There must be another way!

The common mistakes are...

I've spotted a pattern...

Have we tried...

I SEE REASONING - LKS2

TASKS FOR ENRICHING MATHEMATICAL TALK

So that's why...

It's simpler if we...

I've never noticed that before!

This picture shows...

I've spotted a pattern...

It's possible if...

What's different about...

by GARETH METCALFE

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I SEE REASONING – LKS2

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I SEE REASONING – LKS2

Tasks for enriching mathematical talk

Introduction

I See Reasoning – LKS2 is written to provide rich, open contexts for mathematical discussion and enquiry.

Children build on their current understanding when solving ***'I know… so…'*** questions. Concepts are represented visually in ***'Read the picture'*** tasks. Friends work systematically to find all possible solutions for the ***'How many ways?'*** challenges.

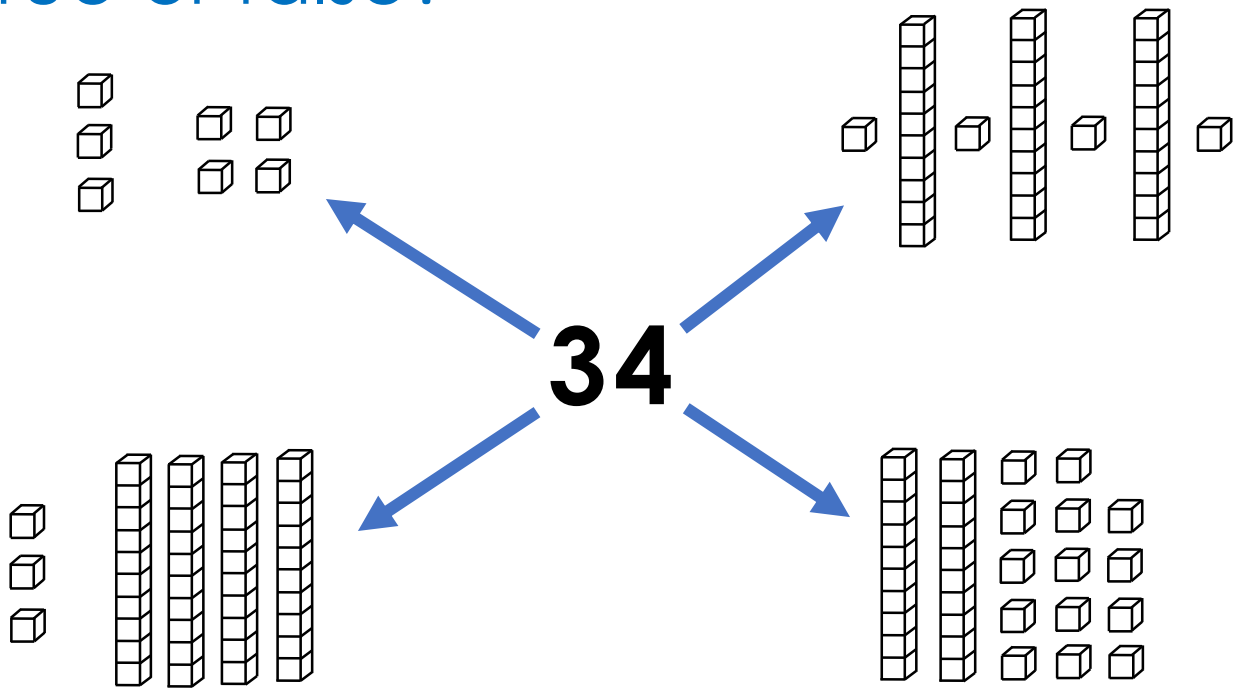
The resource is comprised of 240 varied tasks, linked to all different areas of the lower KS2 mathematics curriculum. These activities correspond to US grades 2-3 and Australian years 3-4. Screenshots of tasks can be used within presentations or printed and given to children.

I hope that ***I See Reasoning*** enriches the maths learning in your classroom!

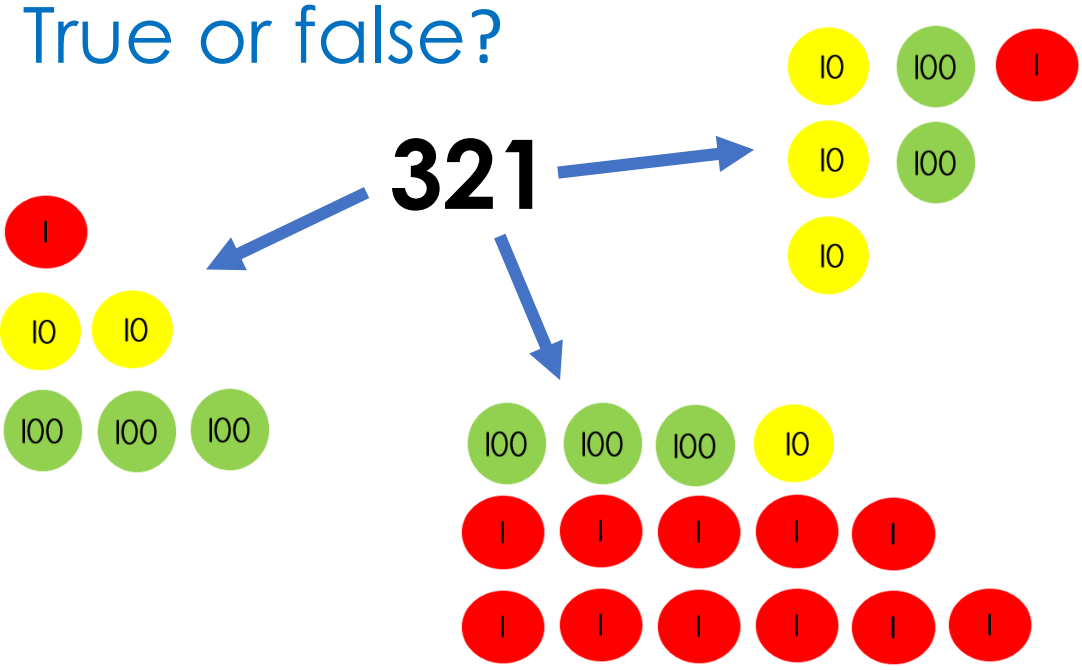
Gareth Metcalfe

www.iseemaths.com

True or false?

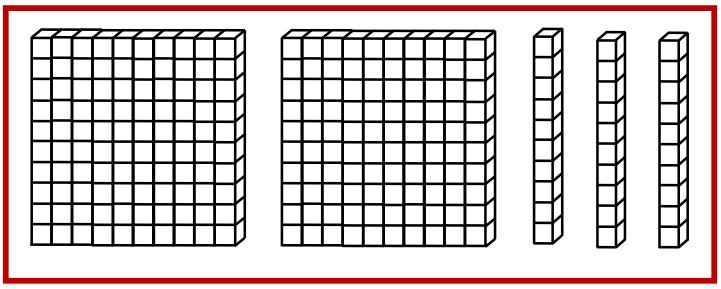


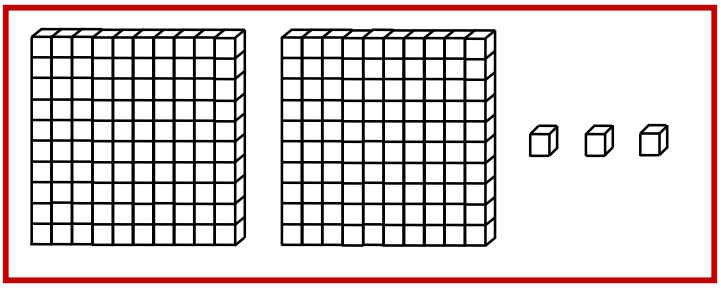
True or false?



Which picture?

Draw lines to match the two pictures to the correct number of cubes.





230

23

203

How many?

100 1 1 = 102

1000 100 100 =

1000 10 10 =

1000 1 1 =

Which answer?

Which number is 10 more than 396?

(a) 496

(b) 386

(c) 406

Explain your choice

Which answer?

Ten more than a number is 2696.
What is the number?

(a) 2706

(b) 2686

Explain your choice

Different ways

To turn **180** into **210** you can…

add ____ tens

OR add ____ ones

OR add ____ tens and ____ ones

OR add ____ hundred and subtract ____ tens

Different ways

To turn **2940** into **3000** you can…

add ____ tens

OR add ____ ones

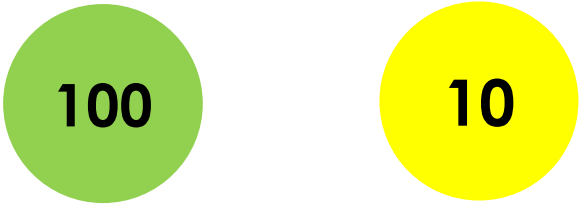
OR add ____ tens and ____ ones

OR add ____ hundred and subtract ____ tens

How many ways?

You have a pile of 100 coins and a pile of 10 coins.

Make 230



Level 1: I can find a way
Level 2: I can find different ways
Level 3: I know how many ways there are

How many ways?

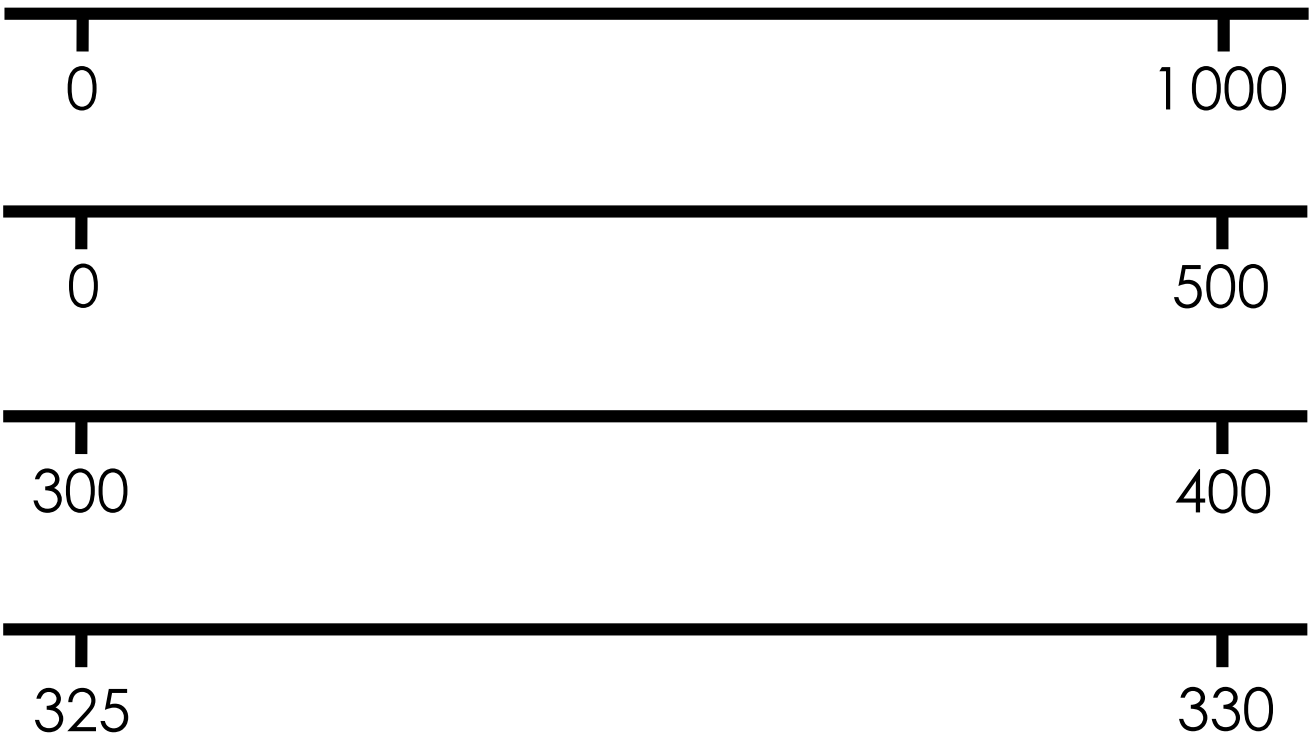
You have a pile of 1000 coins and a pile of 100 coins.

Make 4100

Level 1: I can find a way
Level 2: I can find different ways
Level 3: I know how many ways there are

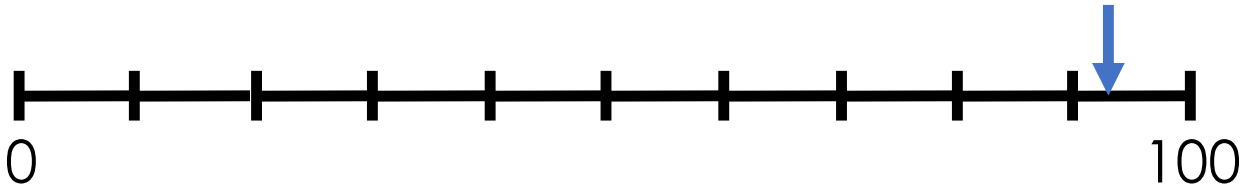
Number lines

Show the position of **328** on each number line.



Estimate

Estimate the position of the arrow.

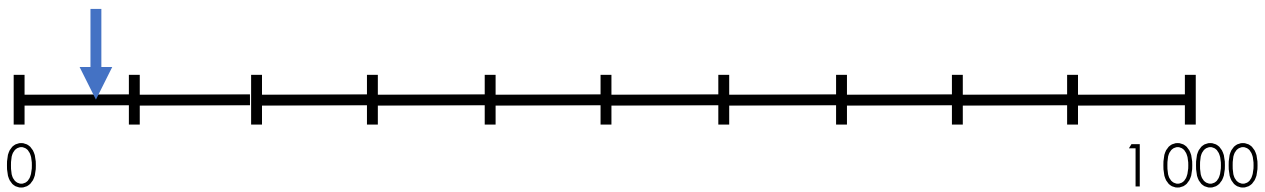


Number lines

Show the position of **7 063** on each number line.

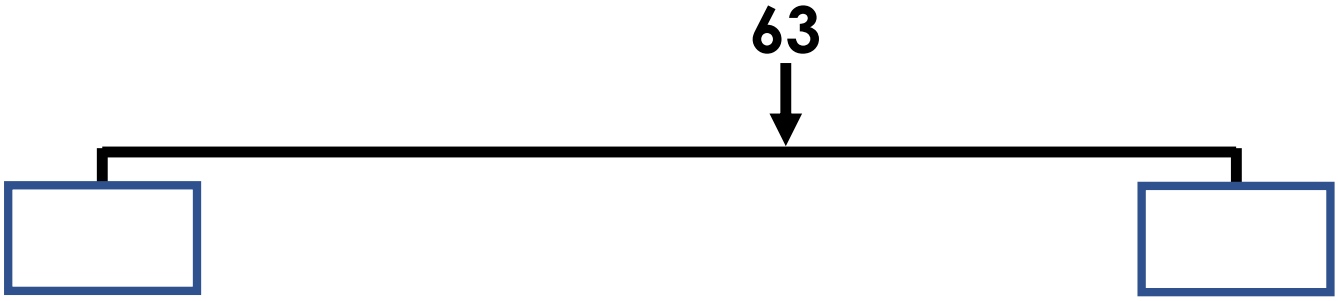
Estimate

Estimate the position of the arrow.



Different ways

What could the start and end numbers be?

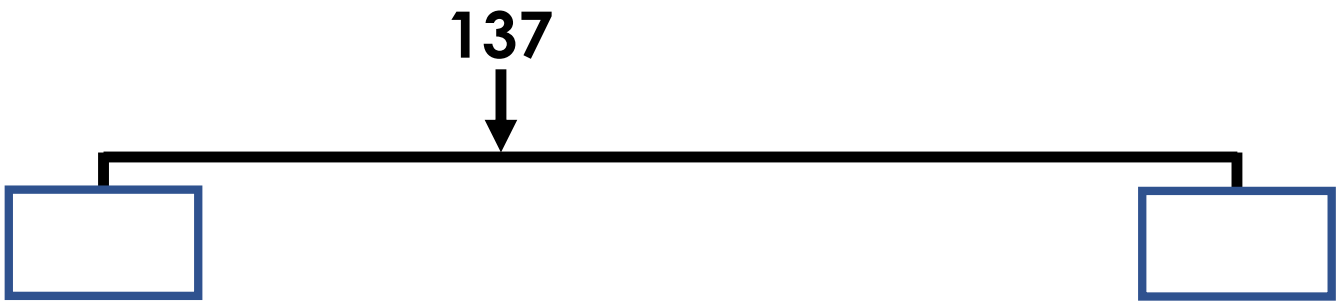


Different ways

What could the start and end numbers be?

