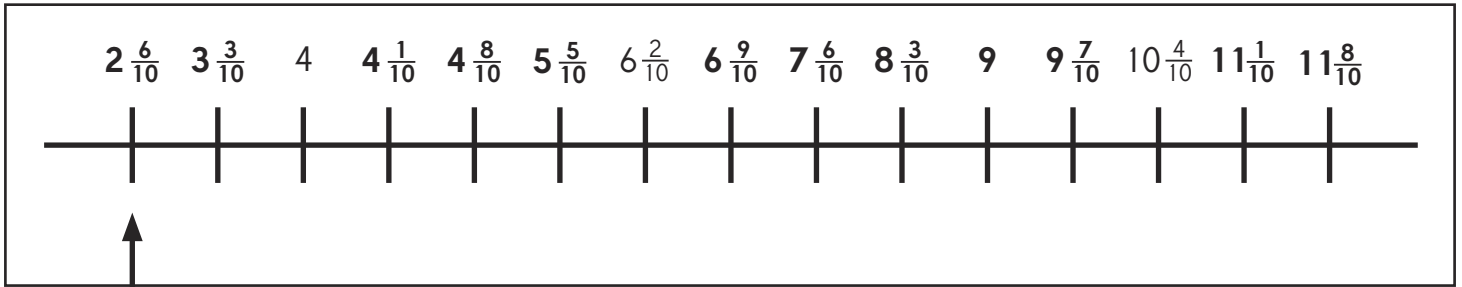
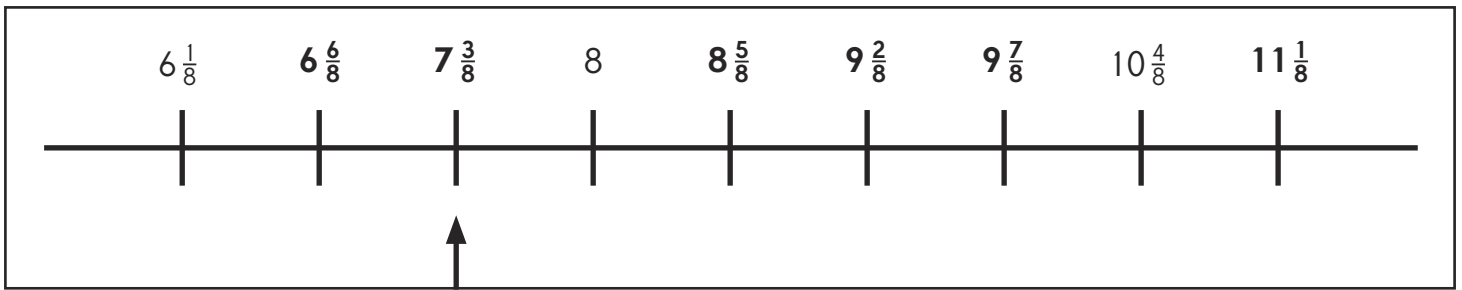
Crack the Code Extra Challenge – Answers

I can use number lines to order sequences of whole numbers, fractions and decimals.



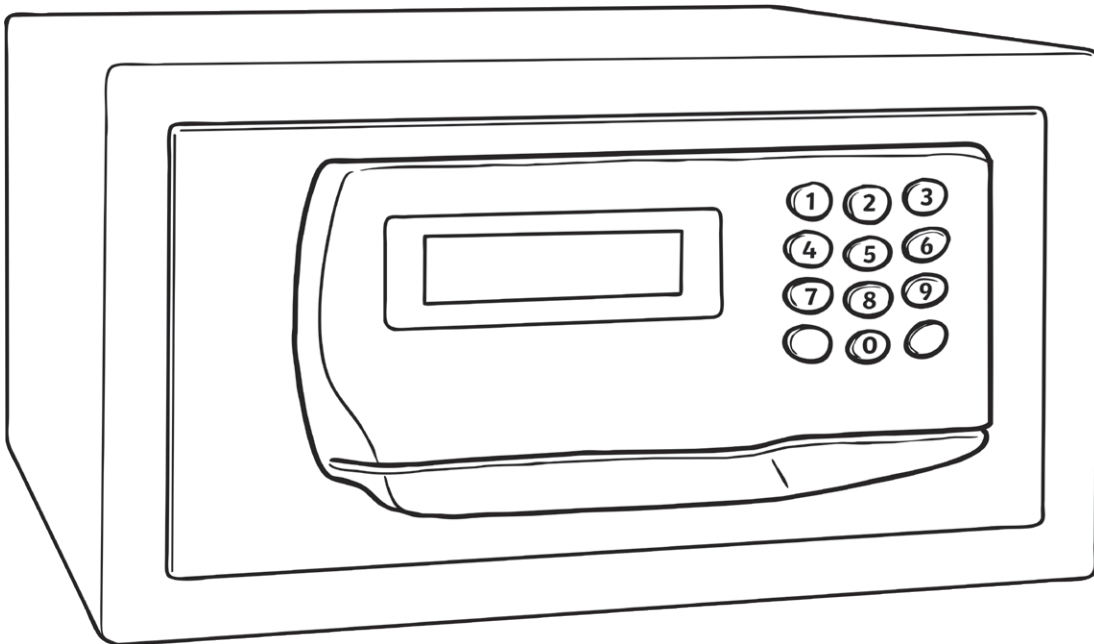
Find the missing terms in the sequences below. Use the missing terms that the arrows are pointing at to crack the code and open the safe.





Put the numbers that the arrows are pointing to in order from smallest to biggest. The highlighted number below is the code for the safe!

| | | | | | | | |
|-------|--------|-----------------|------------------|-------|-----------------|--------|------|
| 0.099 | 0.2435 | 2 $\frac{1}{2}$ | 2 $\frac{6}{10}$ | 5.318 | 7 $\frac{3}{8}$ | 8.5105 | 9.05 |
|-------|--------|-----------------|------------------|-------|-----------------|--------|------|



Write the code onto the display panel of the safe.

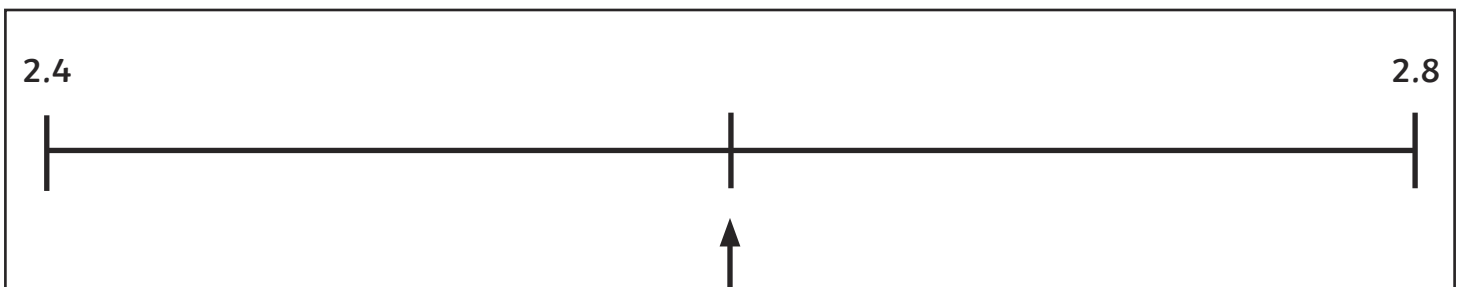
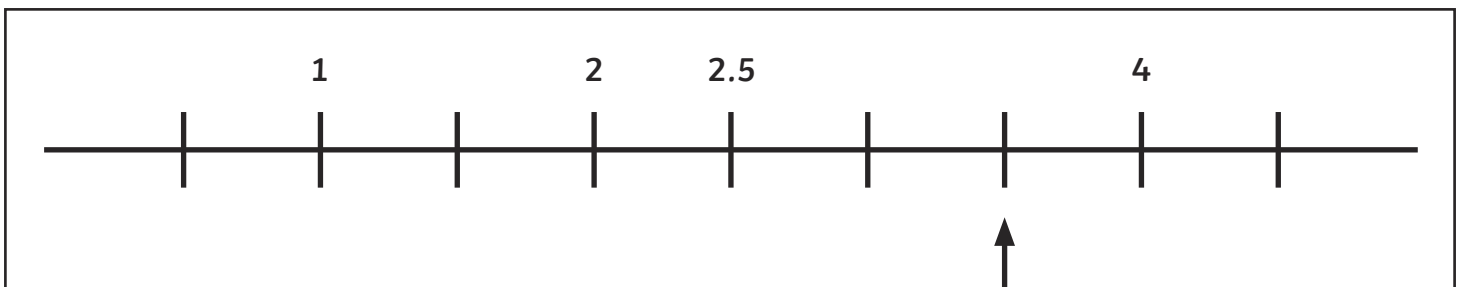
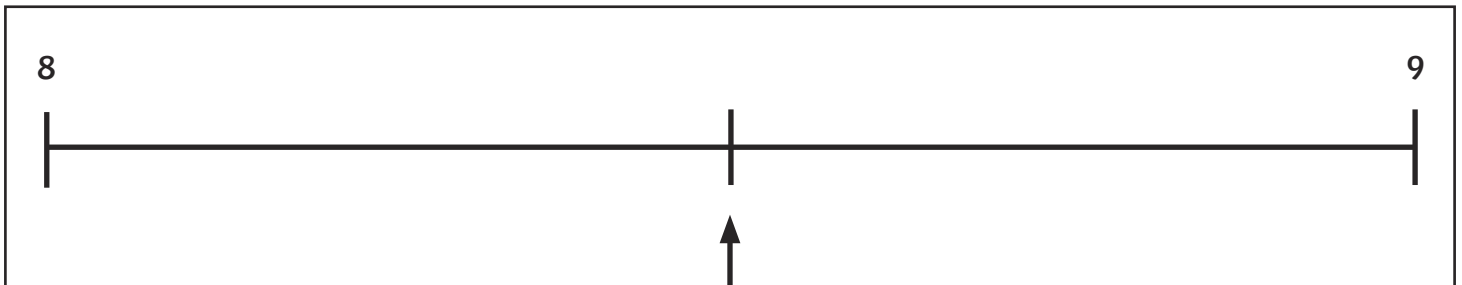
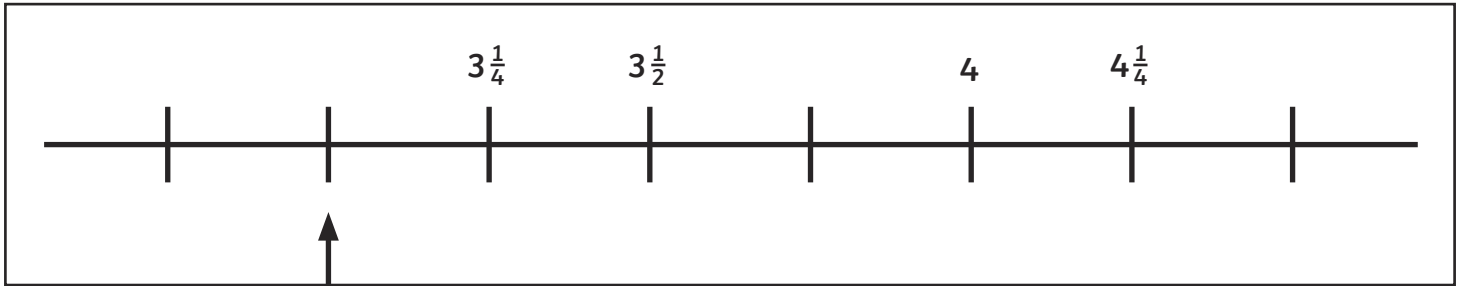
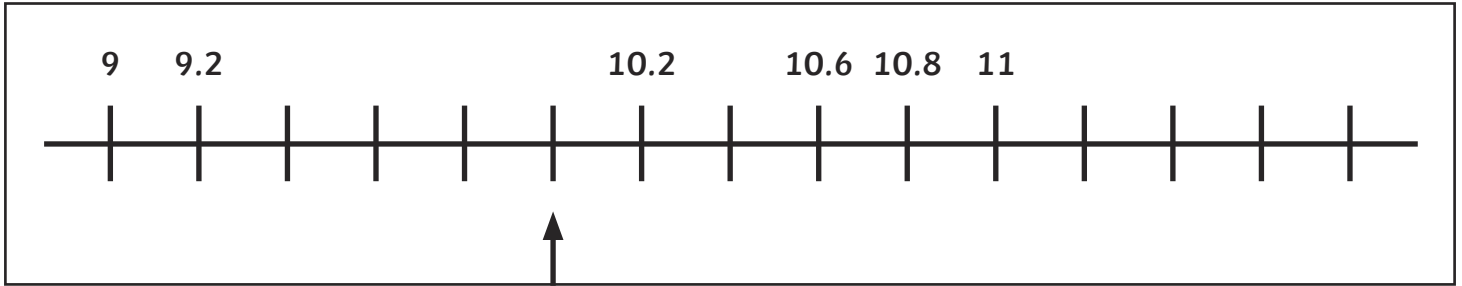