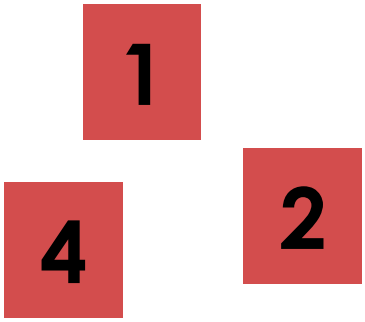
Different ways

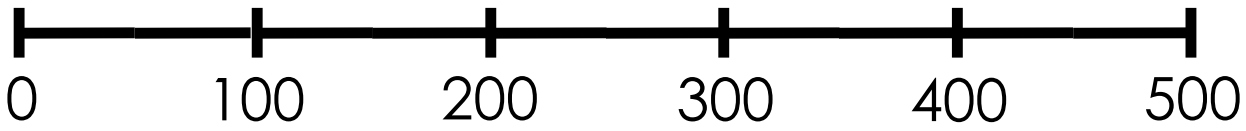
What could the start and end numbers be?



Different ways

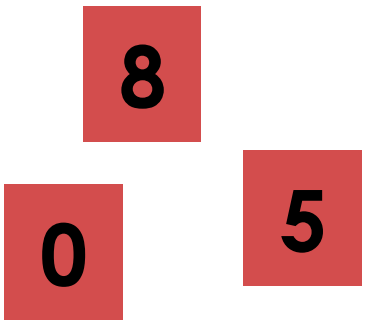
Make different 3-digit numbers using the digits 1, 2 and 4. Position your numbers accurately on the number line below:

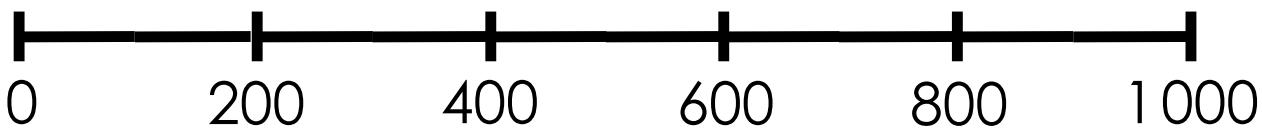




Different ways

Make different 3-digit numbers using the digits 0, 5 and 8. Position your numbers accurately on the number line below:

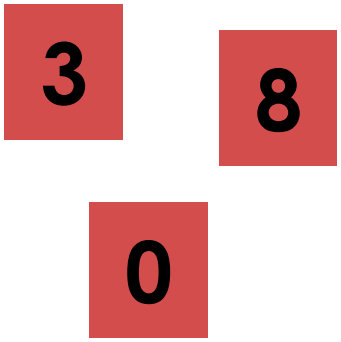




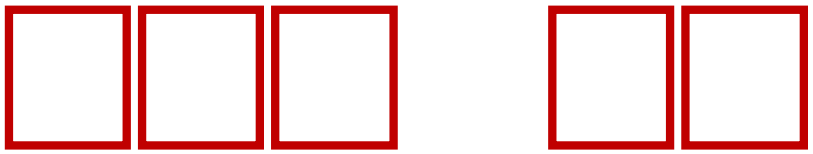
Explore

Using the digits 3, 0 and 8 make the number that is ***closest to 600.***

You can use each digit only once.



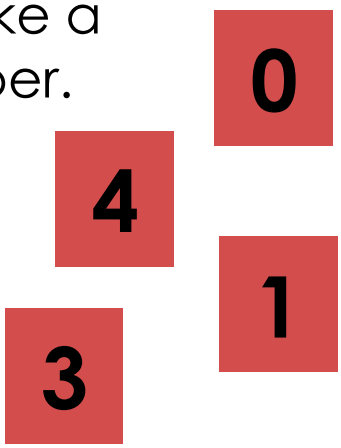
Investigate



Using the digits 0, 1, 2, 3 and 4 make a 3-digit number and a 2-digit number.

Make the difference between the two numbers as small as possible.

You can use each digit only once.



Investigate

Make a 3-digit number.
Each digit must be different.

Make another 3-digit number.
Use the same digits.

Make the difference between the numbers as large as possible.

Example

Number 1: **2** **5** **7** Number 2: **7** **2** **5**

The difference between 257 and 725 is 468.

Explain

Put the following in order from fewest to most:

A – seconds to get changed for P.E.

B – countries in the world

C – children in your school

D – days until Christmas

How many ways?

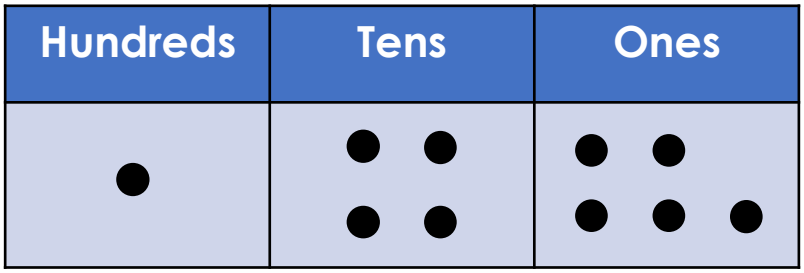
Put exactly 10 counters on a hundreds, tens, units mat to make a number.

The difference between your number and 500 must be less than 150.

Your number must be odd.

Example

This is 145, made with 10 counters



Level 1: I can find a way
Level 2: I can find different ways
Level 3: I know how many ways there are

Missing digits

Fill in the missing digits.

$3\square + \square 6 = \square\square 6$

Find different ways.

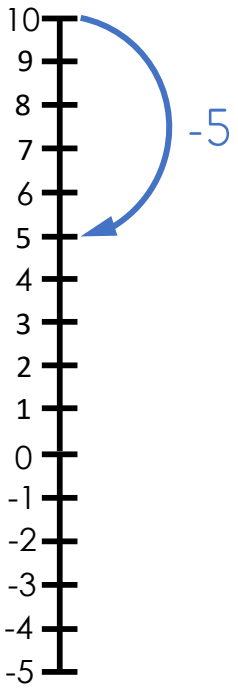
Spot the pattern

5 less than 10 is **5**

5 less than 7 is ____

5 less than 4 is ____

5 less than 1 is ____



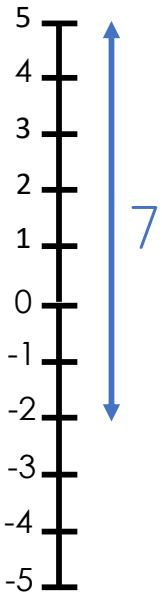
I know… so…

The difference between **-2** and **5** is **7**

The difference between **-2** and **4** is ____

The difference between **-3** and **4** is ____

The difference between **-3** and ____ is **9**

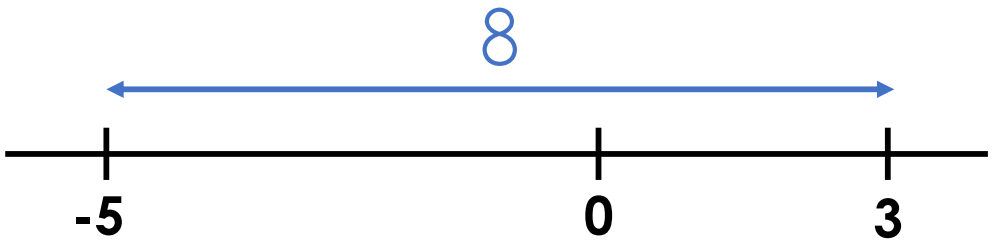


I know… so…

The difference between **-5** and **3** is **8**

The difference between **-** ____ and **3** is **6**

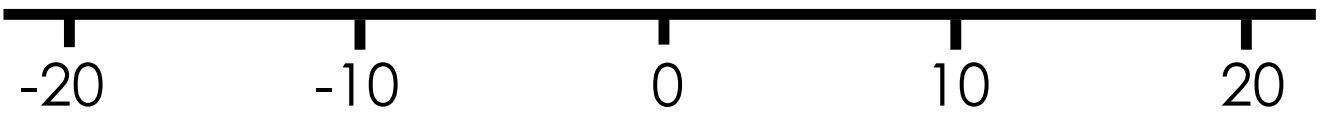
The difference between **-** ____ and **3** is ____



Draw

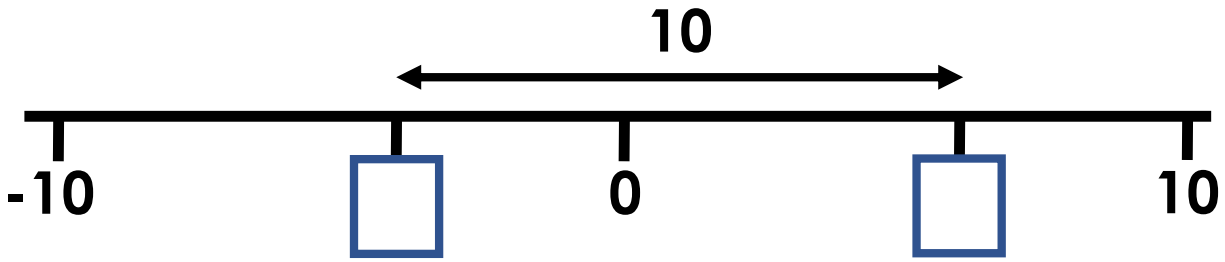
Draw an arrow to show the position of each number.

8, -6, -12, 15



Estimate

Estimate the value of the hidden numbers.

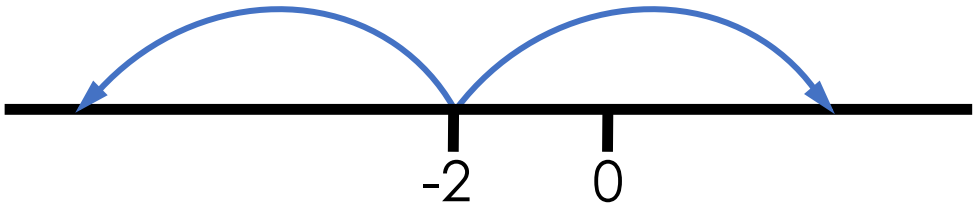


Different ways

The difference between a number and -2 is 5.

What could the number be?

There are two possible answers!



Different ways

The first negative number in the sequence is -3.

0 is not in the sequence.

At least the first three numbers in the sequence are positive.

Write the first three numbers in the sequence.

There are different ways this can be done!

Example:

10, 7, 4…

These are the first three numbers in a sequence.

There will not be a 0 in this sequence.

-2 is the first negative number in this sequence.

Explain the mistakes

What is 245 rounded to the nearest 10?

Mistake 1: 50

Mistake 2: 240

Mistake 3: 200

I know… so…

678 rounded to the nearest ____ is **680**

678 rounded to the nearest 100 is _____

295 rounded to the nearest 10 is _____

295 rounded to the nearest 100 is _____

Which answer?

What is the largest whole number that, when rounded to the nearest 10, is 150?

(a) 149

(b) 154

(c) 155

How many ways?

Rounded to the nearest 10, my number is 250.

Rounded to the nearest 100, my number is 300.

My number is odd.

What could my number be?

Level 1: I can find one possible answer

Level 2: I can find different possible answers

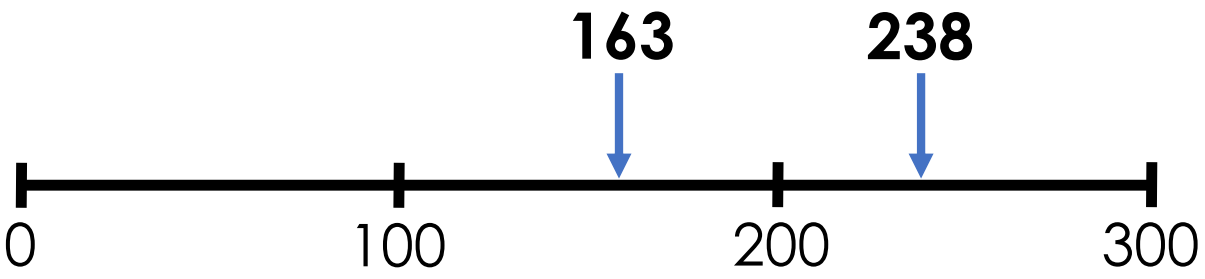
Level 3: I know how many possible answers there are

Explain

163 and 238 round to the same 100.

163 and 238 round to a different 10.

Explain why.



Fill the gaps

Number	**674**	**153**		
Rounded to nearest 10	670		350	450
Rounded to nearest 100	700		400	400

Explain

Rounded to the nearest £100, Ben has £200.

Rounded to the nearest £10, Helen has £150.

Helen has more money than Ben.

Explain how this is possible.

Race to 500

A 2-4 player game

You will be given a start number. Take turns to roll a dice. On your go, change your number in this way:

Roll a 1: plus or minus 1 from your number

Roll a 2: plus or minus 10 from your number

Roll a 3: plus or minus 100 from your number

Roll a 4: round your number to the nearest 10

Roll a 5: round your number to the nearest 100

Roll a 6: free choice from the options above

The first player to get to 500 wins!

Start numbers: 258, 310, 648, 686, 295, 382, 373, 701, 696, 718, 284, 728

True or false?

IV = 15

XIX = 21

XII = 12

IV = 4

True or false?

XL = 60

CII = 100

XXV = 115

XL = 40

Order

Order the numbers from smallest to largest.

VIII **C**

XX **XVI**

What do you notice?

Spot the pattern

22 in Roman Numerals is written **XXII**

32 in Roman Numerals is written _____

42 in Roman Numerals is written _____

____ in Roman Numerals is written **LII**

Rank by difficulty

Write these numbers in Roman Numerals:

44 **33**

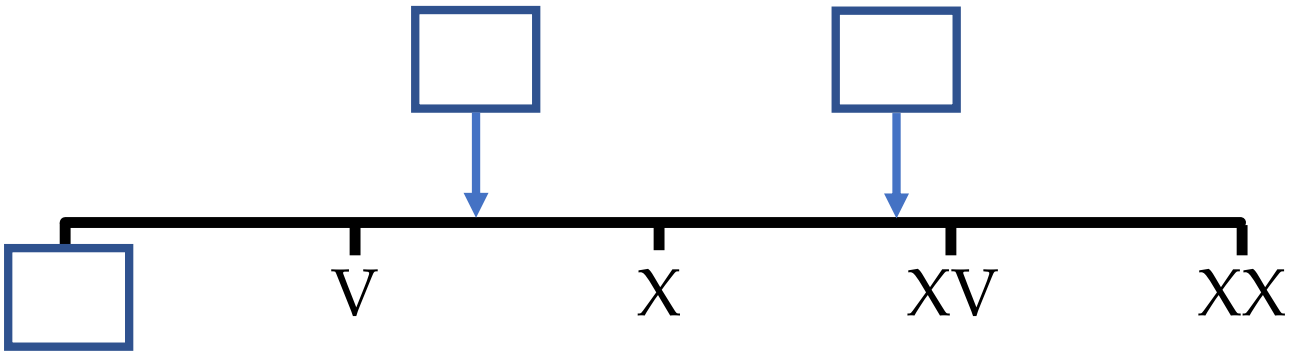
51

Always, sometimes or never?

'In Roman Numerals, bigger numbers have more symbols than smaller numbers.'

Estimate

Estimate the value of the missing numbers.
Complete using Roman Numerals.



Explain

Here are some examples of numbers written in Roman Numerals:

1 = I	**3 = III**	**4 = IV**
5 = V	**8 = VIII**	**9 = IX**
10 = X	**13 = XIII**	**14 = XIV**
50 = L	**80 = LXXX**	**40 = XL**
100 = C	**103 = CIII**	**104 = CIV**

Explain why we don't still use Roman Numerals.

Rank by difficulty

49 + 48

56 + 42

73 + 49

Rank by difficulty

247 + 65

364 + 235

273 + 98

Mental or written?

34 + 25 + 22

82 + 39

83 + 82

55 + 27 + 15

Mental or written?