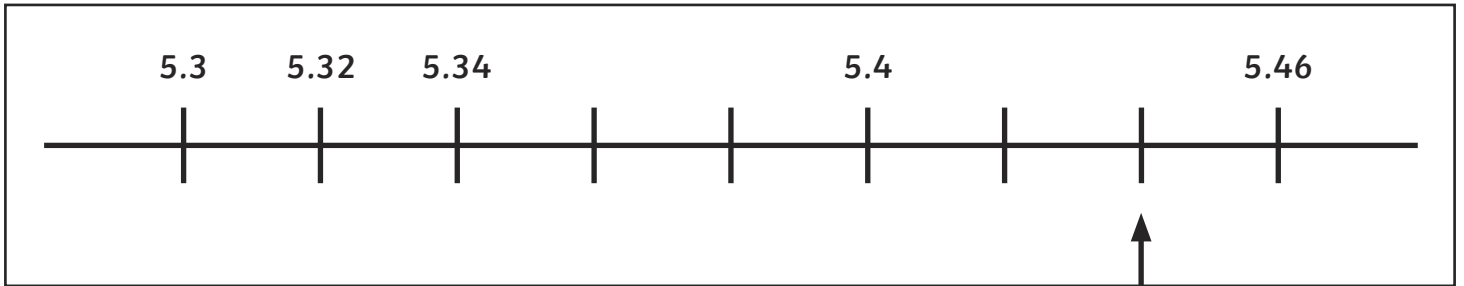
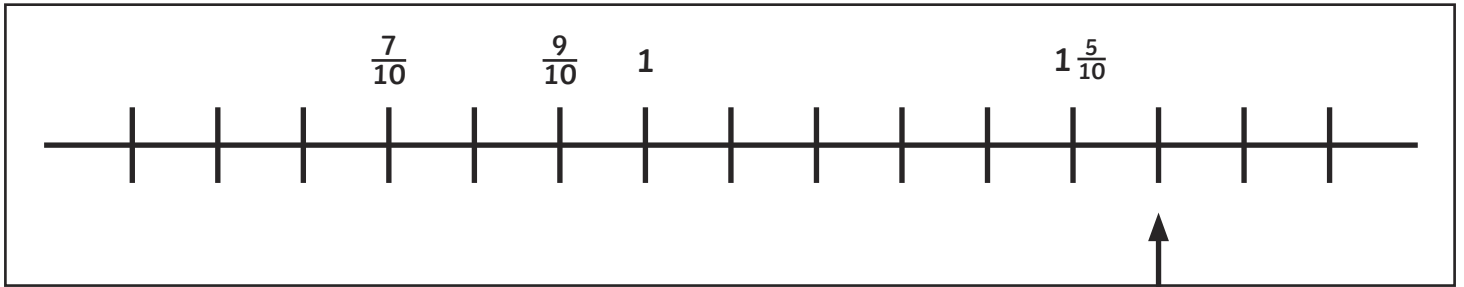
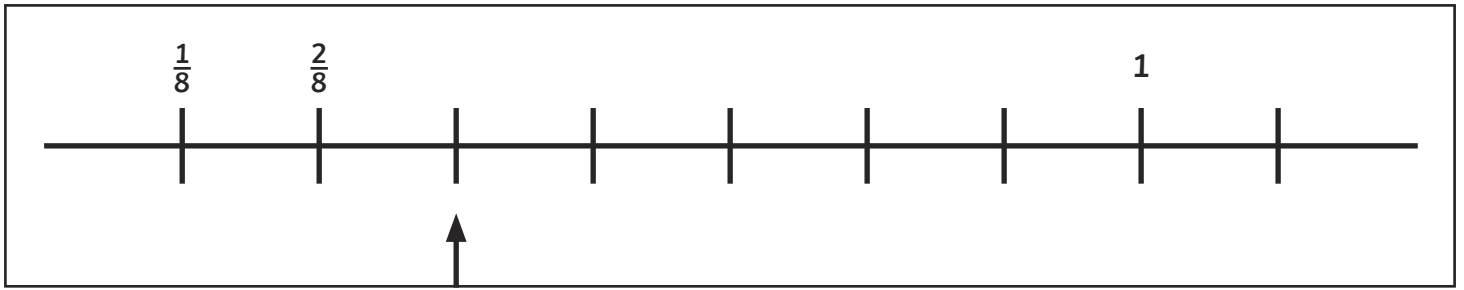
Crack the Code

I can use number lines to order sequences of whole numbers, fractions and decimals.



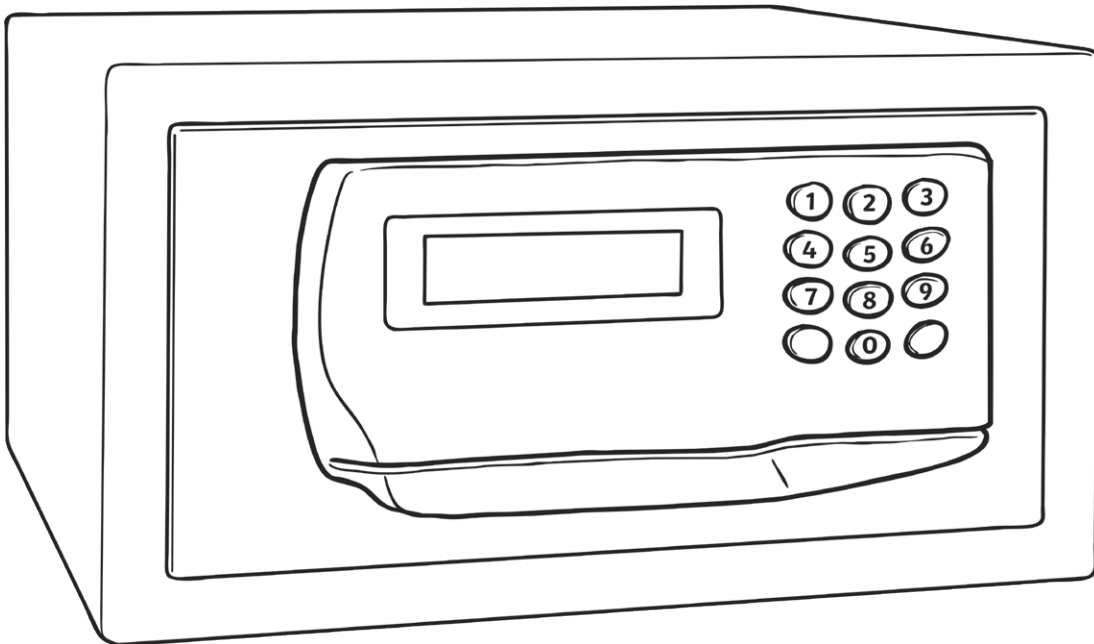
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Put the numbers that the arrows are pointing to in order from smallest to biggest. The highlighted number below is the code for the safe!