1062 + 1251

375 + 125

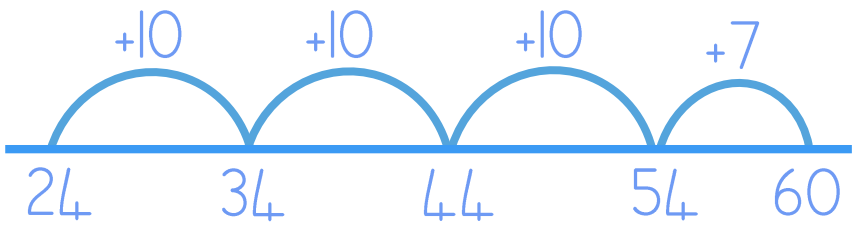
534 + 399

4085 + 46

Explain the mistakes

24 + 37

Mistake 1



Mistake 2

$$\begin{array}{r} {\scriptstyle 1} \\ 24 \\ +\ 37 \\ \hline 51 \\ \hline \end{array}$$

Mistake 3

24 + 37 = 511

Gold, silver, bronze

Here are three ways of calculating **36 + 29 + 14**

Method 1

$$\begin{array}{r} {\scriptstyle 1} \\ 36 \\ +\ 29 \\ \hline 65 \\ \hline \end{array} \qquad \begin{array}{r} 65 \\ +\ 14 \\ \hline 79 \\ \hline \end{array}$$

Method 2

36 + 30 = 66

66 − 1 = 65

65 + 14 = 79

Method 3

36 + 14 = 50

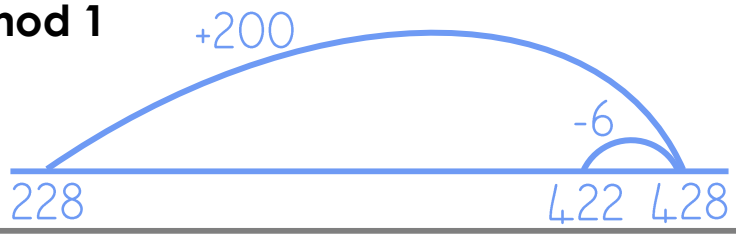
50 + 29 = 79

Rank each method as gold, silver or bronze.

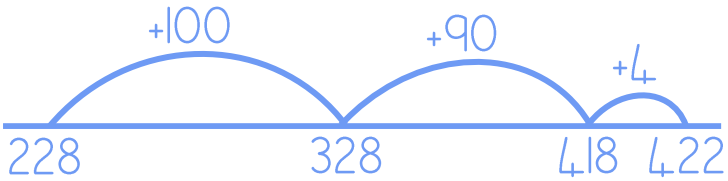
Gold, silver, bronze

Here are three ways of calculating **228 + 194**

Method 1



Method 2



Method 3

$$\begin{array}{r} {\scriptstyle 1\ \ 1\ \ \ } \\ 228 \\ +\,194 \\ \hline 422 \end{array}$$

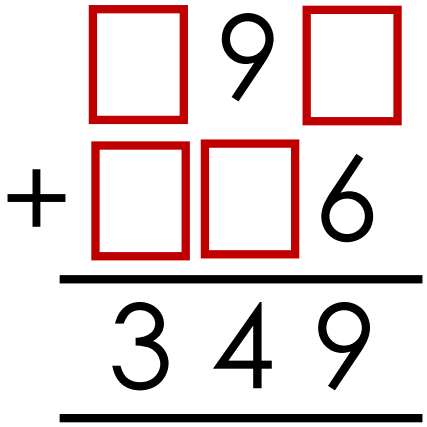
Rank each method as gold, silver or bronze.

Missing digits

$$\begin{array}{r} 8\square \\ +\ \square\,4 \\ \hline \square\,3\,2 \\ \hline \end{array}$$

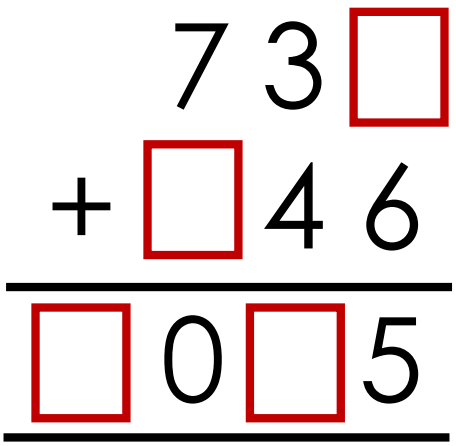
Fill in the missing digits.

Missing digits



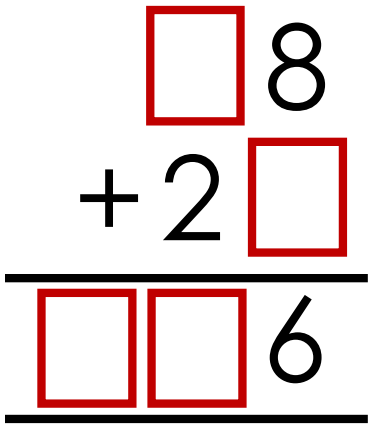
Fill in the missing digits.

Missing digits



Fill in the missing digits.

How many ways?



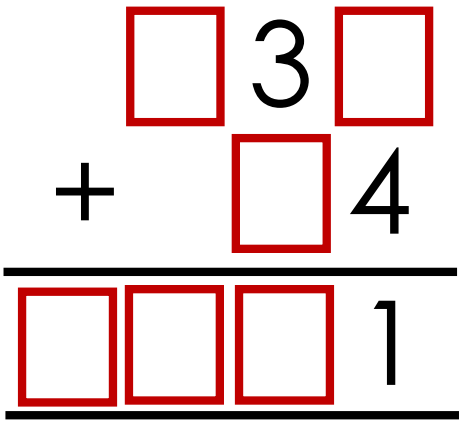
Fill in the missing digits.

Level 1: I can find a way

Level 2: I can find different ways

Level 3: I know how many ways there are

How many ways?



Fill in the missing digits.

Level 1: I can find a way

Level 2: I can find different ways

Level 3: I know how many ways there are

Investigate

Stage 1: complete using digits 0-9 (use each digit no more than once)

Stage 2: complete using digits 0-9 (use each digit no more than once) and with the digit 9 in this position:

Rank by difficulty

137 – 56

163 – 59

187 – 56

Rank by difficulty

50 – 19

139 – 19

101 – 19

Rank by difficulty

2000 – 60

3003 – 1996

2645 – 1082

Is it the same?

63 take away 20, add 2

63 take away 20, take away 2

Is 63 – 18 the same as…

2 + 43

65 – 20

I know… so…

200 – ___ = 128

200 – 70 = 130

2000 – 70 = _____

I know… so…

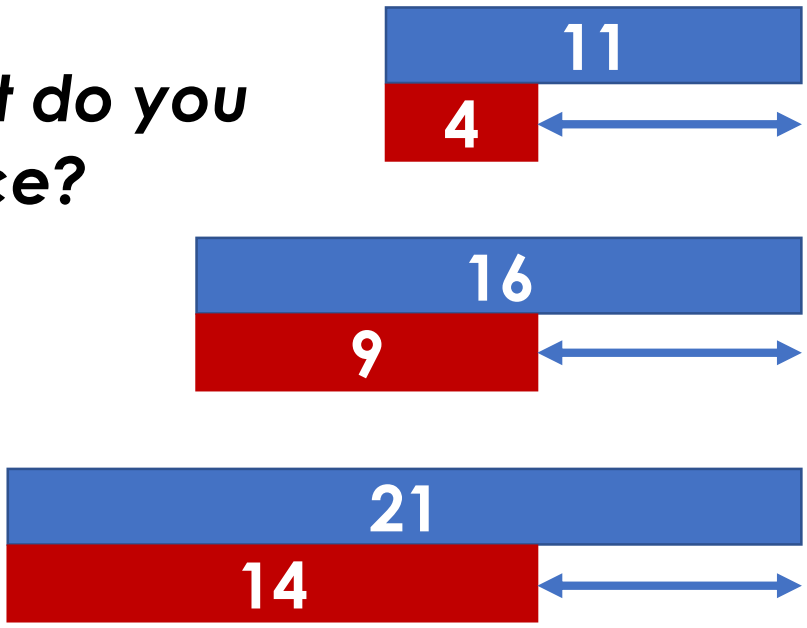
326 – 191 = _____

326 – 187 = 139

328 – 189 = _____

Spot the pattern

What do you notice?



'… is the same' ***'… is different'***

Gold, silver, bronze

Here are three ways of calculating **405 – 297**

Method 1

405 – 297

+3 +3

408 – 300 = 108

Method 2

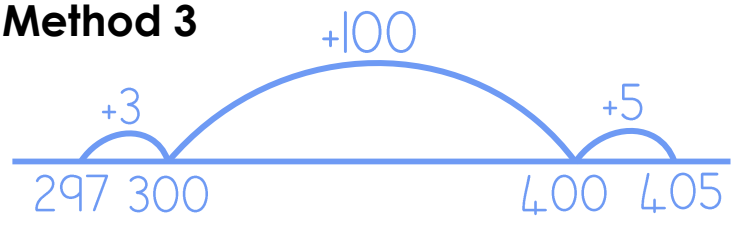
3 9 1

~~4~~ ~~0~~ 5

– 2 9 7

1 0 8

Method 3



Rank each method as gold, silver or bronze.

Explain the mistakes

Mistake 1

200 – 7 = 103

Mistake 2

£10 - £8.90 = £2.10

Mistake 3

100 – 47 = 63

Explain the mistakes

628 – 56

Mistake 1

$$\begin{array}{r} 628 \\ -\ 56 \\ \hline 632 \\ \hline \end{array}$$

Mistake 2

$$\begin{array}{r} {}^{5}\not{6}\,{}^{1}28 \\ -56 \\ \hline 068 \\ \hline \end{array}$$

Mistake 3

$$\begin{array}{r} {}^{5}\not{6}\,{}^{1}28 \\ -\ 56 \\ \hline 582 \\ \hline \end{array}$$

Missing digits

Fill in the missing digits.

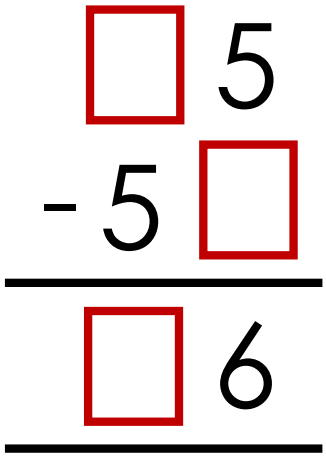
3□ - □2 = □8

Missing digits

Fill in the missing digits.

□2□ - □2 = 99

How many ways?



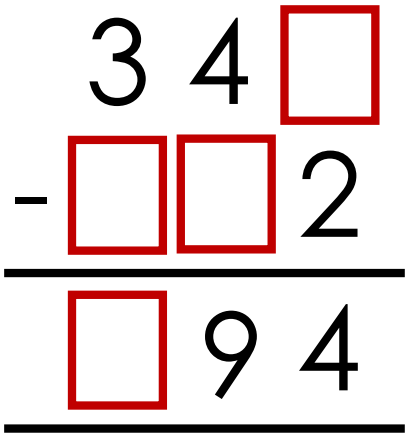
Fill in the missing digits.

Level 1: I can find a way

Level 2: I can find different ways

Level 3: I know how many ways there are

Missing digits



Fill in the missing digits.

How many ways?

Complete using digit cards 0-9. Position the digits 6 and 7 as shown:

Level 1: I can find a way

Level 2: I can find different ways

Level 3: I know how many ways there are

How many ways?

Complete using digit cards 0-9. Position the digits 0 and 6 as shown:

Level 1: I can find a way

Level 2: I can find different ways

Level 3: I know how many ways there are

I know… so…

437 + 285 = 722

722 - _____ = 287

_____ - 435 = 285

I know… so…

603 – 194 = _____

600 – 200 = 400

_____ – 401 = 199

Broken calculator

'The 9 and 5 keys on my calculator are broken!'

How can I use it to work out:

98 + 95

182 – 90

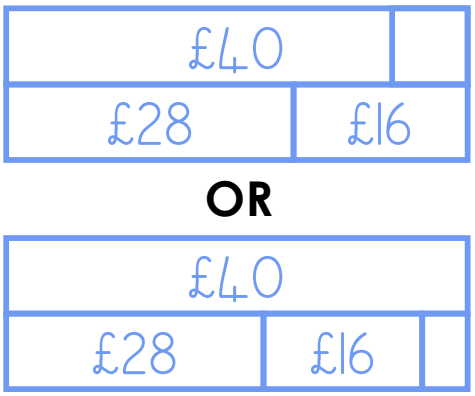
65 + 55

Which picture?

Draw lines to match the question to the correct bar model

Ava buys a t-shirt and a pair of jeans.
How much change does she get from £50?

Jen has £40. She wants to buy a t-shirt and a pair of jeans.
How much more money does she need?



Fill the gaps

Fill in each of the blank boxes.

MENU
Sandwich: £2.40
Drink: 75p
Fruit: 40p

Question	Bar model	Answer
Sam buys a drink and a sandwich. He gets 35p change. ***How much did he pay?***		
Dan has £3.50. He buys a sandwich and a drink. ***Does he have enough money to buy fruit?***		No
		

Write a question here that matches the bar model picture

Which answer?

13 + 9 = ☐ + 10

What is the missing number?

(a) 12

(b) 32 *Explain how you know.*

(c) 22

Which answer?

23 + 16 = ☐ – 6

What is the missing number?

(a) 39

(b) 33 *Explain how you know.*

(c) 45

How many ways?

The missing numbers are positive whole numbers.

25 + ☐ = 32 – ☐

Fill in the missing numbers.

Level 1: I can find a way

Level 2: I can find different ways

Level 3: I know how many ways there are

How many ways?

The missing numbers are positive whole numbers.

18 – ☐ > ☐ + 13

Fill in the missing numbers.

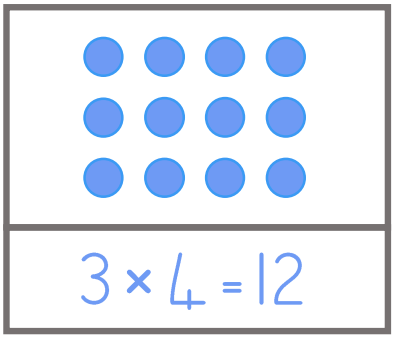
Level 1: I can find a way

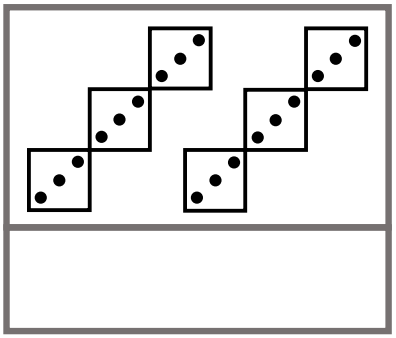
Level 2: I can find different ways

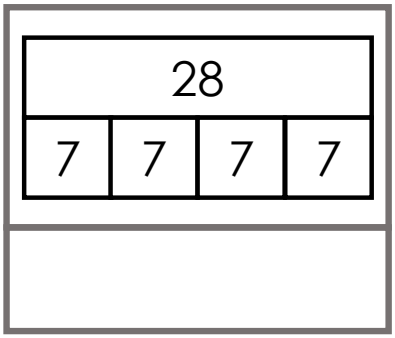
Level 3: I know how many ways there are

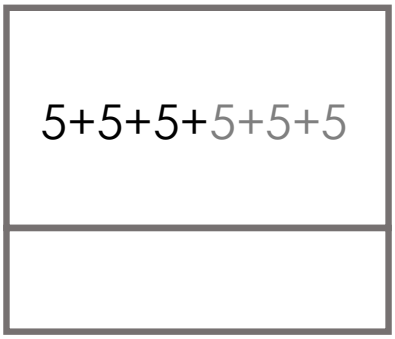
Which number sentence?

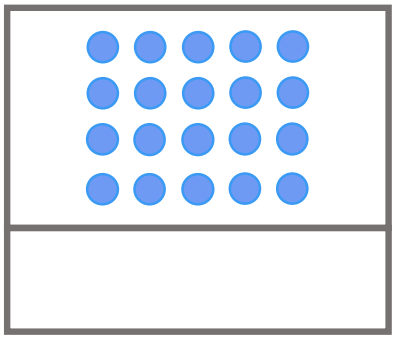
Write a multiplication number sentence for each example. One has been done for you.

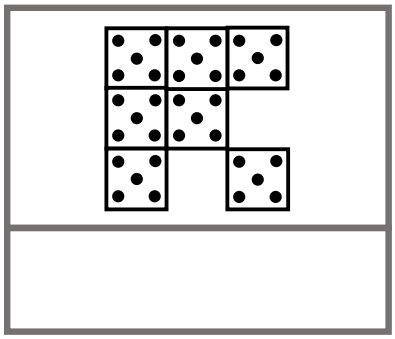








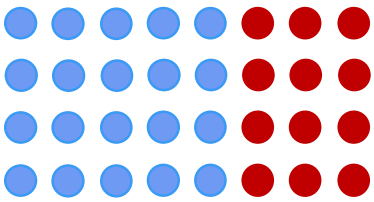




I know… so…

$7 \times 4 =$ ____

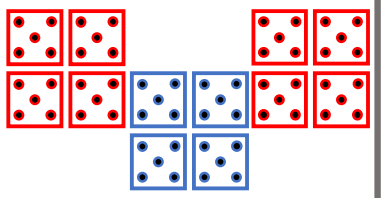
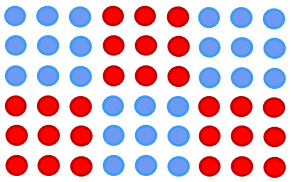
$8 \times 4 = 32$ →



$8 \times 5 =$ ____

Which number sentence?