| | | | | | | | |
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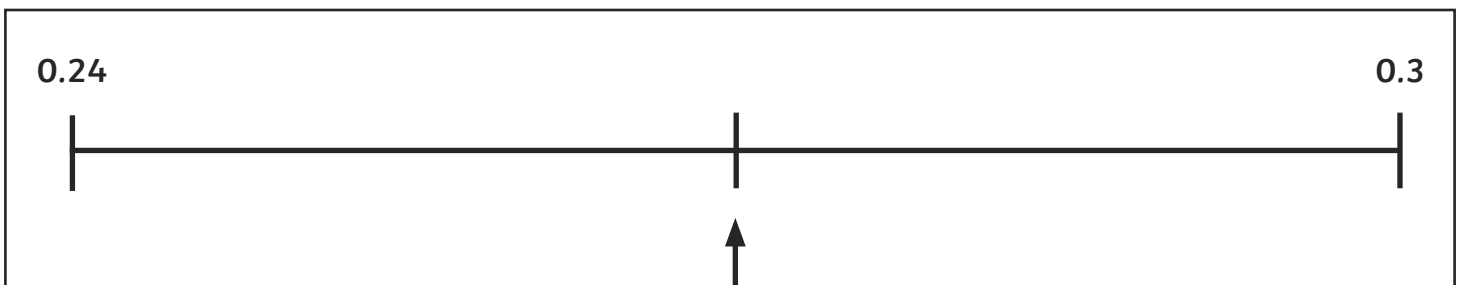
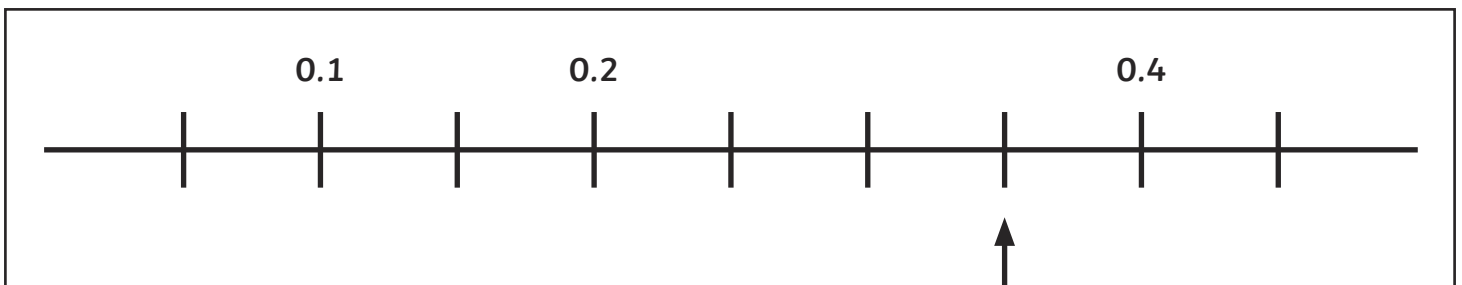
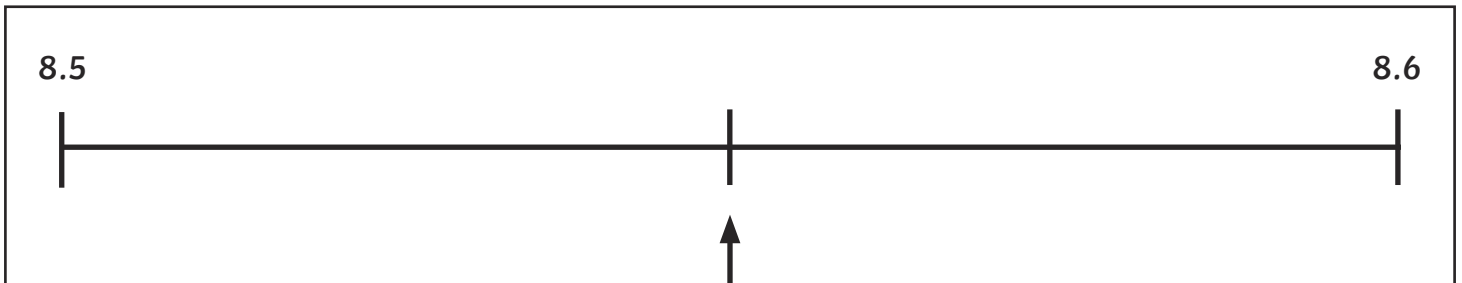
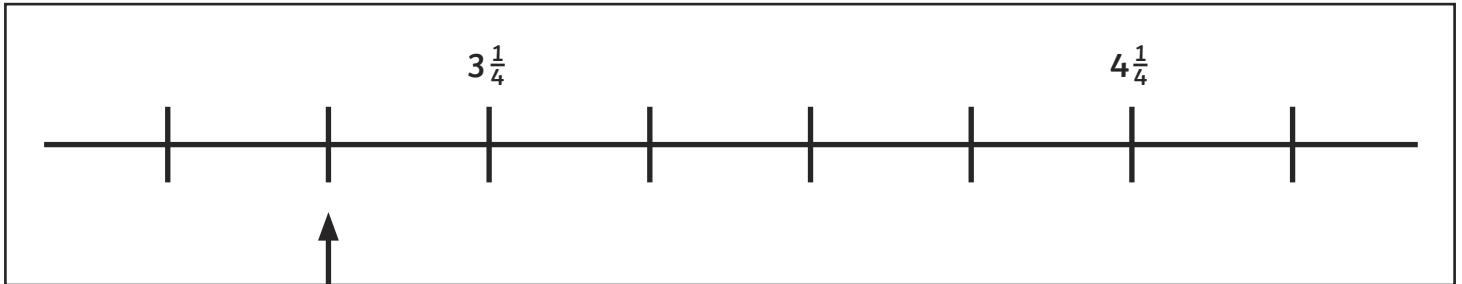
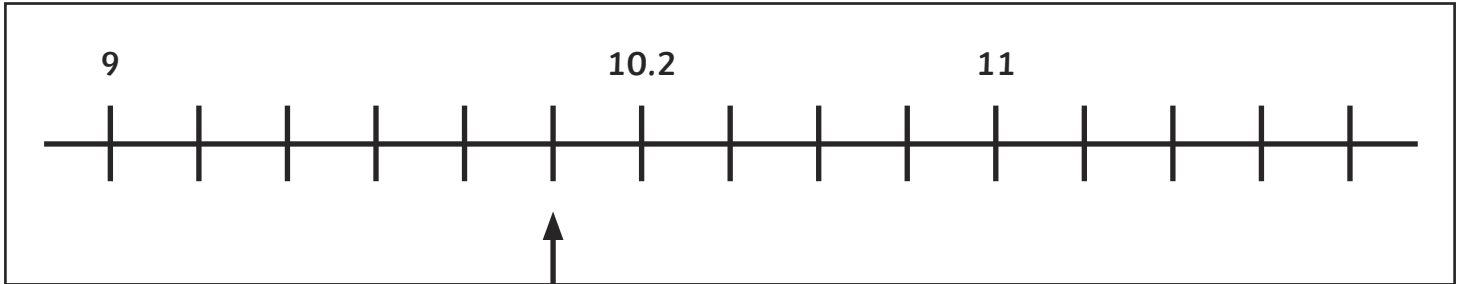


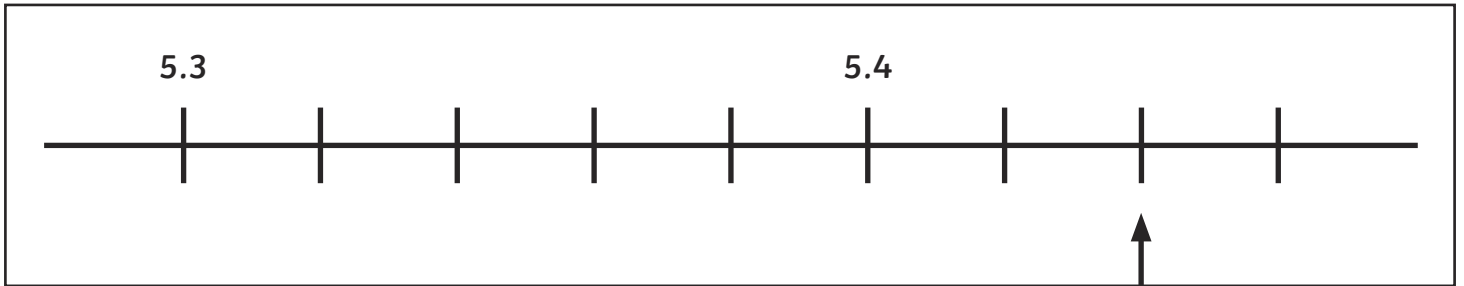
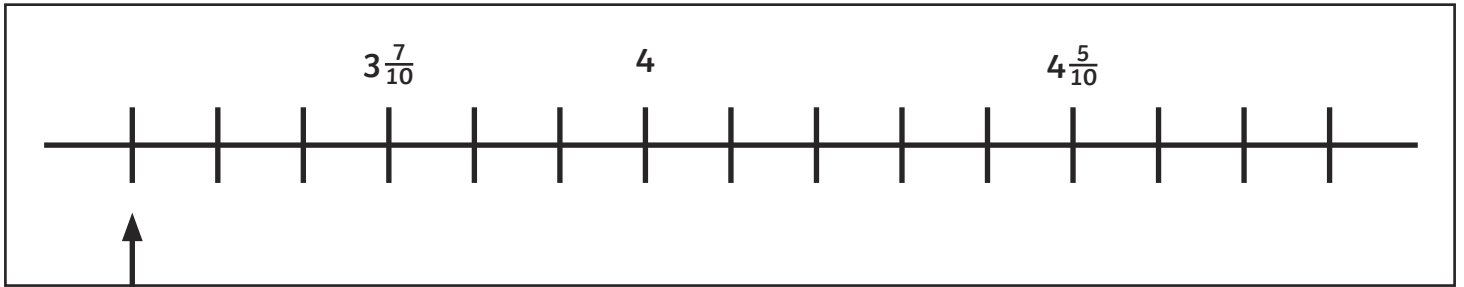
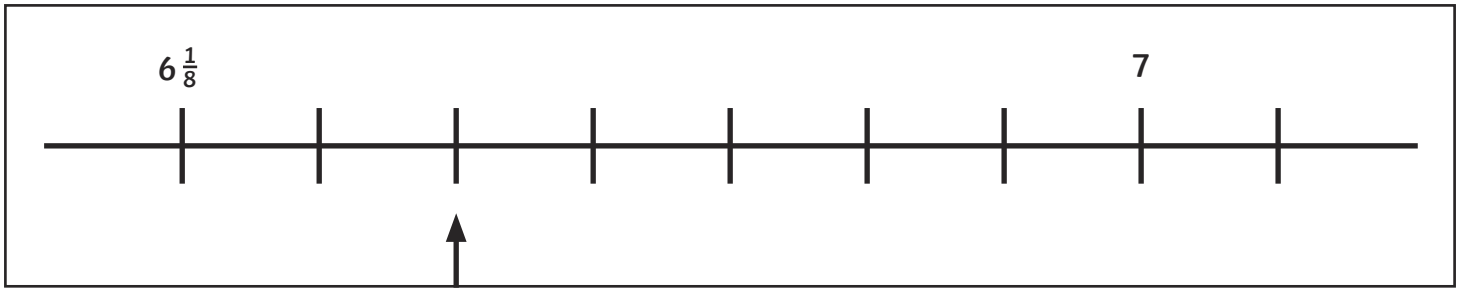
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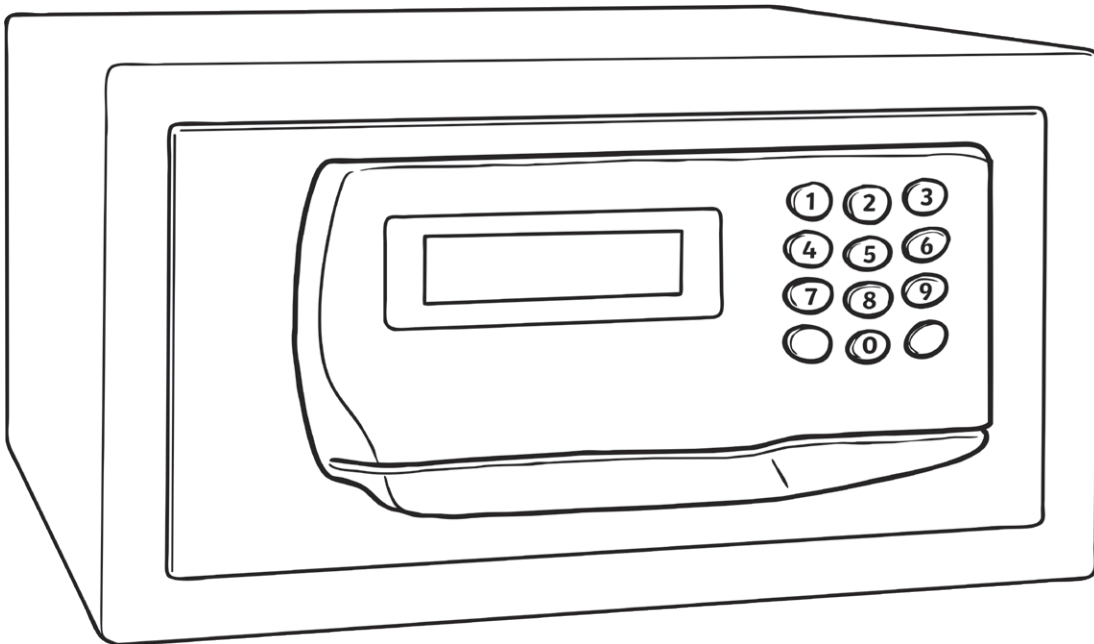
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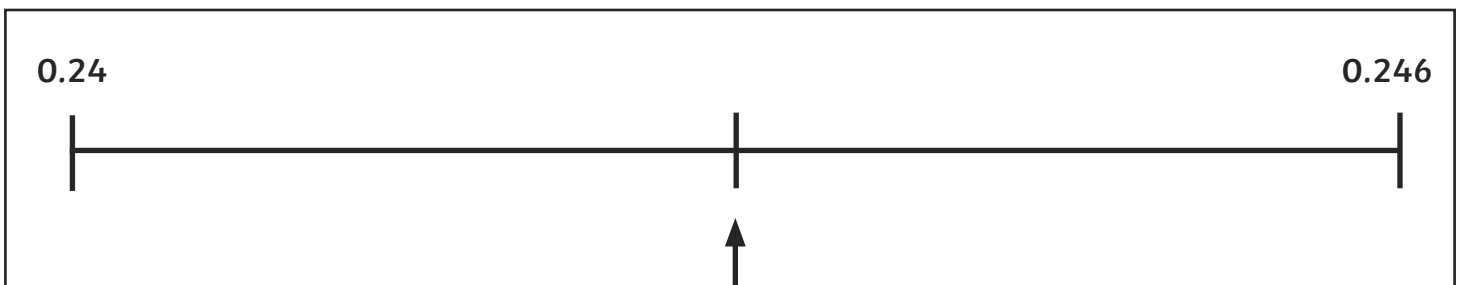
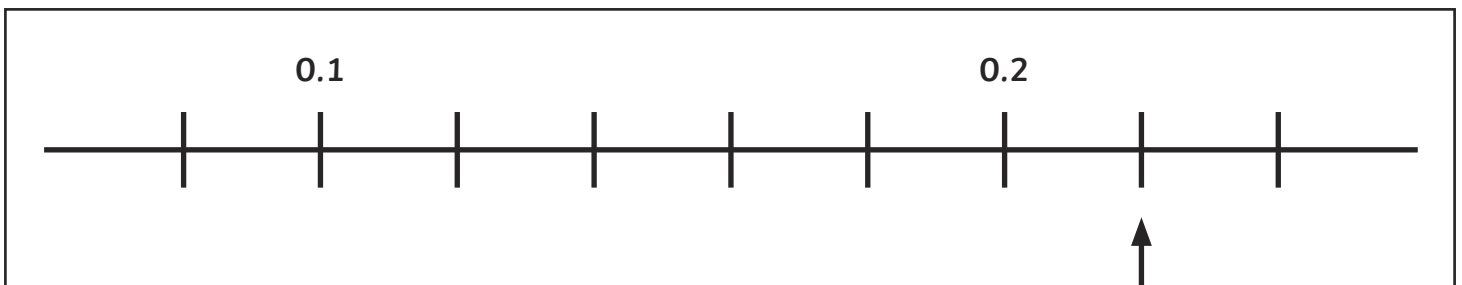
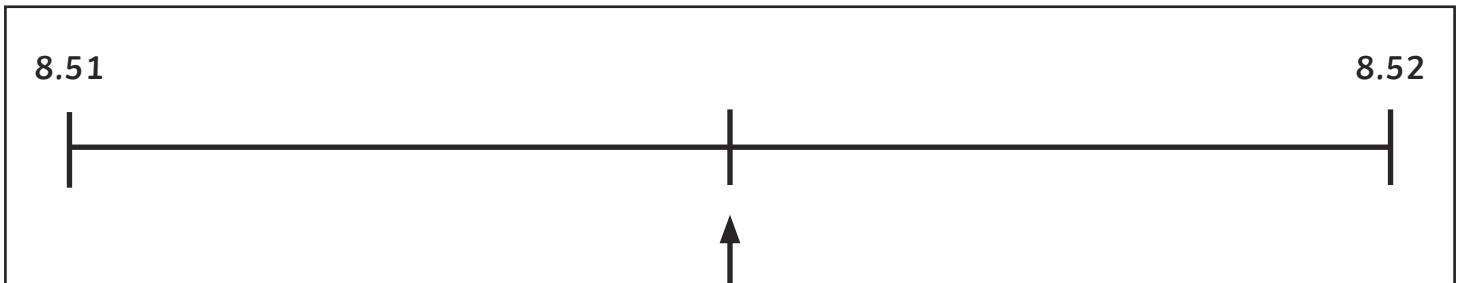
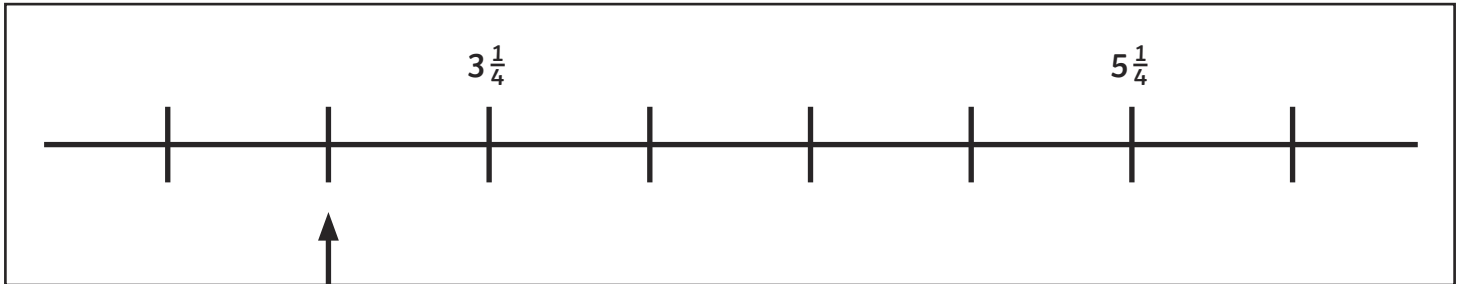
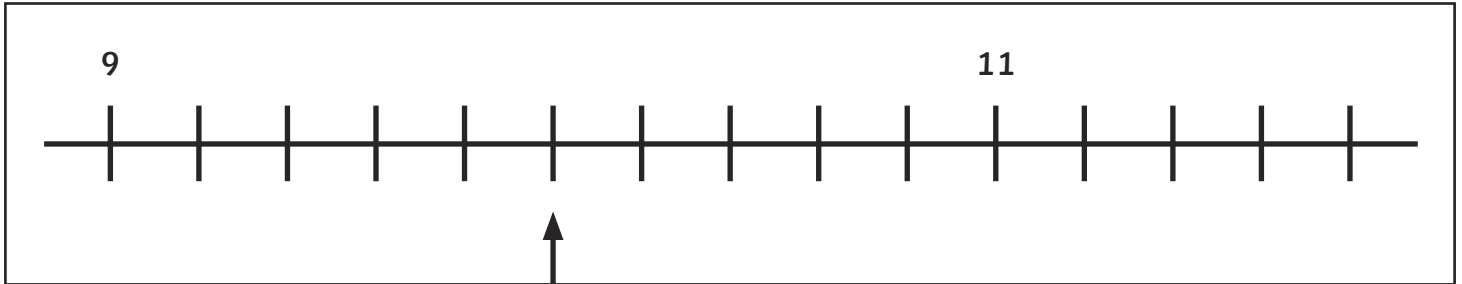


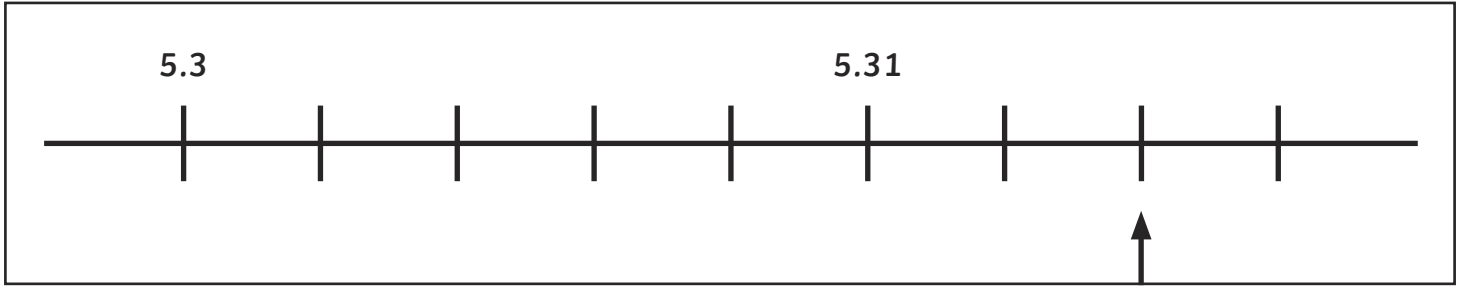
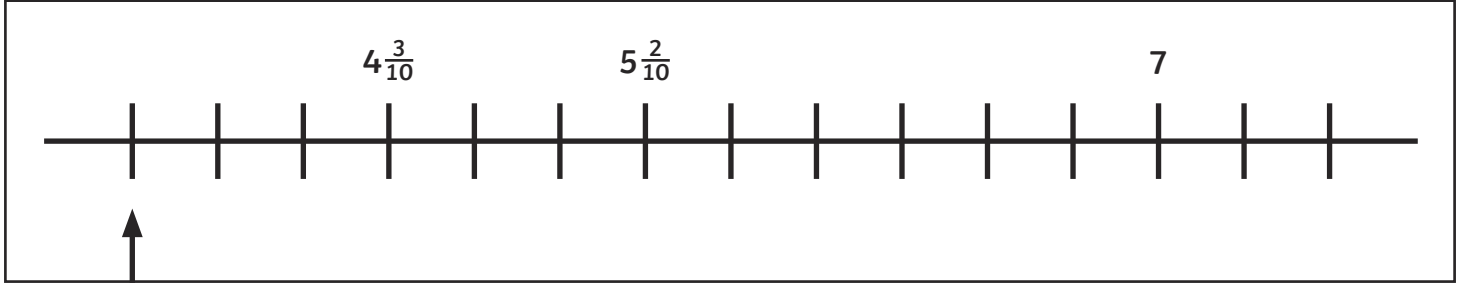
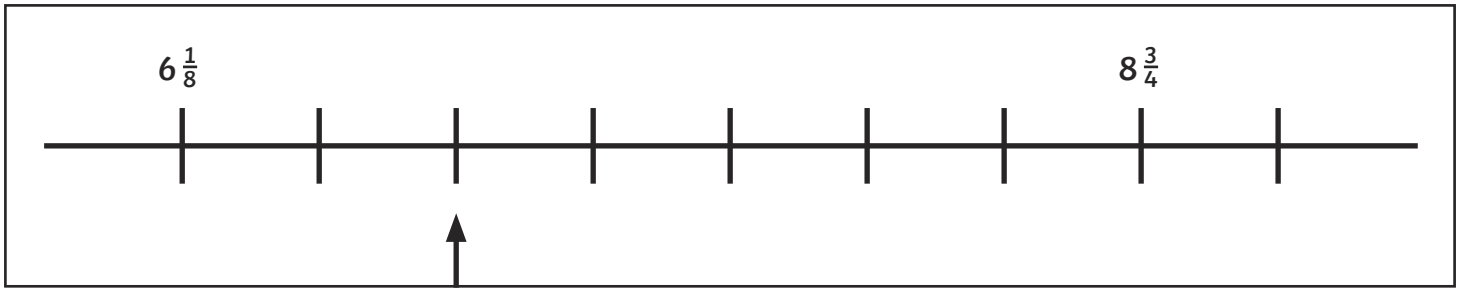
Crack the Code

I can use number lines to order sequences of whole numbers, fractions and decimals.