Write a multiplication number sentence for each example. One has been done for you.

$6+12+12$		$5\times4-5$
$6\times5=30$		
$7\times4+7+7$		$4+8+12$

I know… so…

$6\times\_\_\_=48$

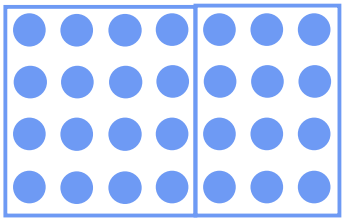
$6\times6=36$ →

36					
6	6	6	6	6	6

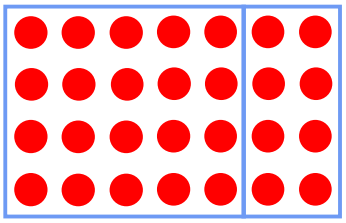
$12\times6=\_\_\_\_$

The same as...

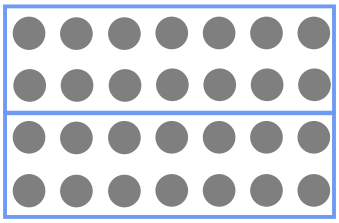
7 × 4 is the same as:



4 × 4 + 3 × 4

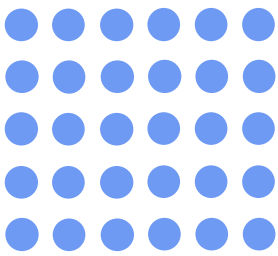


5 × 4 + 2 × 4

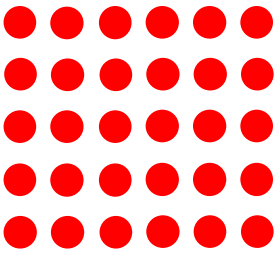


7 × 2 + 7 × 2

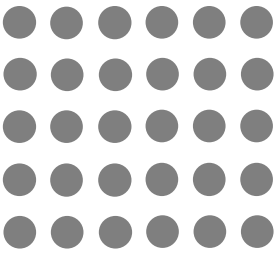
6 × 5 is the same as:



__ × __ + __ × __



__ × __ + __ × __



__ × __ + __ × __

I know... so...

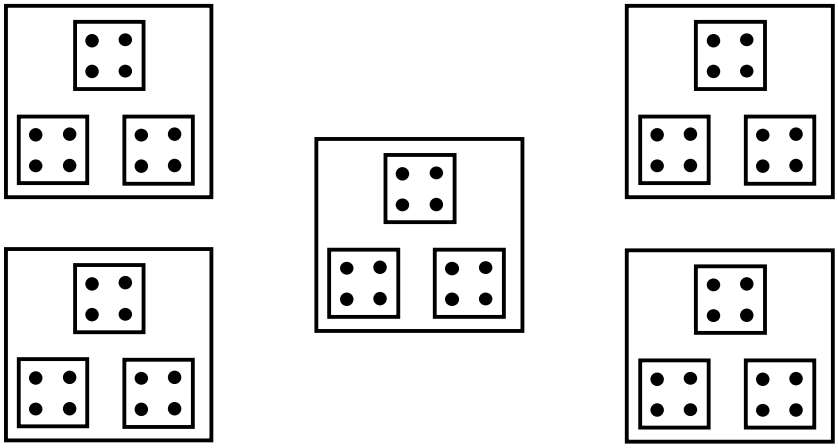
18 × 7 = ____

16 × 7 = 112

8 × 14 = ____

Read the picture

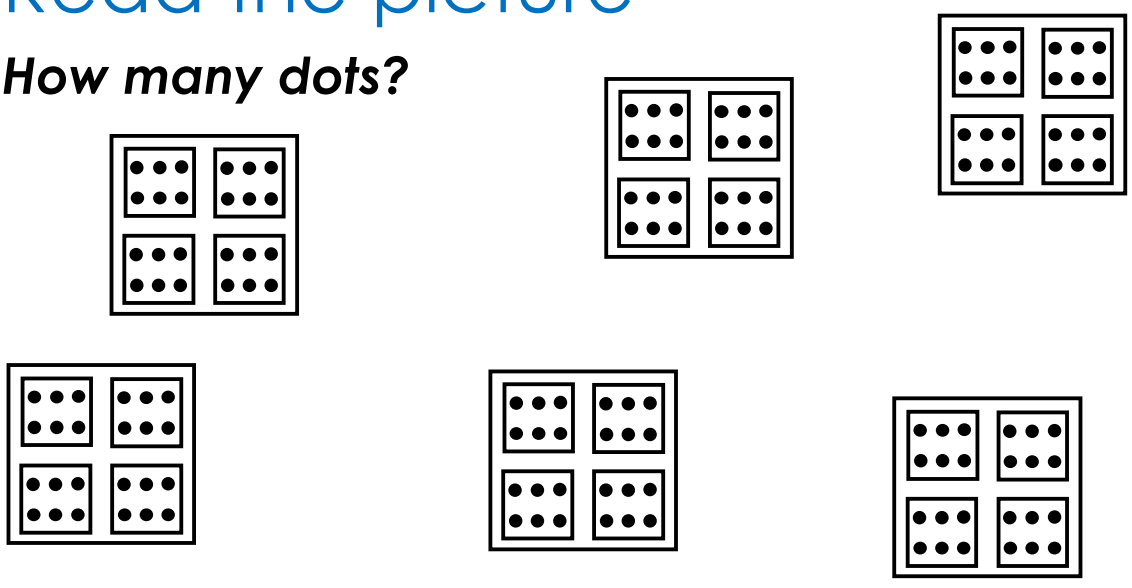
How many dots?



Which number sentence(s) do you see?

Read the picture

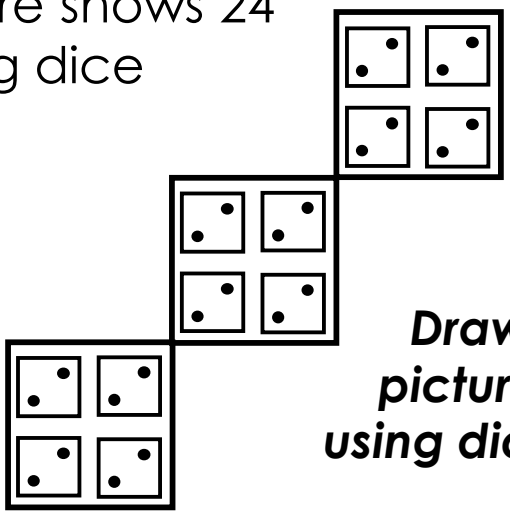
How many dots?



Which number sentence(s) do you see?

Draw

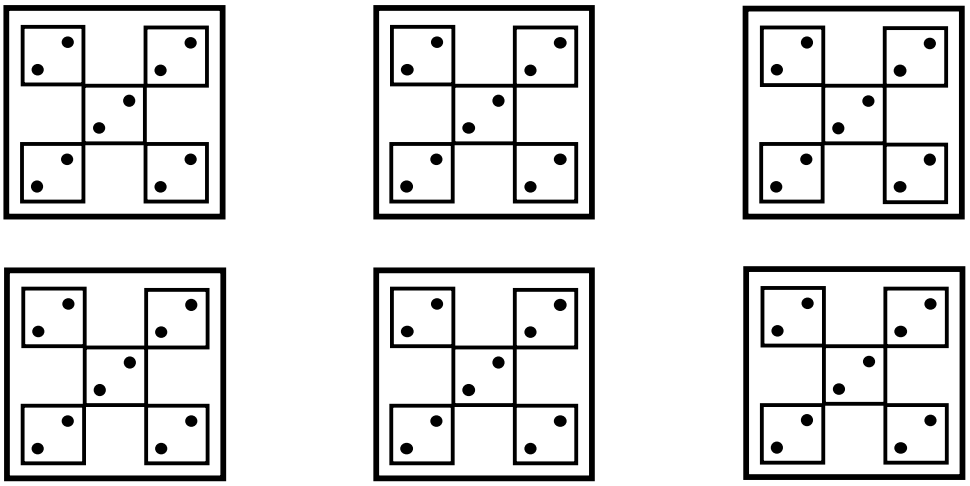
This picture shows 24 dots using dice patterns.



Draw a different picture of 24 dots using dice patterns.

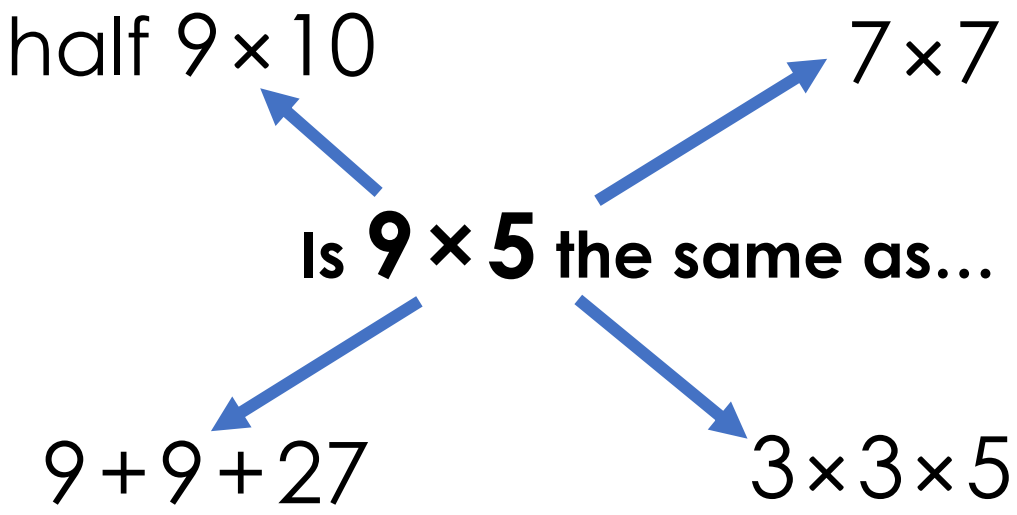
Draw

This picture shows 60 dots using dice patterns.

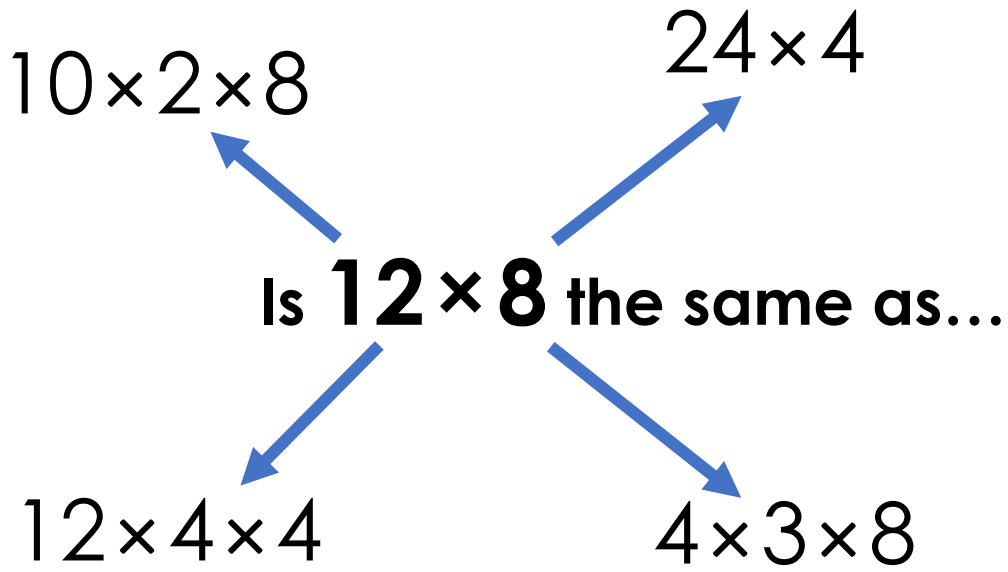


Draw a different picture of 60 dots using dice patterns.

Is it the same?



Is it the same?



Matching number sentences

+ number sentence	× number sentence
6 + 6 + 12	6 × 4
8 + 8 + 8 + 8 + 8	
	3 × 2 × 2
15 + 10 + 5	

Rank by difficulty

15 × 6

23 × 3

18 × 5

Explain the mistakes

34 × 6

Method 1

	30	4
6	160	24

160
+24
184

Method 3

	3	4
6	18	24

18+24=42

Method 2

	30	4
6	180	24

11
180
+24
6
210

Which one's correct?

Find the correct calculation. Spot the mistakes.

326 × 7

326
× 7
2142
14

326
× 7
2289
14

326
× 7
2282
14

Missing digits

Fill in the missing digits.

$4\square \times 3 = 1\square 5$

Missing digits

$$\begin{array}{r} \square 8 \\ \times \quad \square \\ \hline 3\square 0 \end{array}$$

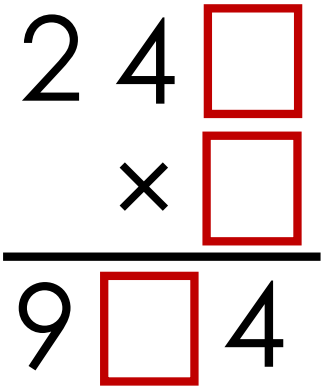
Fill in the missing digits.

Missing digits

$$\begin{array}{r} \square\square \\ \times \quad 8 \\ \hline \square 6 \end{array}$$

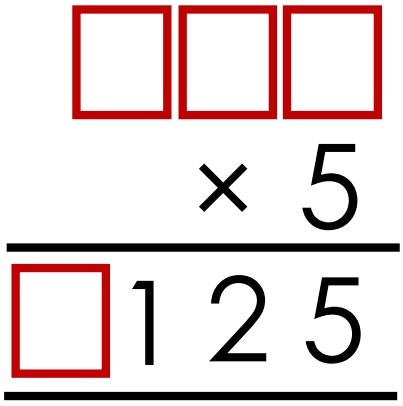
Fill in the missing digits.

Missing digits



Fill in the missing digits.

How many ways?



Fill in the missing digits.

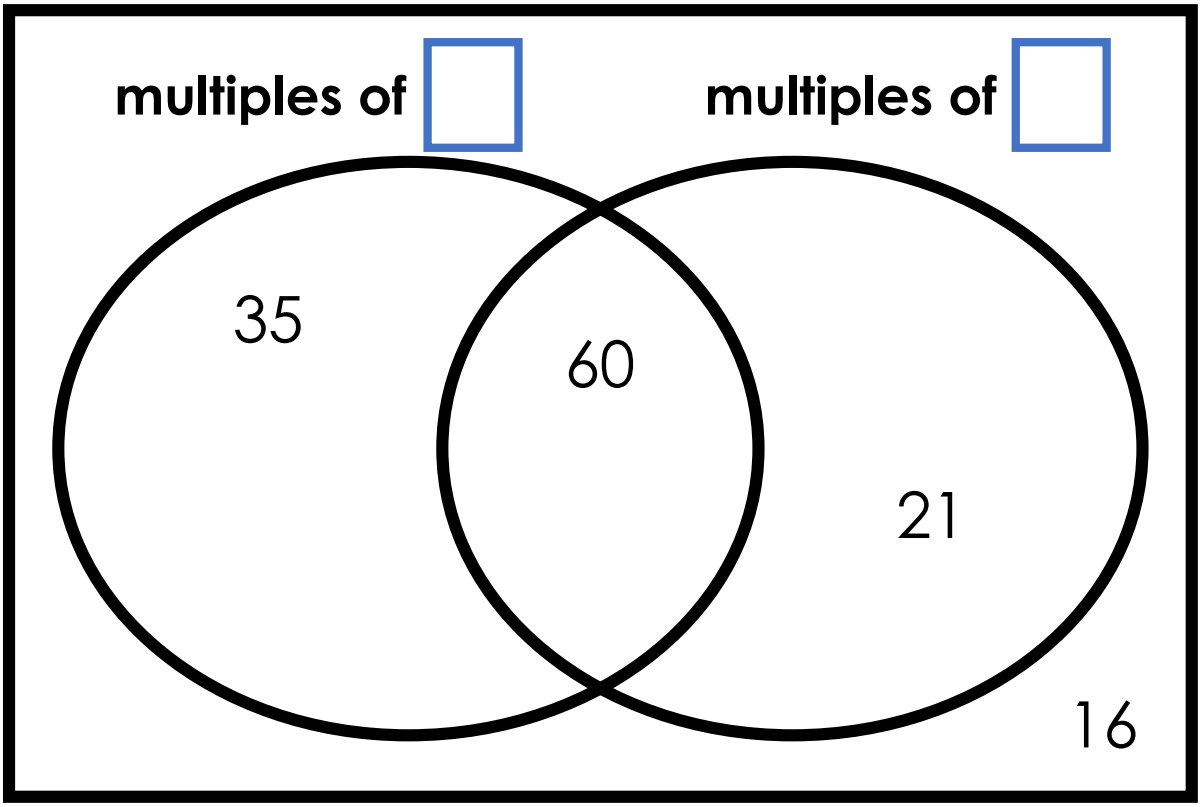
Level 1: I can find a way

Level 2: I can find different ways

Level 3: I know how many ways there are

Explore

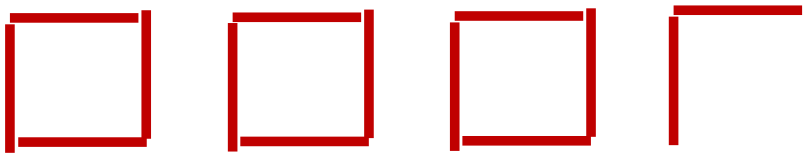
Complete the headings of the Venn diagram:



Add a different number in each section.