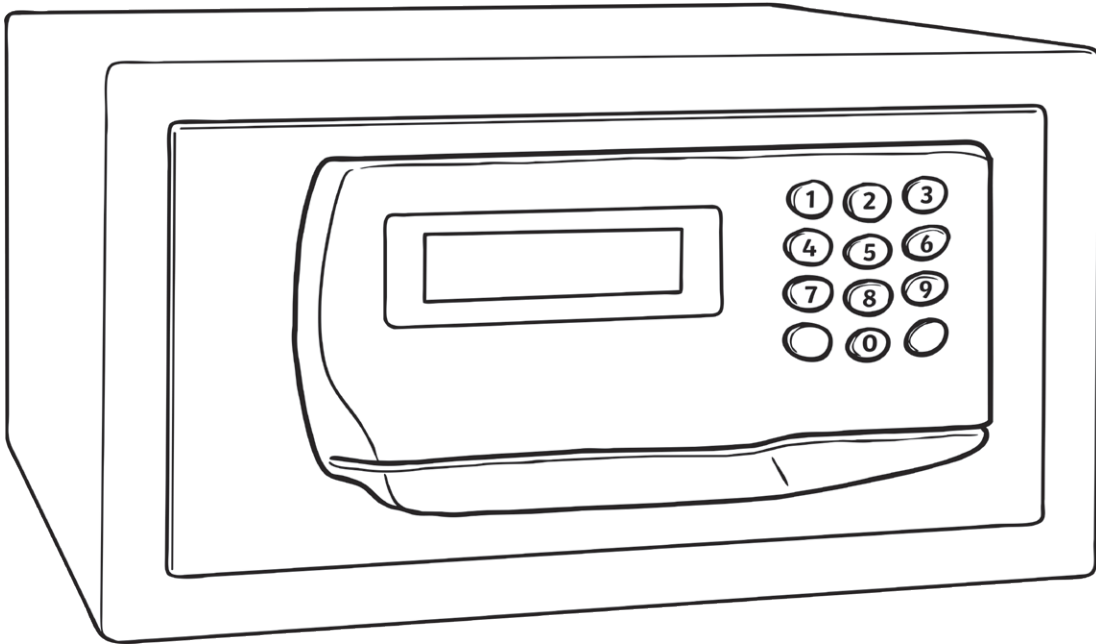
Find the missing terms in the sequences below. Use the missing terms that the arrows are pointing at to crack the code and open the safe.





Put the numbers that the arrows are pointing to in order from smallest to biggest. The highlighted number below is the code for the safe!

| | | | | | | | |
|--|--|--|--|--|--|--|--|
| | | | | | | | |
|--|--|--|--|--|--|--|--|



Write the code onto the display panel of the safe.

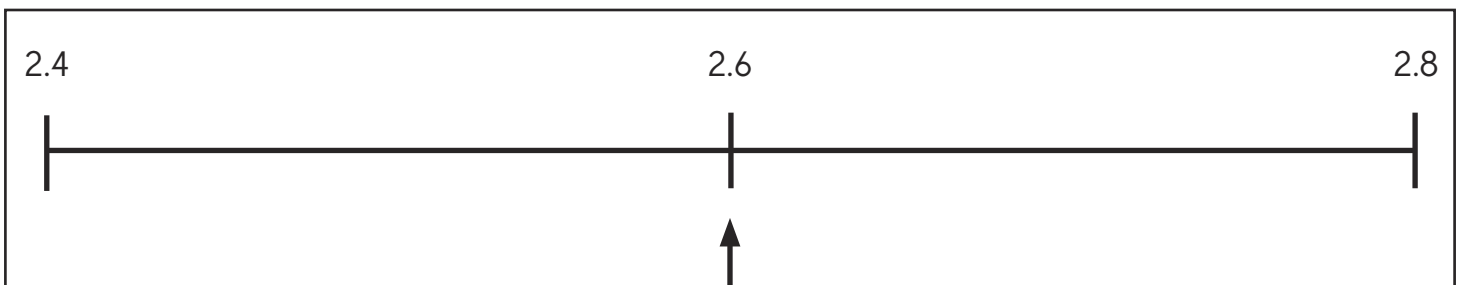
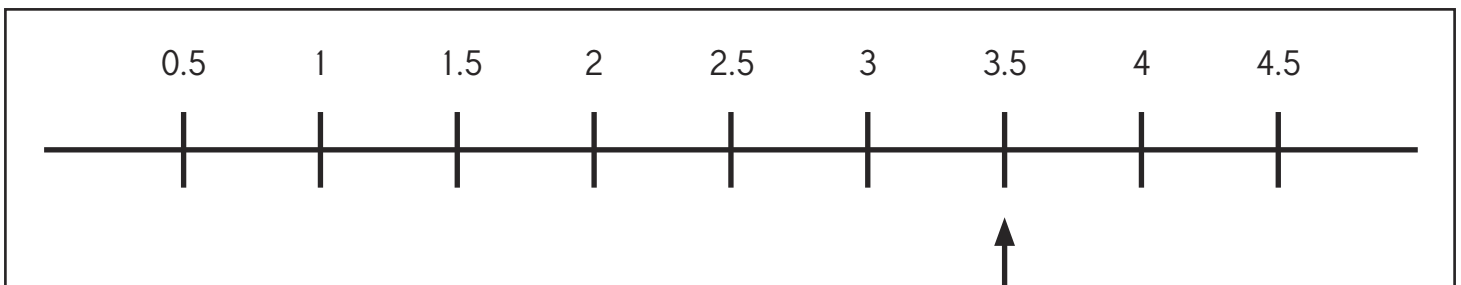
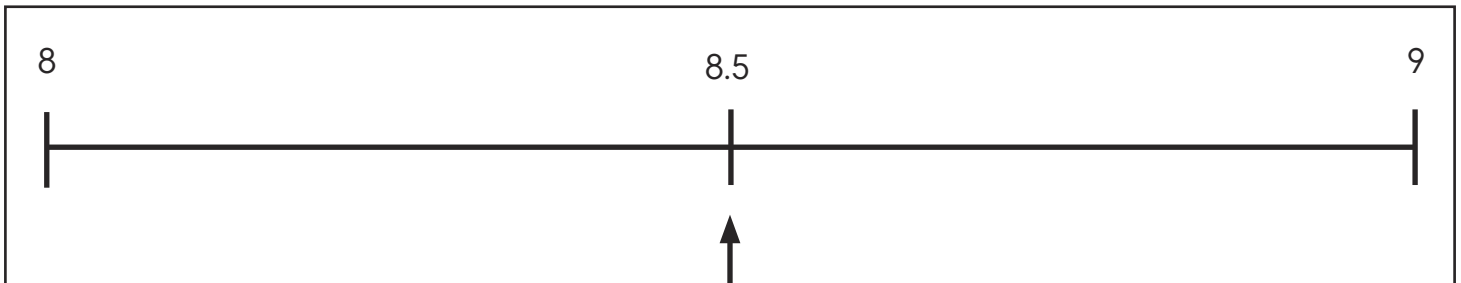
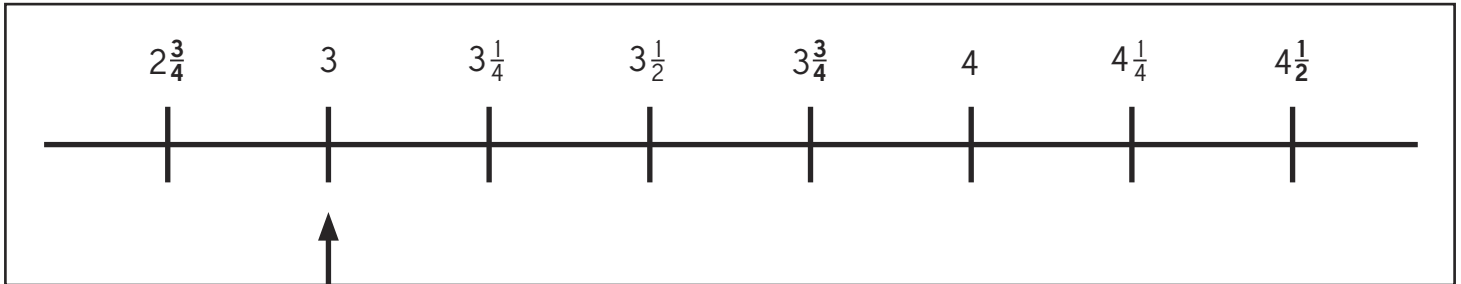
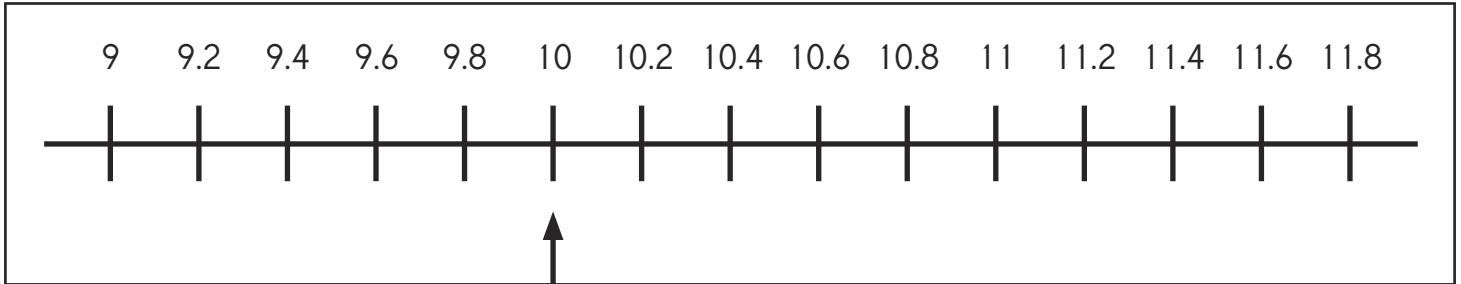