Explore

There are [3] squares and [2] left over.



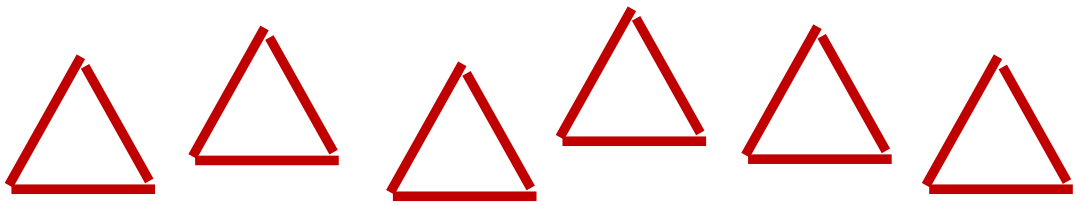
Rearrange the same number of matchsticks.

There are [ ] triangles and [ ] left over.

There are [2] _____ and [4] left over.

Explore

There are [6] triangles and [0] left over.



Rearrange the same number of matchsticks.

There are [ ] squares and [ ] left over.

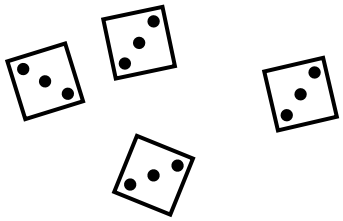
There are [3] _____ and [0] left over.

Explain

3 on each dice

4 dice

12 dots in total

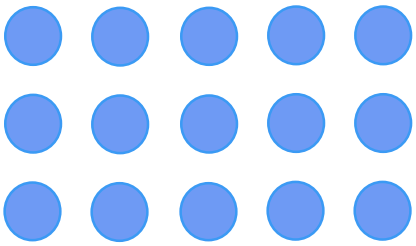


4 on each dice

☐ dice

28 dots in total

Explain



3 rows

5 columns

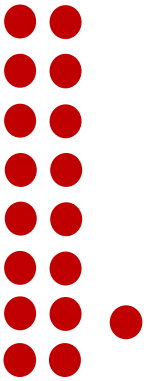
15 dots in total

4 rows

☐ columns

24 dots in total

Different ways



17 circles

2 columns

8 rows

1 left over

17 circles

☐ columns

☐ rows

1 left over

17 circles

☐ columns

☐ rows

2 left over

18 circles

☐ columns

☐ rows

☐ left over

I know… so…

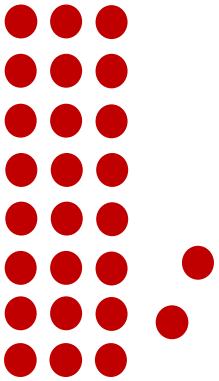
$24 \div 6 = 4$

How many 6s in 24?
There are 4.
So…

$30 \div 6 = \_\_\_$

$\_\_\_ \div 6 = 6$

Different ways



26 circles

3 columns

8 rows

2 left over

26 circles

☐ columns

☐ rows

2 left over

26 circles

☐ columns

☐ rows

1 left over

26 circles

☐ columns

☐ rows

0 left over

I know… so…

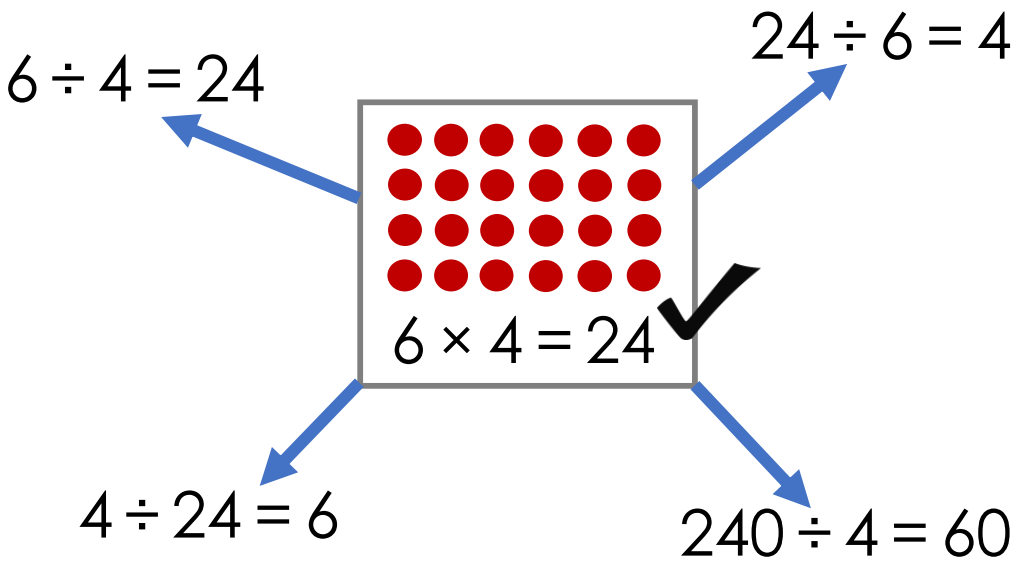
$\_\_\_ \div 8 = 4$

$40 \div 8 = 5$

$56 \div 8 = \_\_\_$

How many 8s in 40?
There are 5.
So…

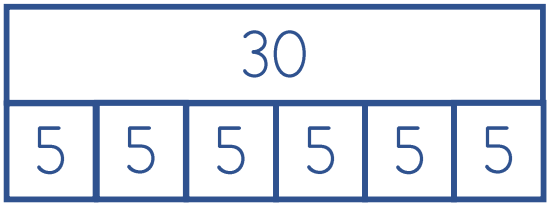
True or false?



Explain

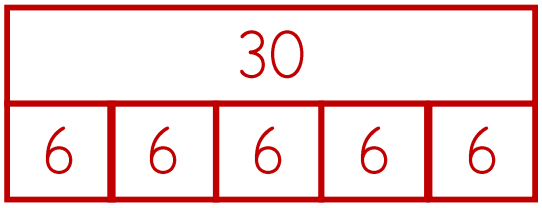
30 ÷ 6

Joy's method



'Split 30 into 6 boxes. 5 per box.'

Fred's method



'How many 6s in 30? There are 5.'

I agree with Joy **I agree with Fred** **I agree with both**

Explain:

Rank by difficulty

60 ÷ 4

32 ÷ 4

14 ÷ 4

Rank by difficulty

120 ÷ 6

32 ÷ 6

78 ÷ 6

Is it the same?

80 ÷ 10

160 ÷ 10 × 2

Is 160 ÷ 5 the same as…

160 ÷ 2 ÷ 2 ÷ 1

160 × 10 ÷ 2

Different methods

What's the best way to answer each question?

80 ÷ 10

80 ÷ 4

80 ÷ 1

80 ÷ 40

80 ÷ 5

Different methods

What's the best way to answer each question?

600 ÷ 1

600 ÷ 10

600 ÷ 7

600 ÷ 200

600 ÷ 4

Which one's correct?

Find the correct calculation. Spot the mistakes.

84 ÷ 3

$$\begin{array}{r} 21 \\ 3\overline{)84} \end{array} \qquad \begin{array}{r} 28 \\ 3\overline{)8^{2}4} \end{array} \qquad \begin{array}{r} 24 \\ 3\overline{)8^{1}4} \end{array}$$

Which one's correct?

Find the correct calculation. Spot the mistakes.

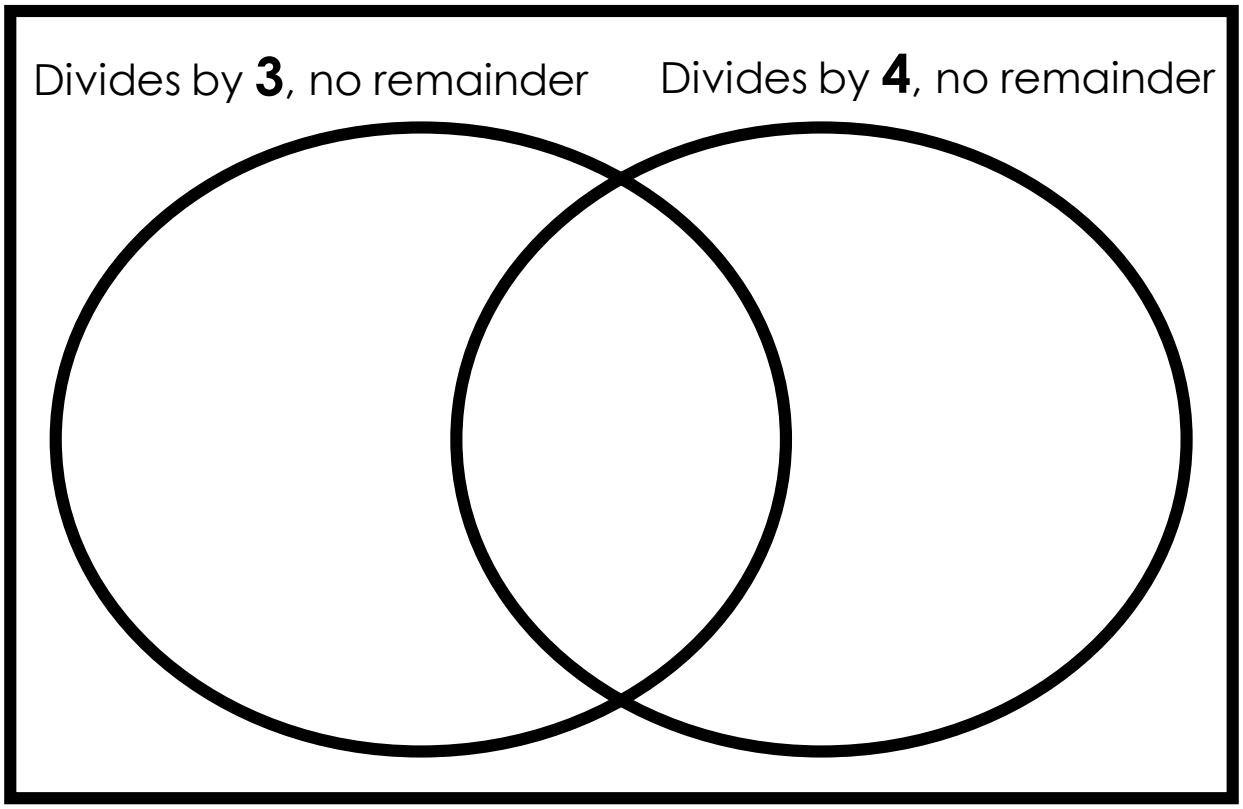
625 ÷ 5

$$\begin{array}{r} 123 \\ 5\overline{)6^{1}2^{1}5} \end{array} \qquad \begin{array}{r} 126 \\ 5\overline{)6^{1}2^{2}5} \end{array} \qquad \begin{array}{r} 125 \\ 5\overline{)6^{1}2^{2}5} \end{array}$$

Explore

Put these numbers in the correct section of the Venn diagram:

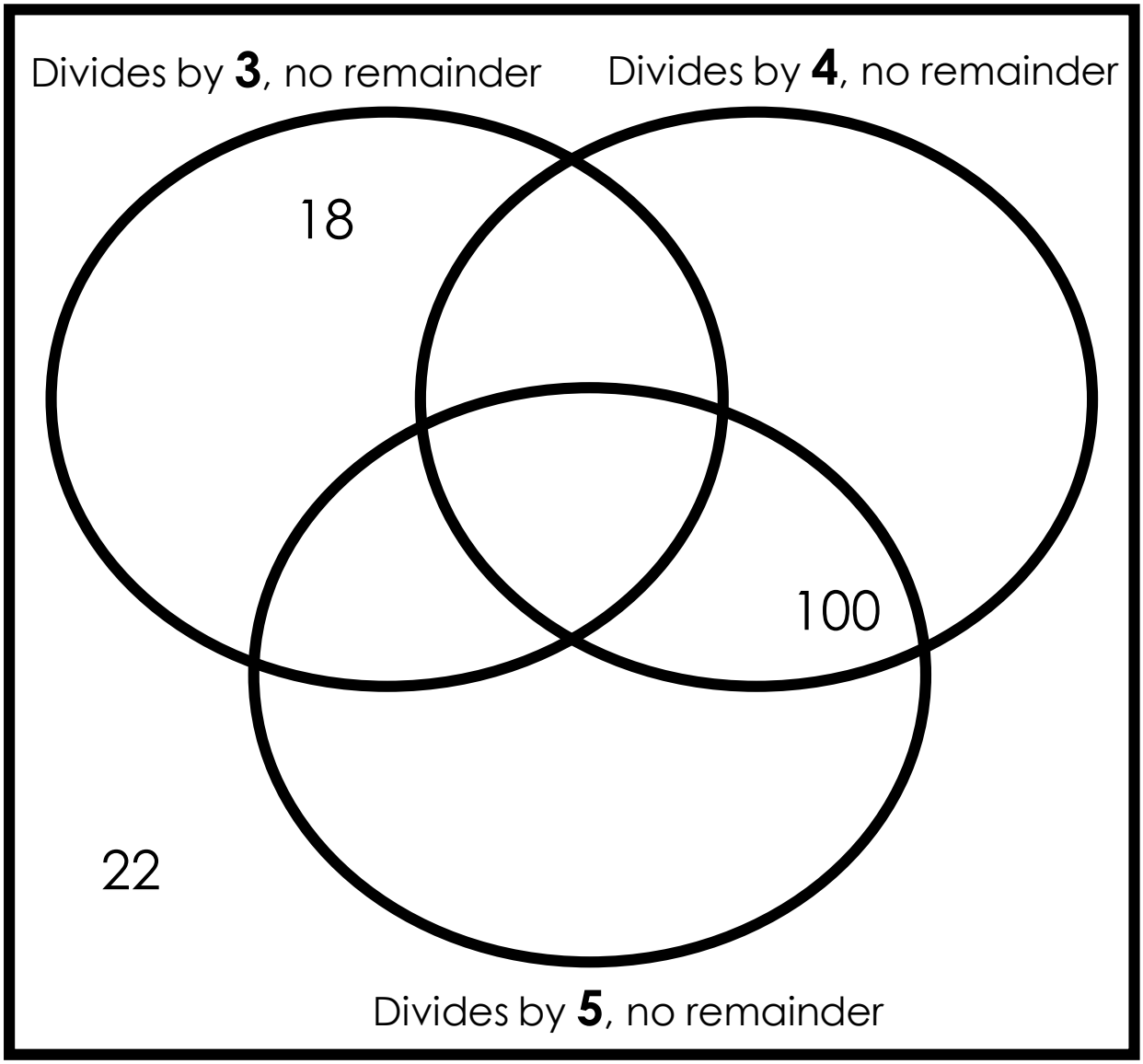
16 20 14 24 18



Add another number to each section.

Explore

Put a number in each section of the Venn diagram:



Investigate

There is a positive whole number in each box.

$100 \div \square = \square$ $60 \div \square = \square$

Which number sentence can be completed in more ways?

How many ways?

Complete using digits 0-9. Position the digit 4 as shown.

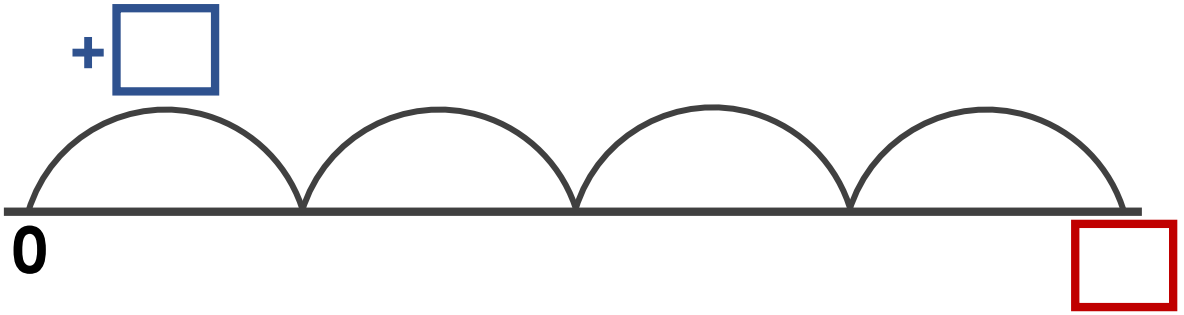
Level 1: I can find a way

Level 2: I can find different ways

Level 3: I know how many ways there are

Different ways

Each jump on the number line is the same.

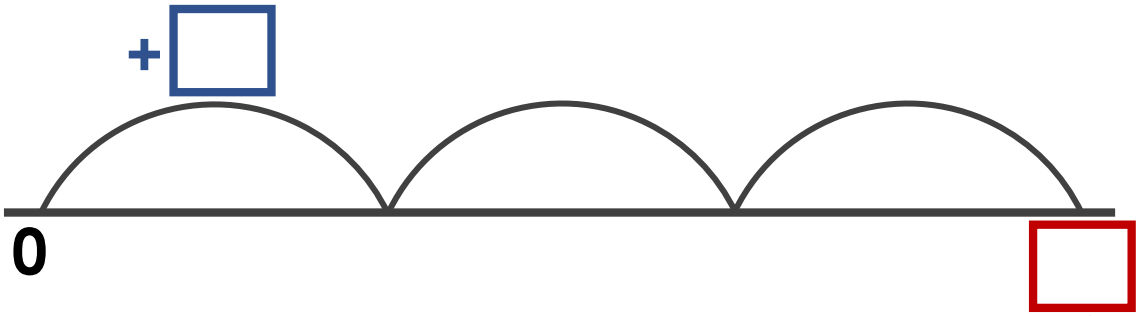


What number could be in the blue box?

more than 30
less than 40

Different ways

Each jump on the number line is the same.



What number could be in the blue box?

more than 100
less than 120

Explain the mistakes

Mistake 1

$3.5 \times 10 = 3.50$

Mistake 2

$35 \times 100 = 350$

Mistake 3

$35 \div 10 = 0.35$

Mistake 4

$350 \div 10 = 3500$

Which answer?

$6 \times \square = 24 \div 2$

What is the missing number?

(a) 2

(b) 4

(c) 8

How many ways?

The missing numbers are positive whole numbers.

$$\square \times 8 = 40 - \square$$

Fill in the missing numbers.

Level 1: I can find a way

Level 2: I can find different ways

Level 3: I know how many ways there are

How many ways?

The missing number is a positive whole number.

$$24 \div \square > 4$$

Fill in the missing number.

Level 1: I can find a way

Level 2: I can find different ways

Level 3: I know how many ways there are

How many ways?

The missing numbers are positive whole numbers.

$$60 \div \square = 4 \times \square$$

Fill in the missing numbers.

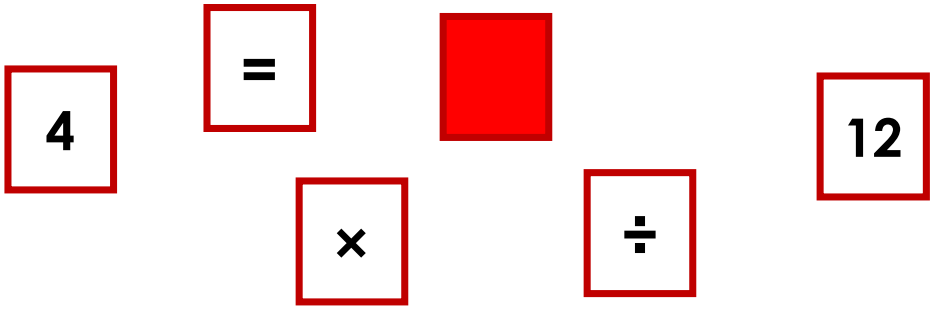
Level 1: I can find a way

Level 2: I can find different ways

Level 3: I know how many ways there are

How many ways?

You have these cards. One card is upside down.



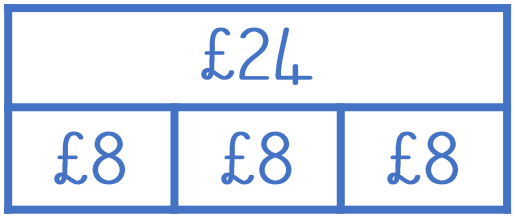
How many number sentences can you make?

The red card can be any number.

Tip: put the = sign in different positions in your number sentences

Which picture?

Tim and three friends get the train.
The total cost is £24.
How much does each person pay?



Which bar model represents the question correctly?

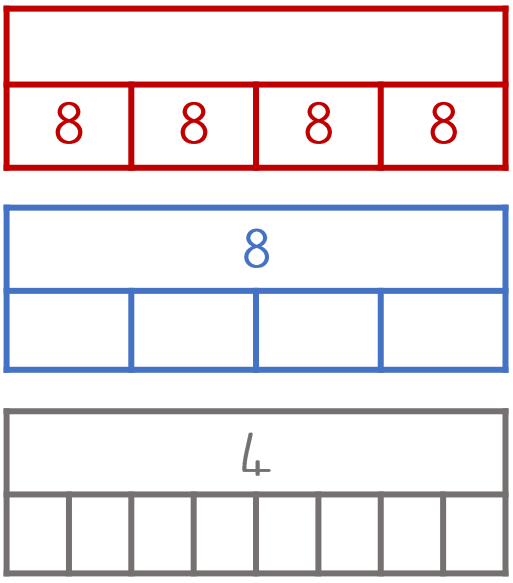
Which picture?

Draw lines to match the questions to the bar models:

4 friends share 8 cherries.
How many cherries each?

4 pizzas shared by 8 friends.
How much pizza each?

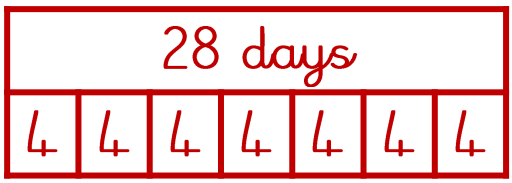
4 friends each have 8 sweets.
How many in total?

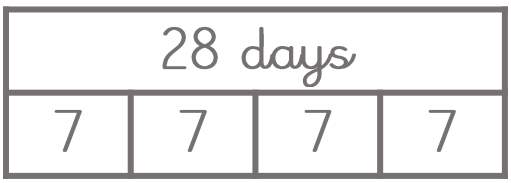


Which picture?

When it's not a leap year there are four weeks in February.

How many days in February on a non-leap year?





Which bar model represents the question correctly?

Which answer?

Mr Jackson has two pairs of trousers, three different ties and four shirts. How many different outfits can he wear?

(a) 14

(b) 9

(c) 24

Fill the gaps

3 glasses fill a bottle

2 bottles fill a jug

6 egg cups fill a glass

____ egg cups fill a bottle

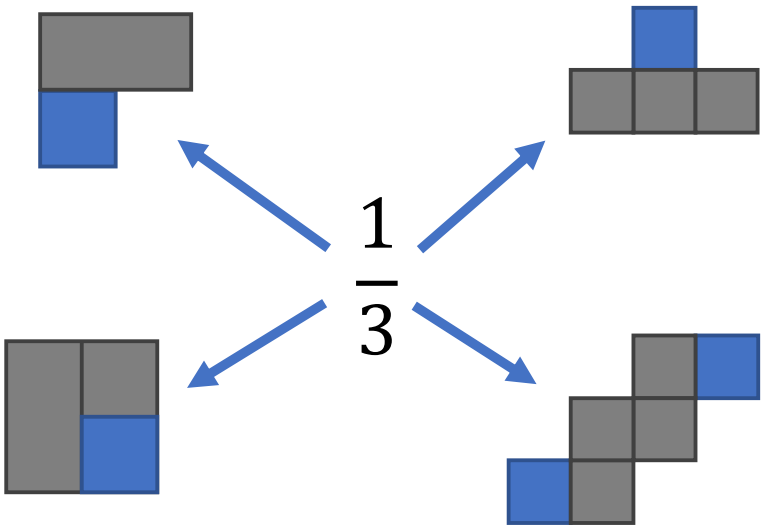
____ glasses fill a jug

____ egg cups fill a jug

____ jugs fill ____ egg cups

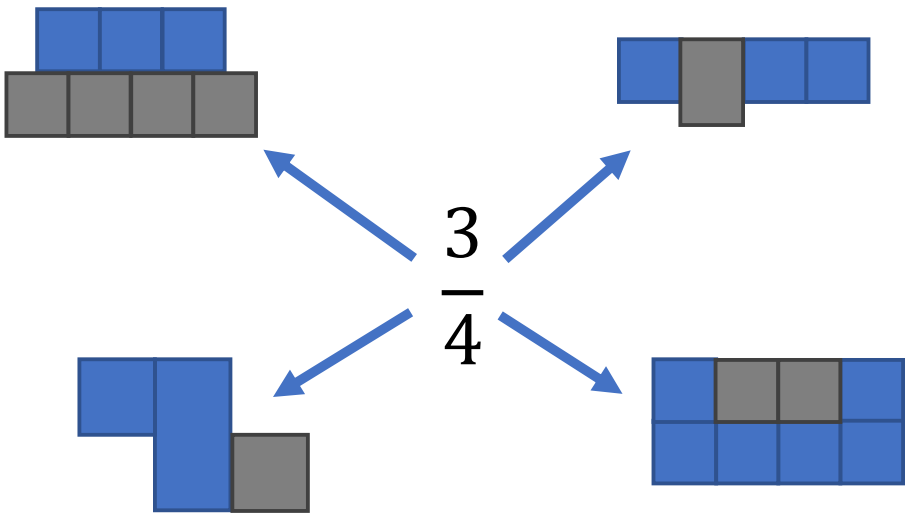
Read the pictures

Which shapes are one-third blue?



Read the pictures

Which shapes are three-quarters blue?



Read the picture

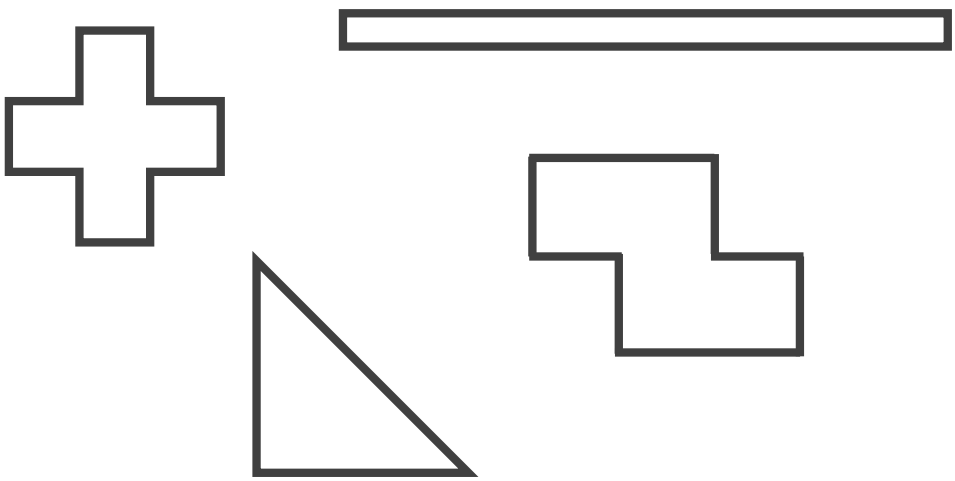
What fraction of the shape is red?
What fraction of the shape is blue?

red =

blue =

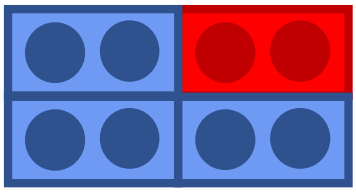
Draw

Shade in $\frac{1}{4}$ of each shape:



Explain

What fraction of the shape is blue?



Kam

$\frac{6}{8}$ as 6 out of 8 circles are blue

Jack

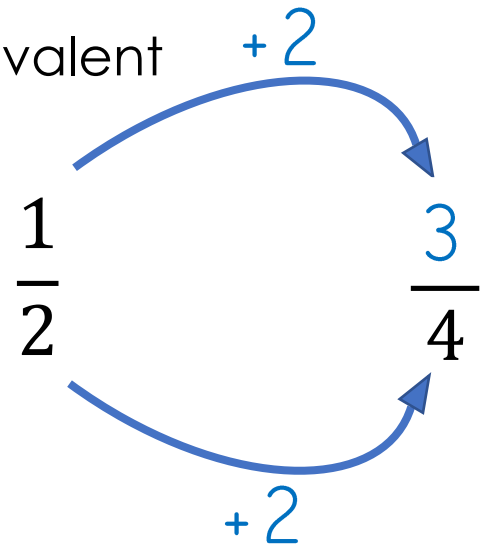
$\frac{3}{4}$ as 3 out of 4 rectangles are blue

I agree with Kam **I agree with Jack** **I agree with both**

Explain:

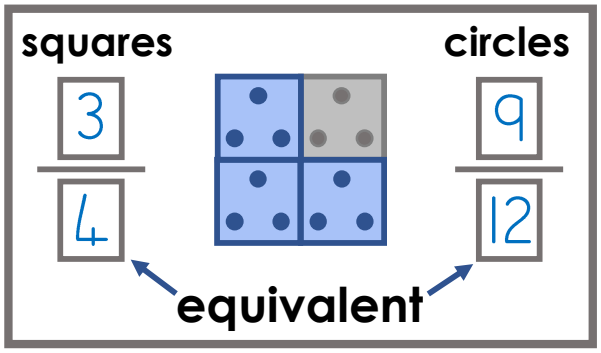
Explain the mistake

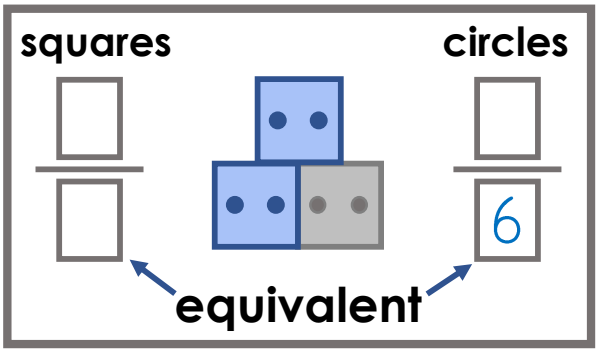
One-half is equivalent to how many quarters?