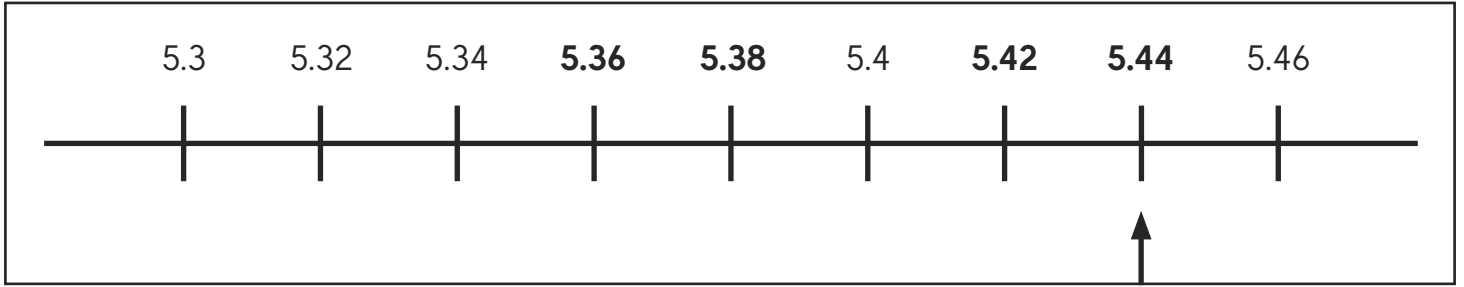
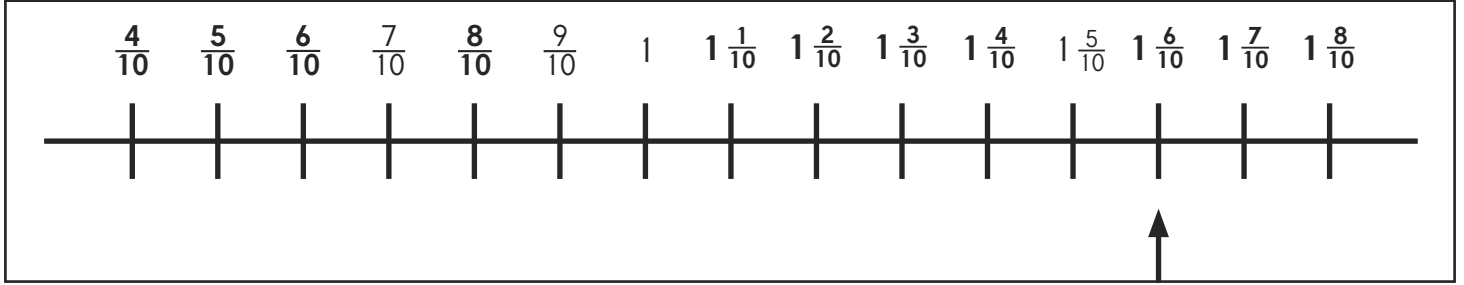
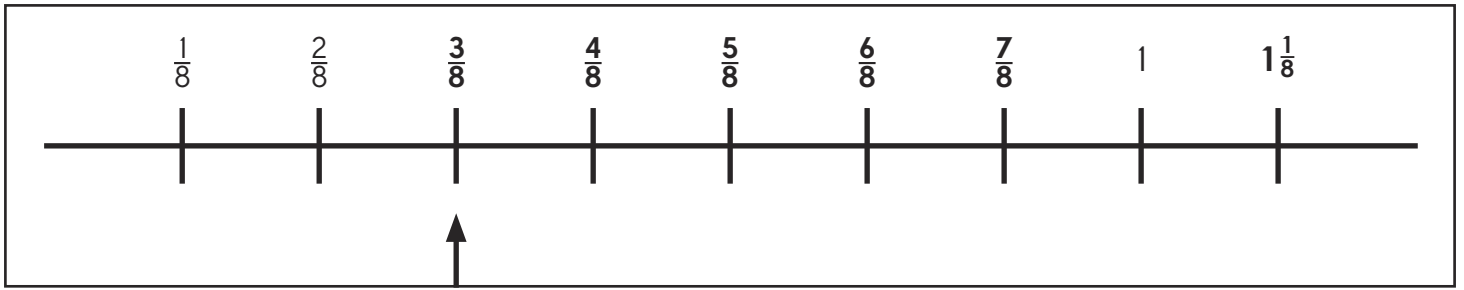
Crack the Code - Answers

I can use number lines to order sequences of whole numbers, fractions and decimals.



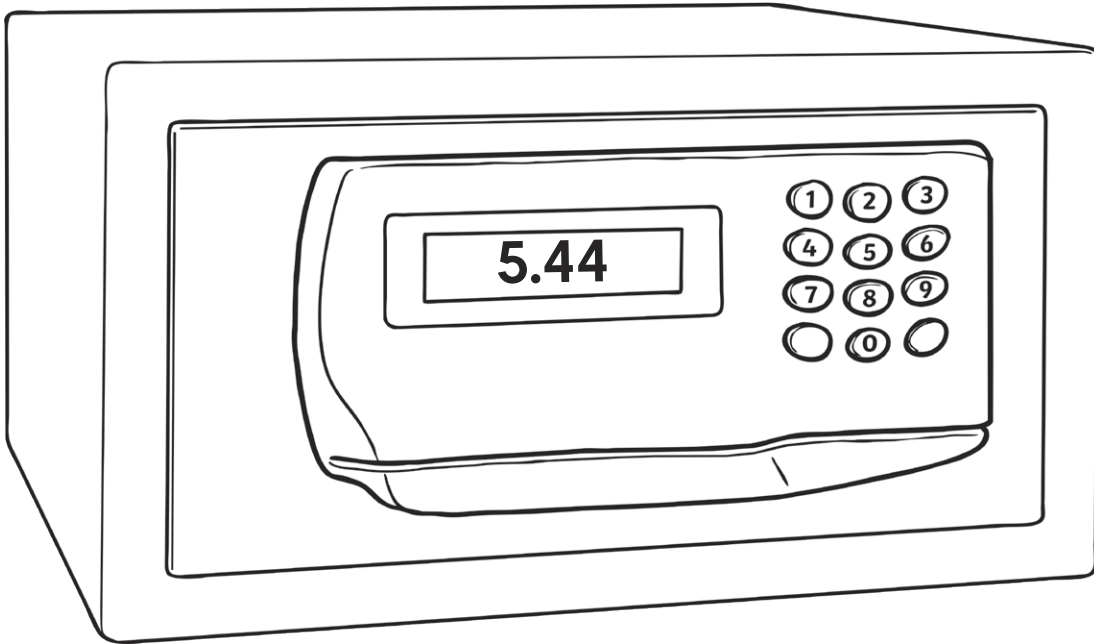
Find the missing terms in the sequences below. Use the missing terms that the arrows are pointing at to crack the code and open the safe.





Put the numbers that the arrows are pointing to in order from smallest to biggest. The highlighted number below is the code for the safe!

| | | | | | | | |
|---------------|-----------------|-----|---|-----|------|-----|----|
| $\frac{3}{8}$ | $1\frac{6}{10}$ | 2.6 | 3 | 3.5 | 5.44 | 8.5 | 10 |
|---------------|-----------------|-----|---|-----|------|-----|----|



Write the code onto the display panel of the safe.

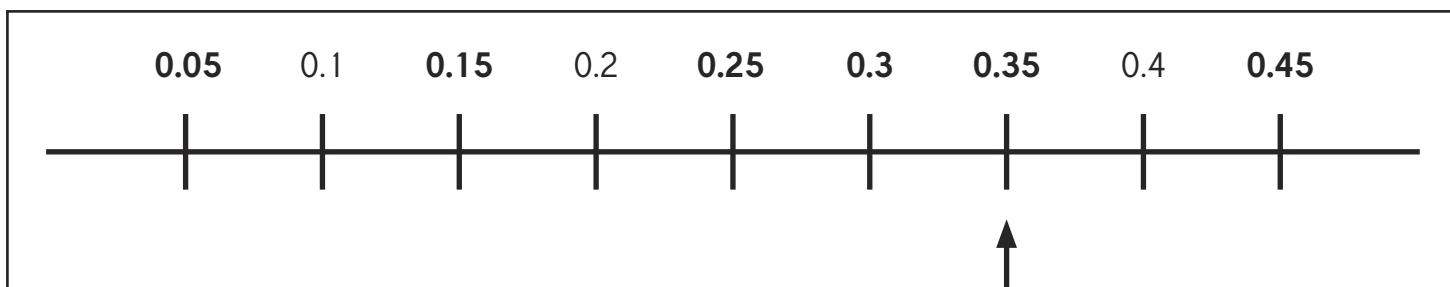
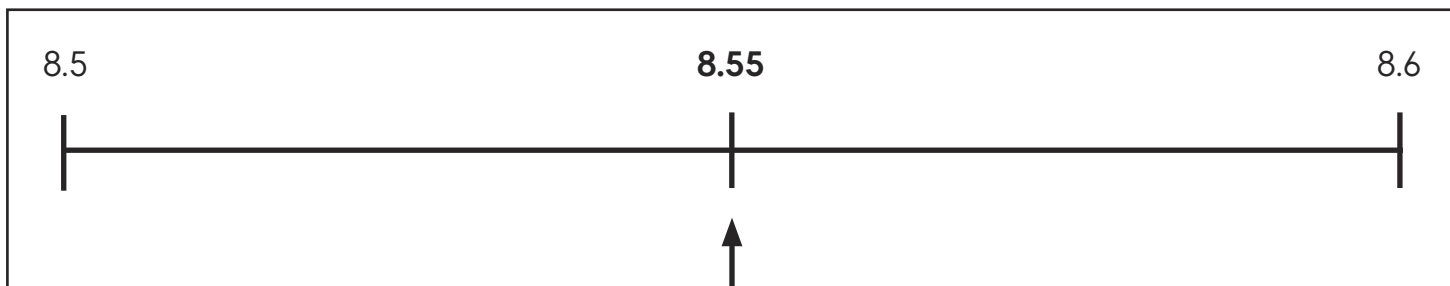
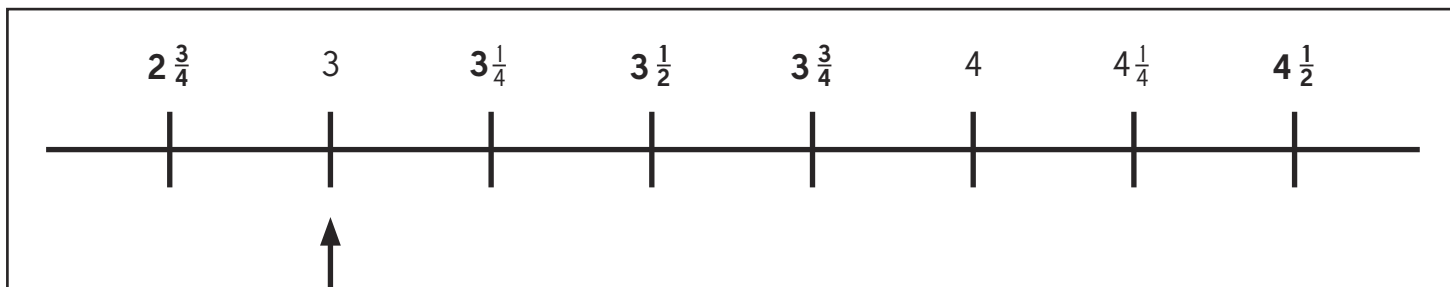
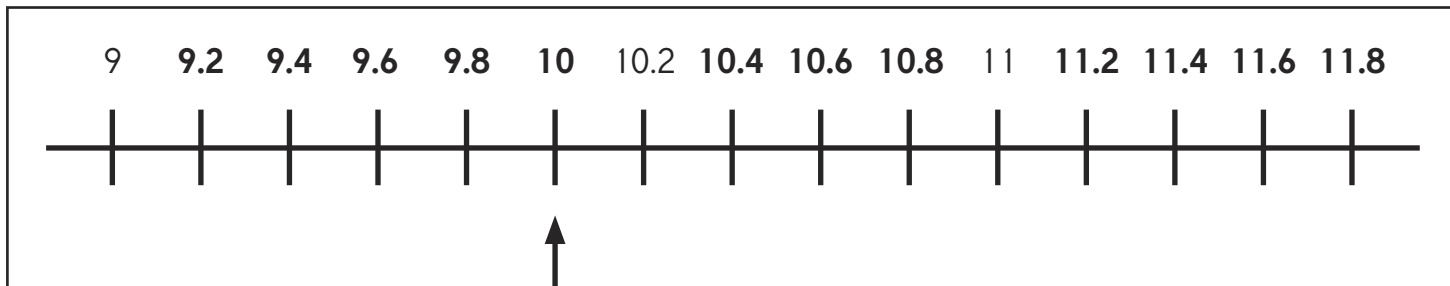


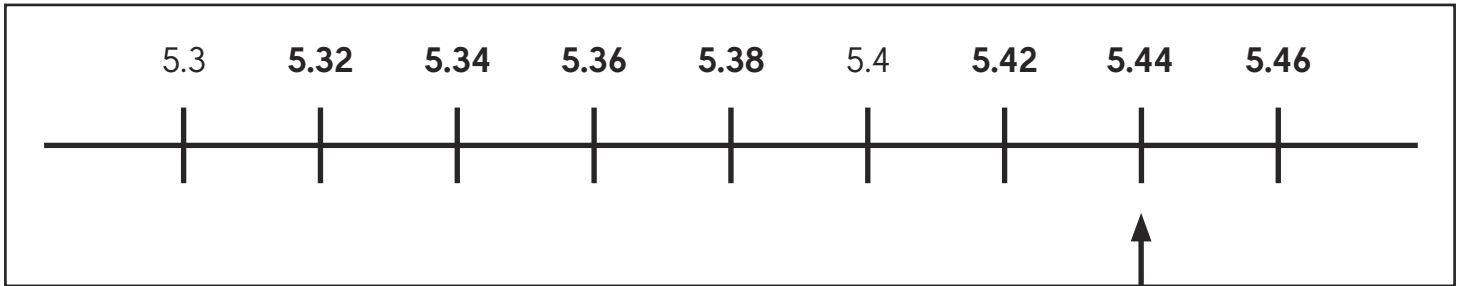
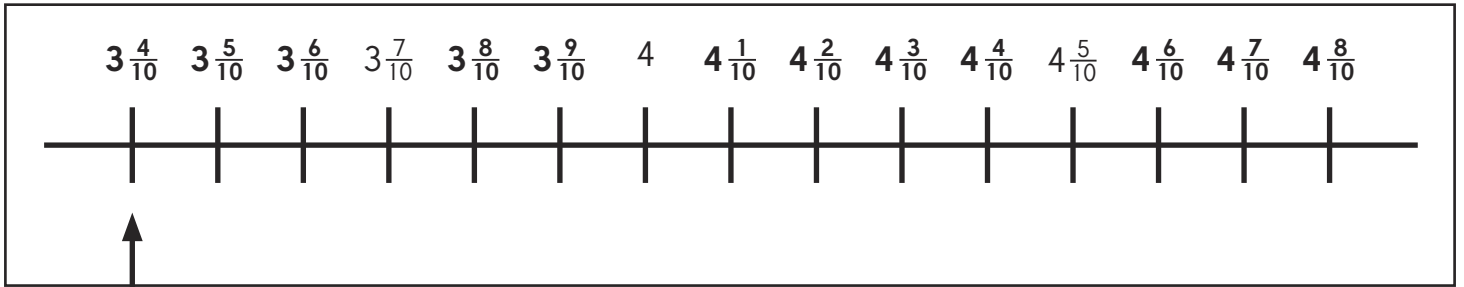
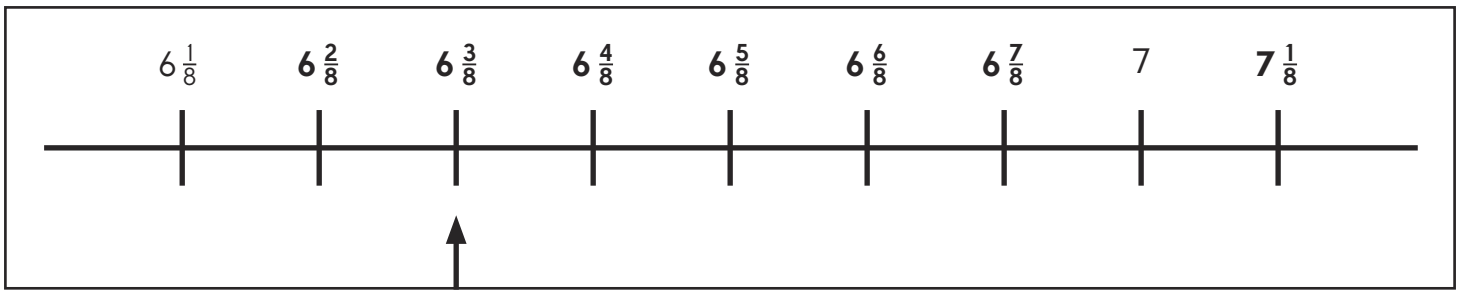
Crack the Code - Answers

I can use number lines to order sequences of whole numbers, fractions and decimals.



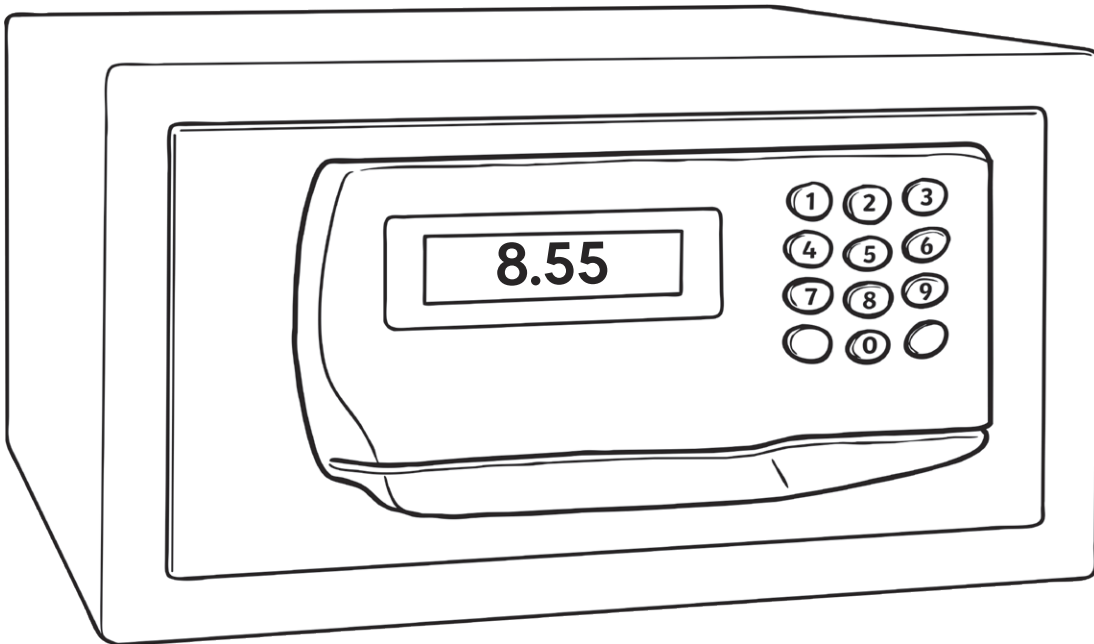
Find the missing terms in the sequences below. Use the missing terms that the arrows are pointing at to crack the code and open the safe.





Put the numbers that the arrows are pointing to in order from smallest to biggest. The highlighted number below is the code for the safe!

| | | | | | | | |
|------|------|---|-----------------|------|----------------|------|----|
| 0.27 | 0.35 | 3 | $3\frac{4}{10}$ | 5.44 | $6\frac{3}{8}$ | 8.55 | 10 |
|------|------|---|-----------------|------|----------------|------|----|



Write the code onto the display panel of the safe.