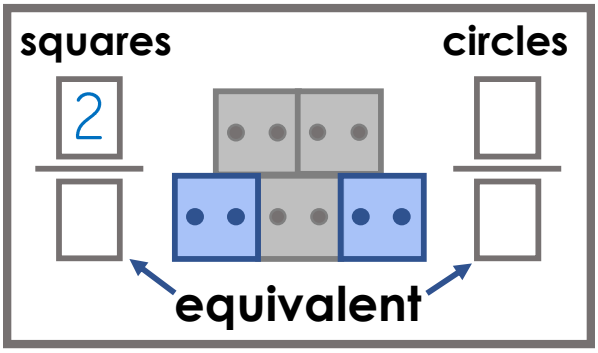


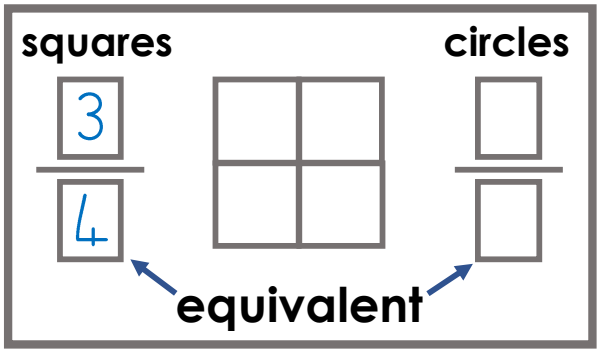
Read the pictures

What fraction of each picture is blue?









finish the drawing

Spot the patterns

Complete the sequences:

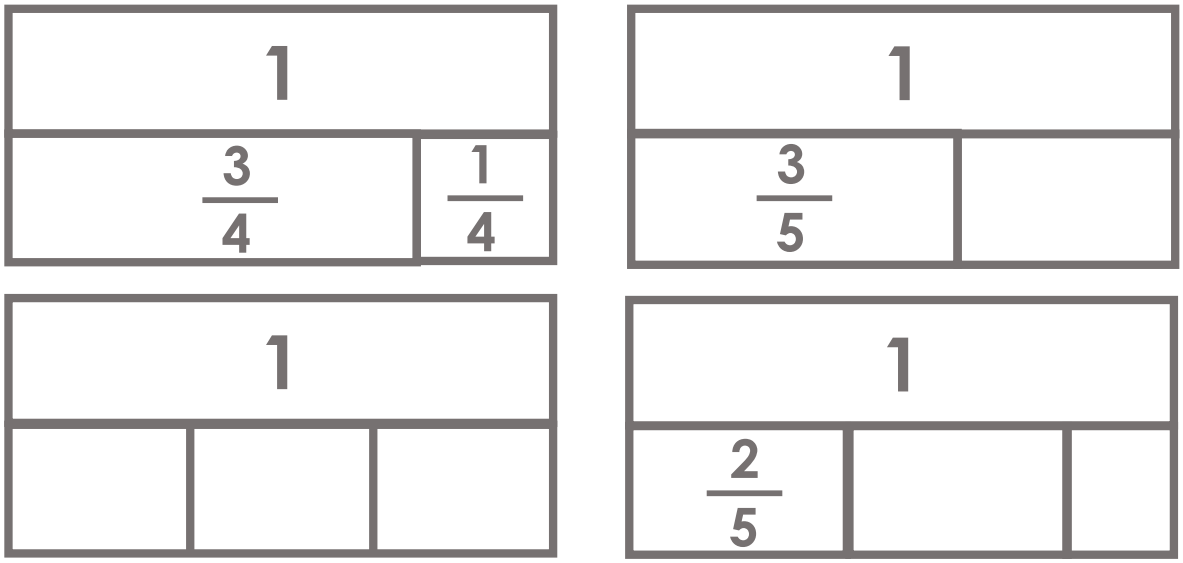
$\square, \frac{8}{10}, \square, 1$

$\frac{5}{7}, \frac{6}{7}, \square$

$1\frac{1}{4}, \square, 1\frac{3}{4}, \square$

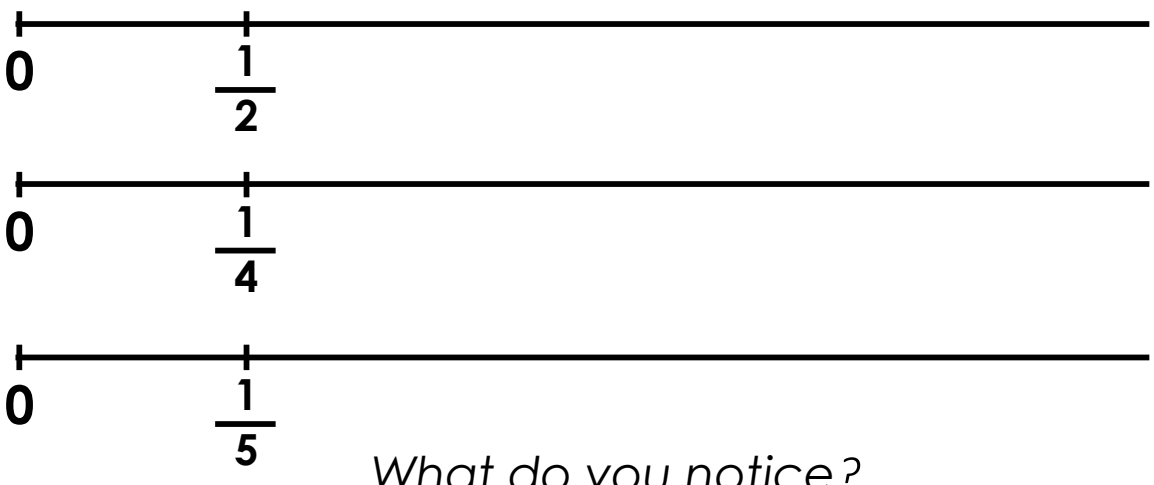
Read the pictures

Complete the missing parts in the bar models:



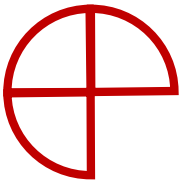
Draw

Show the position of 1 on each number line:



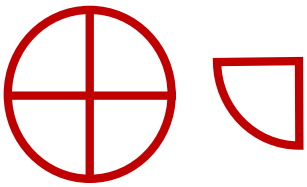
What do you notice?

Read the pictures



This is 3 quarters.

It is less than one whole.



This is ____ quarters.

It is _____ one whole.

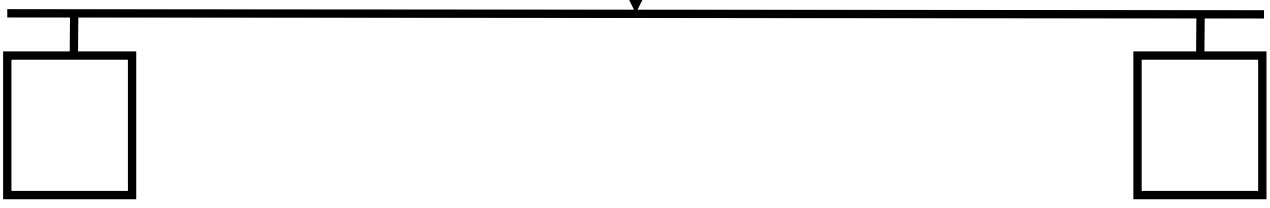
This is ____ quarters.

It is the same as two.

Different ways

Which fractions could be at either end of the number line?

$$\frac{5}{10}$$



Draw

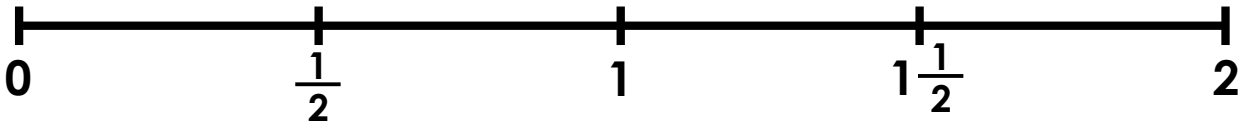
Position the age of each child on the number line.

Francis: 18 months old

Amy: $\frac{1}{5}$ year old

Zoe: $1\frac{3}{4}$ years old

Cruz: 15 months old



Explain

$\frac{1}{5}$ of 15

Nia's method

'5 equal groups, the answer is 3.'

Fern's method

'5 per group, the answer is 5.'

I agree with Nia

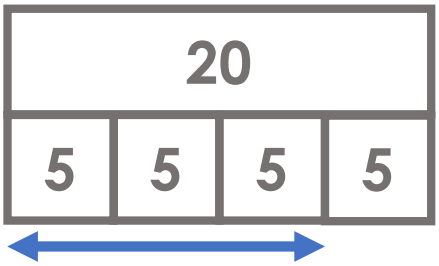
I agree with Fern

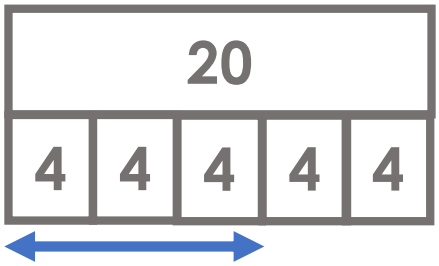
Explain:

Which method?

Which bar model represents the question correctly?

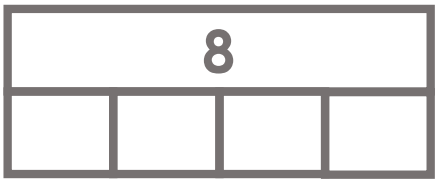
$\frac{3}{4}$ **of 20**





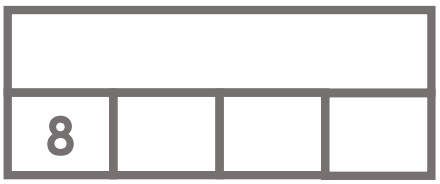
Which picture?

Match the question to the bar model.
Use the bar models to answer the questions.



$\frac{1}{4}$ of 8 = ☐

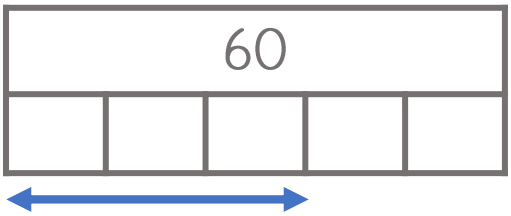
$\frac{1}{4}$ of ☐ = 8

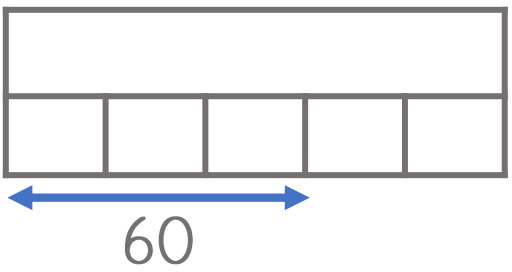


Which picture?

Match the question to the bar model.
Use the bar models to answer the questions.

$\frac{3}{5}$ of $\square$ = 60





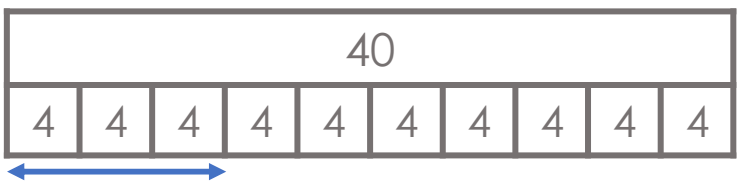
$\frac{3}{5}$ of 60 = $\square$

I know… so…

$\frac{1}{10}$ of 40 =

$\frac{3}{10}$ of 40 = 12

$\frac{3}{10}$ of 80 =

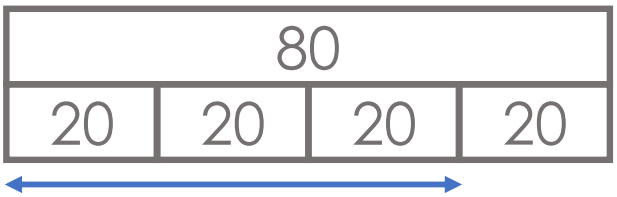


I know… so…

$\frac{\square}{4}$ of 80 = 20

$\frac{3}{4}$ of 80 = 60

$\frac{3}{4}$ of $\square$ = 120



3 ways

Complete in 3 different ways:

$\frac{1}{4}$ of $\square$ = $\frac{1}{2}$ of $\square$ *What do you notice?*

3 ways

Complete in 3 different ways:

$\frac{1}{2}$ of $\square$ = $\frac{1}{10}$ of $\square$ *What do you notice?*

Different ways

Fill in the gaps. Find different ways.

$\frac{1}{6}$ of $24 = 4$

$\frac{1}{\square}$ of $\square = 4$

$\frac{1}{\square}$ of $\square = 4$

$\frac{1}{\square}$ of $\square = 4$

$\frac{1}{\square}$ of $\square = 4$

Different ways

Fill in the gaps. Find different ways.

$\frac{1}{5}$ of $100 = 20$

$\frac{1}{\square}$ of $\square = 20$

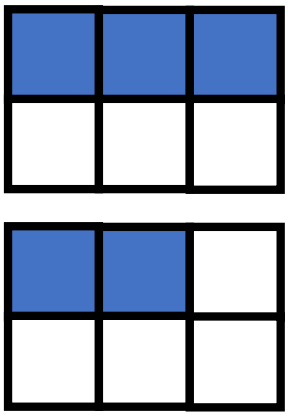
$\frac{1}{\square}$ of $\square = 20$

$\frac{1}{\square}$ of $\square = 20$

$\frac{1}{\square}$ of $\square = 20$

Which way?

$$\frac{3}{6} + \frac{2}{6}$$



$$\frac{3}{6} + \frac{2}{6} = \frac{5}{6}$$

3+2

out of 6

$$\frac{3}{6} + \frac{2}{6} = \frac{5}{12}$$

3+2

6+6

Rank by difficulty

$$\frac{4}{5} + \frac{1}{5}$$

$$\frac{3}{4} + \frac{3}{4}$$

$$\frac{3}{7} + \frac{2}{7}$$

$$\frac{1}{2} + \frac{2}{4}$$

Fill the gaps

$$\frac{3}{8} \square \frac{2}{8} = \frac{5}{8}$$

$$\frac{3}{8} + \frac{\square}{8} = 1$$

$$\frac{3}{8} - \frac{2}{\square} = \frac{\square}{8}$$

Two ways

Fill in the gaps. Do in two different ways.

$$\frac{1}{\square} + \frac{\square}{4} = \frac{3}{4}$$

How many ways?

Fill in the missing numbers:

$$\frac{6}{7} - \frac{\square}{7} = \frac{\square}{7} + \frac{2}{7}$$

Level 1: I can find a way

Level 2: I can find different ways

Level 3: I know how many ways there are

How many ways?

Fill in the missing numbers:

$$\frac{7}{10} - \frac{\square}{10} > \frac{\square}{10} + \frac{3}{10}$$

Level 1: I can find a way

Level 2: I can find different ways

Level 3: I know how many ways there are

Explain the mistakes

Mistake 1

$42 \div 10 = 420$

Mistake 2

$42 \div 10 = 0.42$

Mistake 3

$42 \div 10 = 4 \text{ r } 2$

$$10 \overline{)42} \quad 4 \text{ r } 2$$

Missing numbers

Fill in the gaps using the numbers.

$4 \div \square = \frac{4}{10}$

$4 \div \square = 1$

$4 \div \square = 4$

$4 \div \square = 0.4$

1

4

10

Note: one number is used twice

Missing numbers

Fill in the gaps using the numbers.

$32 \div \square = 32$

$32 \div \square = 3.2$

$32 \div \square = 1$

$32 \div \square = \frac{32}{100}$

100

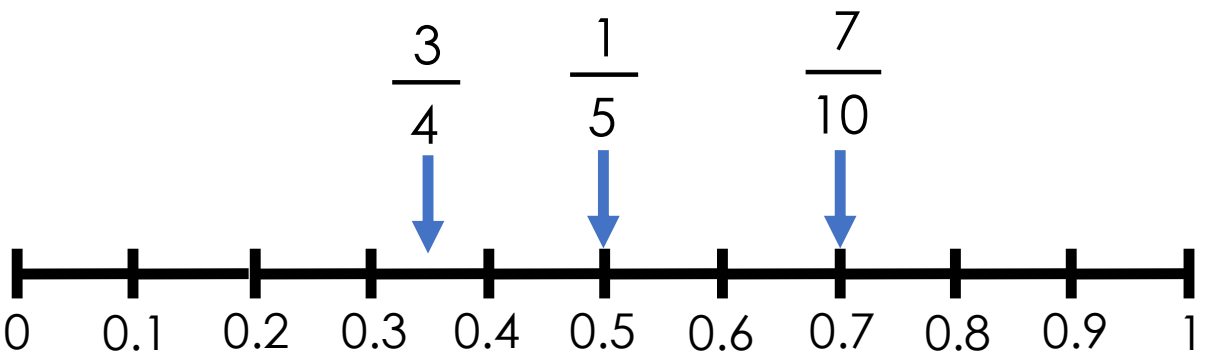
1

32

10

True or false?

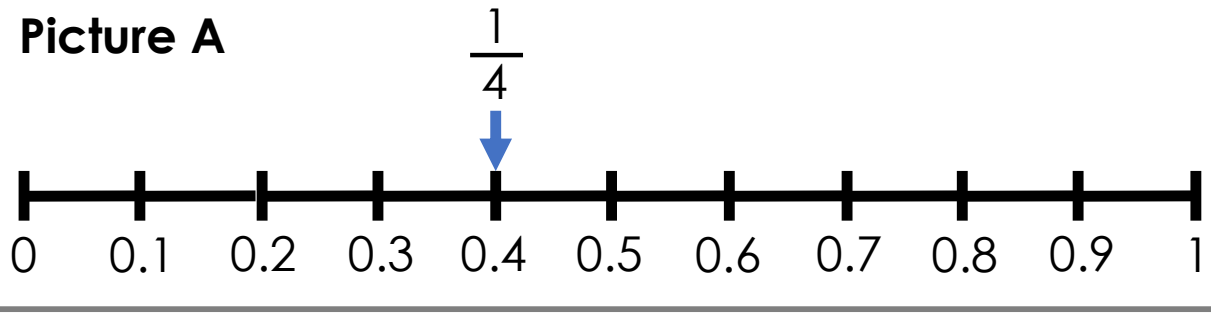
Which fraction(s) have been positioned correctly?