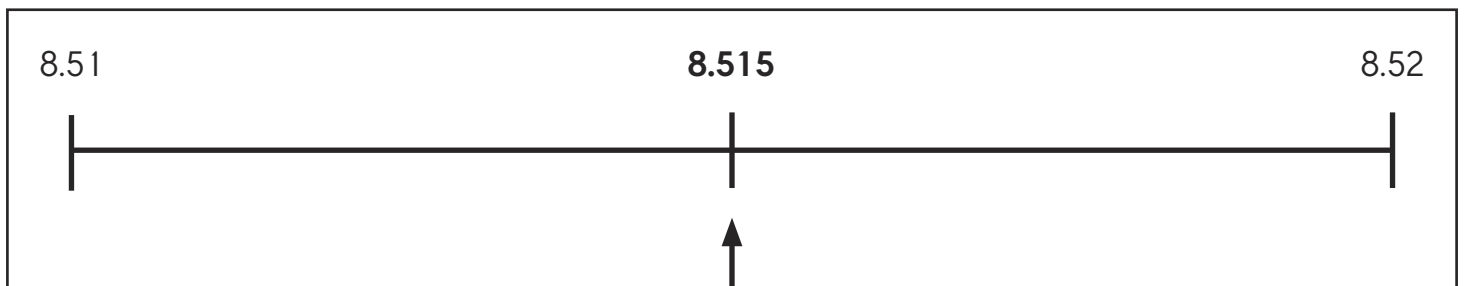
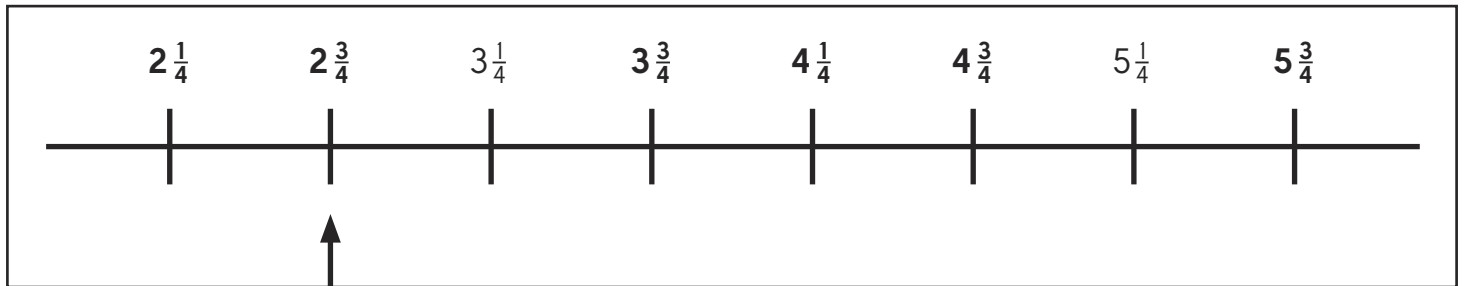
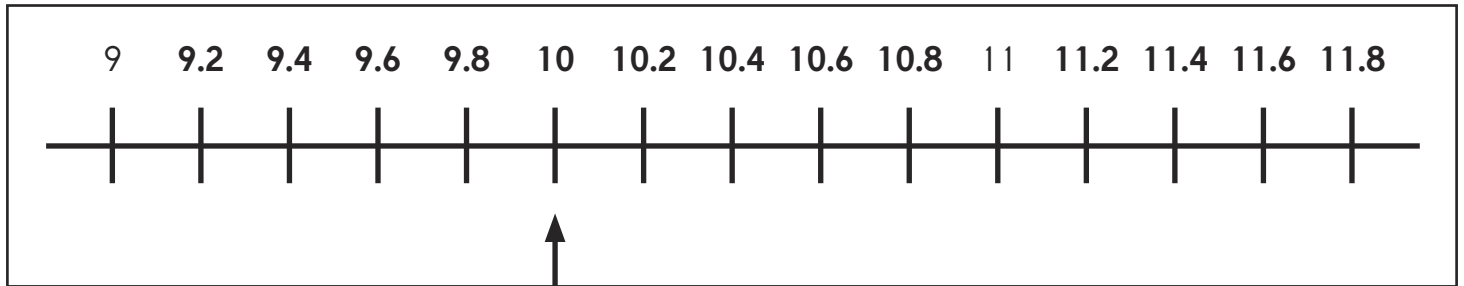


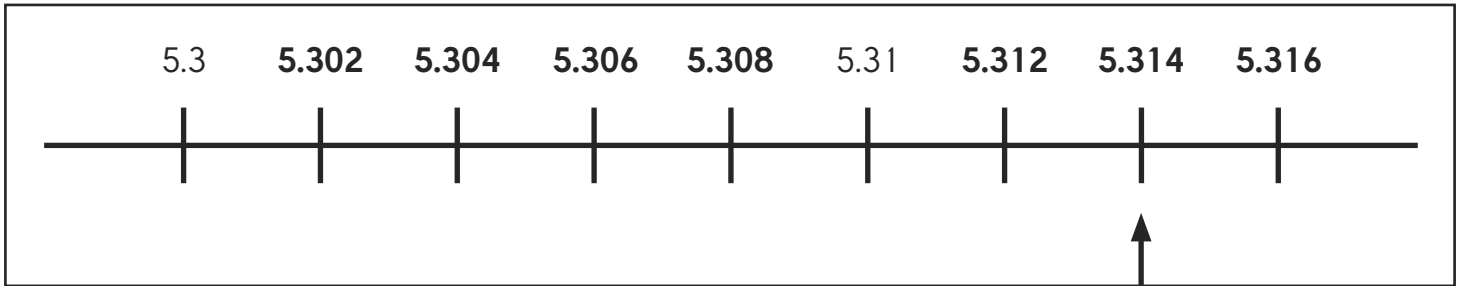
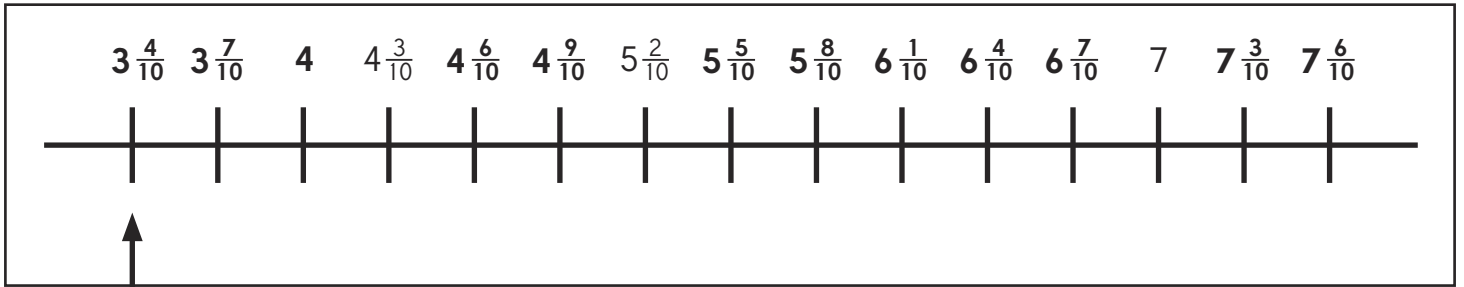
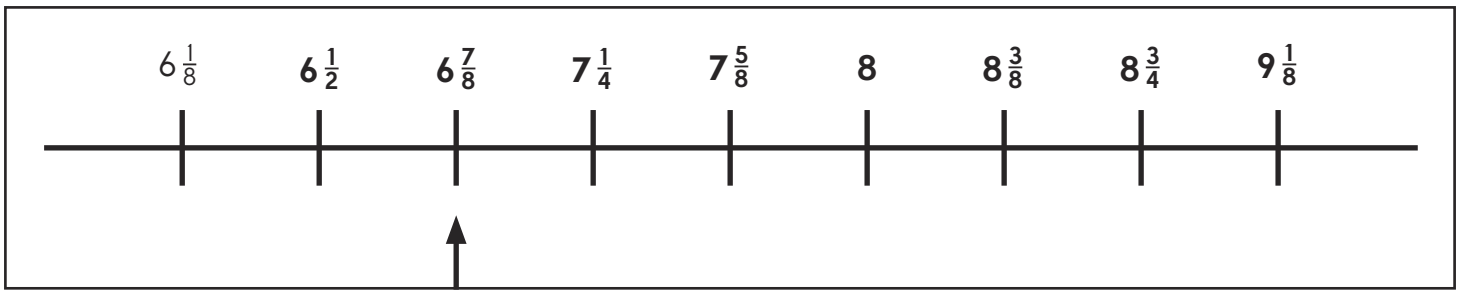
Crack the Code - Answers

I can use number lines to order sequences of whole numbers, fractions and decimals.



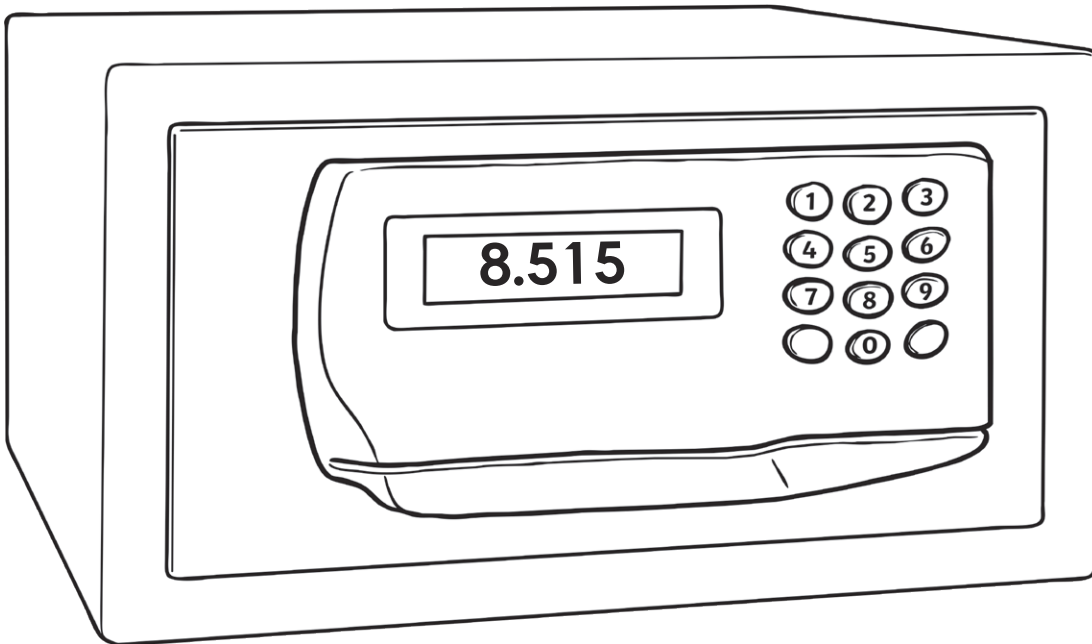
Find the missing terms in the sequences below. Use the missing terms that the arrows are pointing at to crack the code and open the safe.





Put the numbers that the arrows are pointing to in order from smallest to biggest. The highlighted number below is the code for the safe!

| | | | | | | | |
|------|-------|----------------|-----------------|-------|----------------|-------|----|
| 0.22 | 0.243 | $2\frac{3}{4}$ | $3\frac{4}{10}$ | 5.314 | $6\frac{7}{8}$ | 8.515 | 10 |
|------|-------|----------------|-----------------|-------|----------------|-------|----|



Write the code onto the display panel of the safe.

Number and Algebra | Codebreaker

| | | |
|--|--|--|
| I can order and compare numbers up to 10 000 000. | | |
| I can order sequences of whole numbers, fractions and decimals. | | |
| I can place missing whole numbers, fractions and decimals on number lines. | | |

Number and Algebra | Codebreaker

| | | |
|--|--|--|
| I can order and compare numbers up to 10 000 000. | | |
| I can order sequences of whole numbers, fractions and decimals. | | |
| I can place missing whole numbers, fractions and decimals on number lines. | | |

Number and Algebra | Codebreaker

| | | |
|--|--|--|
| I can order and compare numbers up to 10 000 000. | | |
| I can order sequences of whole numbers, fractions and decimals. | | |
| I can place missing whole numbers, fractions and decimals on number lines. | | |

Number and Algebra | Codebreaker

| | | |
|--|--|--|
| I can order and compare numbers up to 10 000 000. | | |
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Number and Algebra | Codebreaker

| | | |
|--|--|--|
| I can order and compare numbers up to 10 000 000. | | |
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| I can place missing whole numbers, fractions and decimals on number lines. | | |

Number and Algebra | Codebreaker

| | | |
|--|--|--|
| I can order and compare numbers up to 10 000 000. | | |
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Number and Algebra | Codebreaker

| | | |
|--|--|--|
| I can order and compare numbers up to 10 000 000. | | |
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Number and Algebra | Codebreaker

| | | |
|--|--|--|
| I can order and compare numbers up to 10 000 000. | | |
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| I can place missing whole numbers, fractions and decimals on number lines. | | |