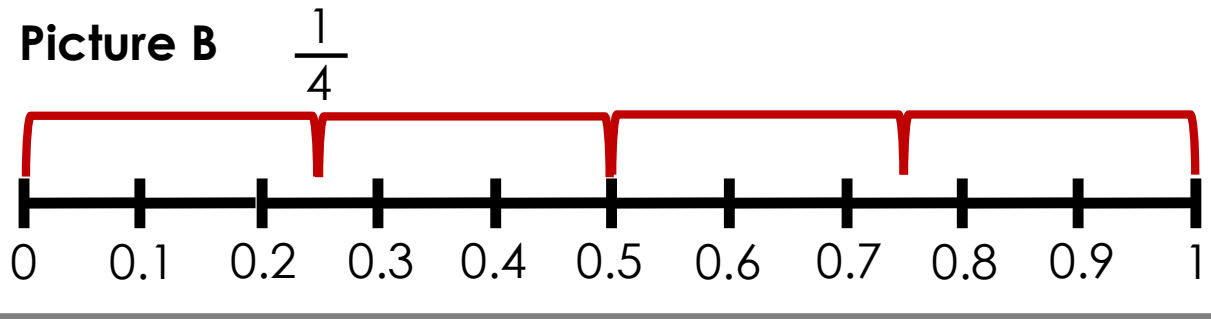
Which picture?

Which picture shows the correct position of $\frac{1}{4}$?

Picture A



Picture B

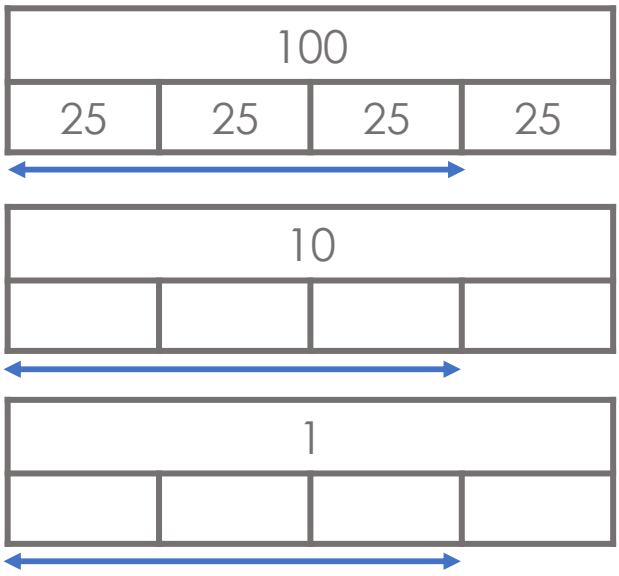


I know… so…

$\frac{3}{4}$ of 100 = 75

$\frac{3}{4}$ of 10 =

$\frac{3}{4}$ of 1 =



Agree or disagree?

320 is more than 90 because it has more digits.

0.32 is more than 0.9 because it has more digits.

Is it the same?

Is 0.24 the same as…

Two **0.1** coins and four **0.01** coins?

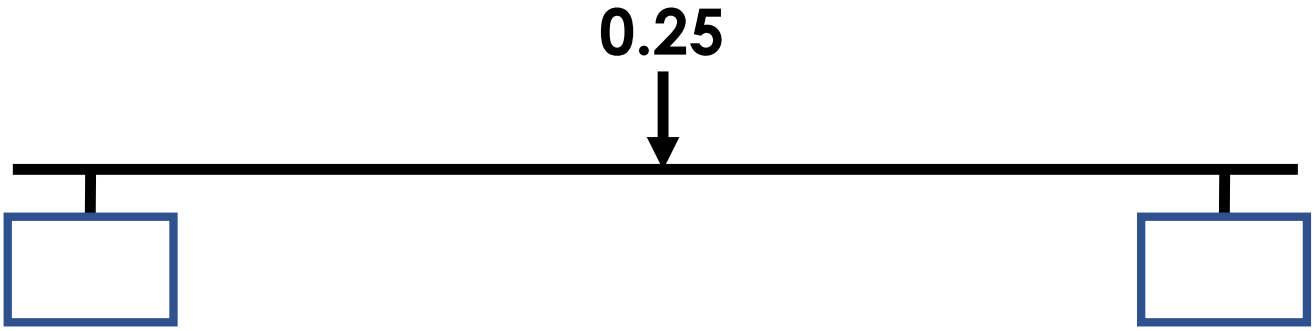
24 **0.1** coins?

24 **0.01** coins?

Are there any other ways?

Different ways

What could the missing numbers be?



Two ways

Complete the decimals using the digits 2, 5 and 8.
Position the decimals on the number lines.

0.□ **0.□□**

2 **5** **8**

Method 1 - small difference between decimals:

Method 2 - large difference between decimals:

Explain

Circle the unit(s) of measure that may be used to measure each item:

The classroom bin → **mm** **cm** **m** **kg** **ml** **litres**

A letter → **mm** **cm** **m** **g** **kg** **ml**

A bath → **mm** **cm** **m** **kg** **litres**

True or false?

8cm = 80 mm

60mm = 600 cm

500m = 5 km

30cm = 3 m

30cm = 300 mm

Which answer?

35cm + 60mm = ____ cm

(a) 95cm

(b) 635cm

(c) 41cm

Rank by difficulty

4 km = _____ metres

4 mm = _____ cm

4 minutes = _____ seconds

Explain

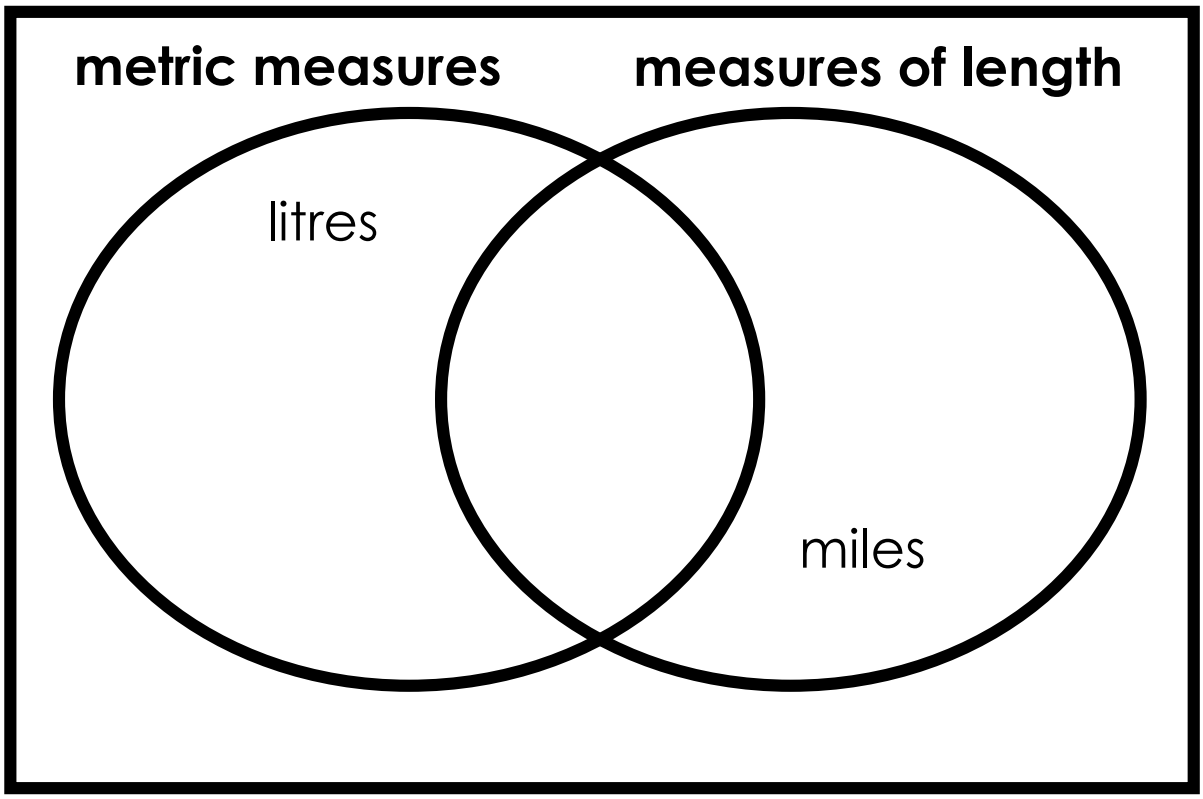
Order these lengths from shortest to longest:

750mm 160cm 0.9m your height

Explore

Write these measures in the correct section of the Venn diagram:

inches metres stones kilograms



Add some more units of measure

Which answer?

£10 - £7.90

(a) £2.10

(b) £3.1

(c) £3.10

Which answer?

I spend £16.99 at the shop. I pay with a £20 note. How much change am I given?

(a) £4 and 1p

(b) £3.01

(c) £3.1

Explain

Sometimes when I am paying for something that costs £6 I pay with a £10 **and a £1 coin.**

Why might I do this?

How many ways?

I spend 70p at the shop.

I pay with exactly 5 coins.

Which coins do I use?

Level 1: I can find a way

Level 2: I can find different ways

Level 3: I know how many ways there are

Different answers

I have less than 50p.

You need at least 5 coins to make this amount of money.

How much money do I have?

Level 1: I can find a possible amount

Level 2: I can find different possible amounts

Level 3: I have found all the possible amounts

Which picture?

I pay for four packs of stickers with a £5 note.

I get £1.80 change.

What is the cost of a pack of stickers?

Which bar model represents the question correctly?

OR

Work out the cost of a pack of stickers.

Which picture?

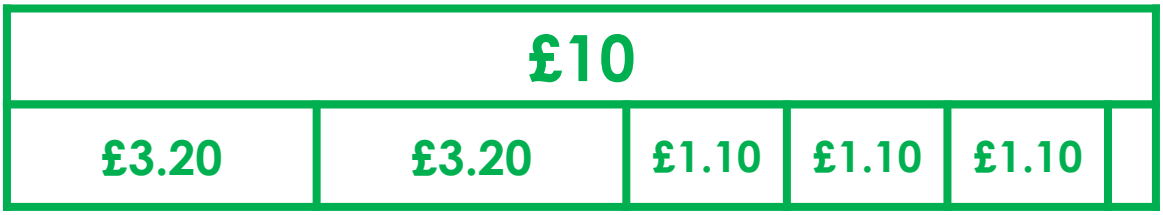
Cost for swimming: £3.20 – adult £1.10 – child

Two adults and three children go swimming.

Lisa pays with a £10 note.

How much change is Lisa given?

Which bar model represents the question correctly?



OR

Explain

Fill in the missing word(s).

An apple is more expensive than a banana.

An apple is cheaper than an orange.

A banana is _____ than an orange.

Which answer?

20 minutes ago it was 7:45pm.

What is the time now?

(a) 8:05pm

(b) 7:25pm

(c) 7:65pm

I know… so…

$2\frac{1}{2}$ hours after **10:15pm** the time is **12:45pm**

$2\frac{1}{2}$ hours after **10:30pm** the time is ☐

$2\frac{1}{2}$ hours after **10:45pm** the time is ☐

Order

Order these times from shortest to longest:

20 minutes 600 seconds $\frac{1}{4}$ hour

Order

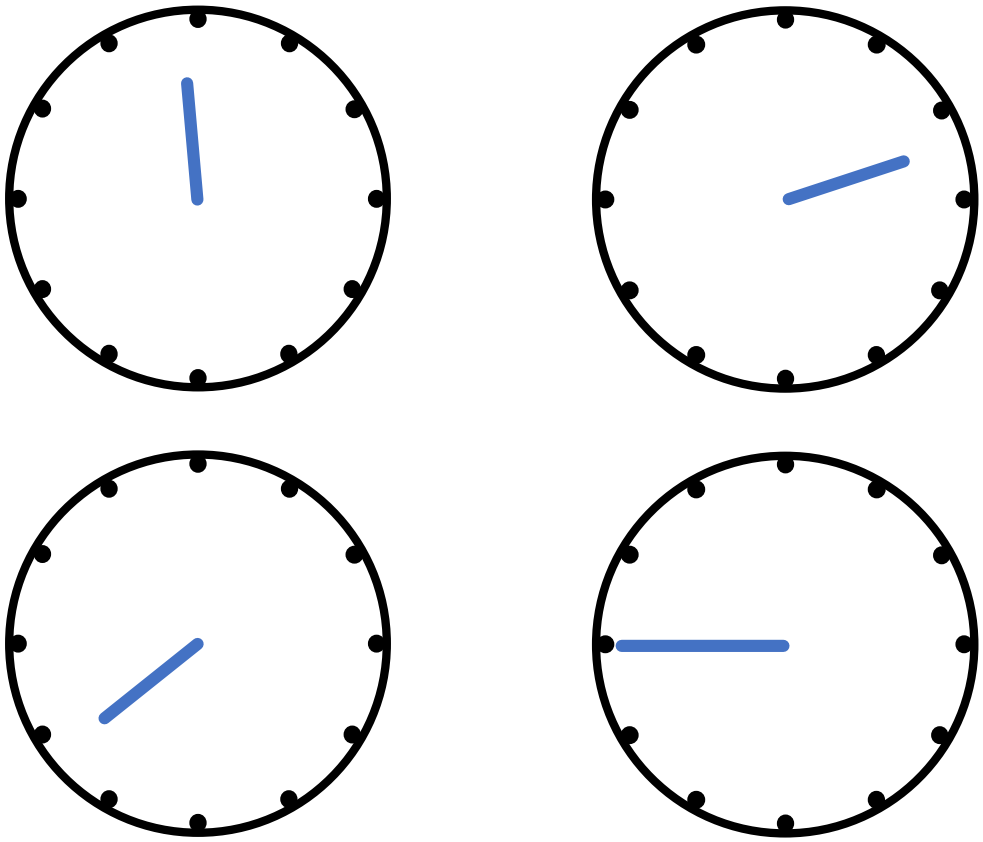
Order these times from shortest to longest:

3 weeks 13 days 240 hours $\frac{1}{2}$ month

Estimate

There is a hand missing from each clock.

For each clock, what time could it be?



Explain

Order the amount of time you have spent:

Brushing your teeth in the last two weeks

Eating yesterday

Exercising in the last 3 days

Explain

Which shape is bigger?

Estimate

Estimate the perimeter:

Estimate

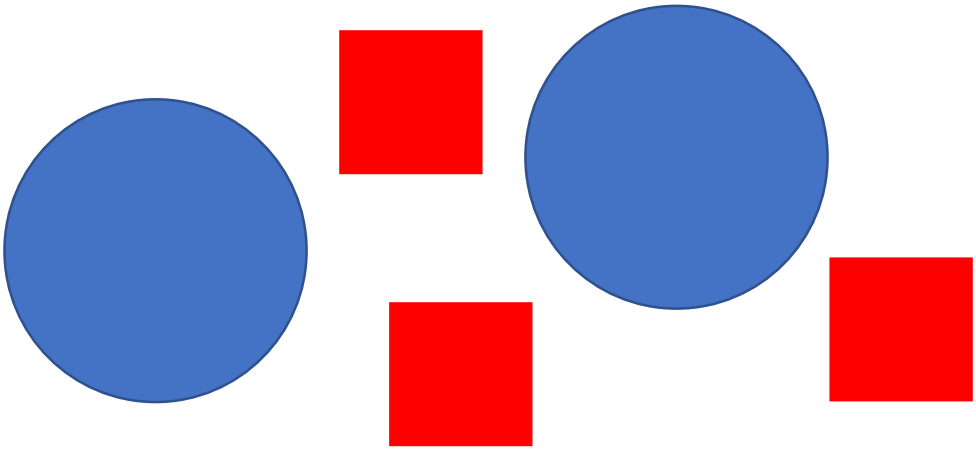
Estimate the perimeter:

Explain

Order these shapes from the smallest to the largest perimeter <u>without</u> measuring them.

Explain

More blue or red?



Read the pictures

Tim's shape

Ben's shape

Tim's shape has a _____ area than Ben's shape.

Tim's shape has a _____ perimeter than Ben's shape.

Read the pictures

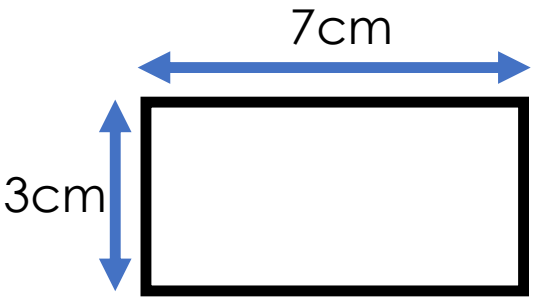
Beth's shape

Zara's shape

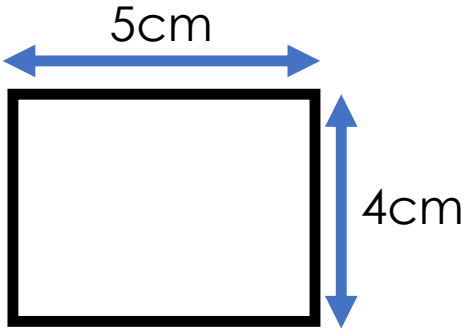
Beth's shape has a _____ area than Zara's shape.

Beth's shape has a _____ perimeter than Zara's shape.

True or false?

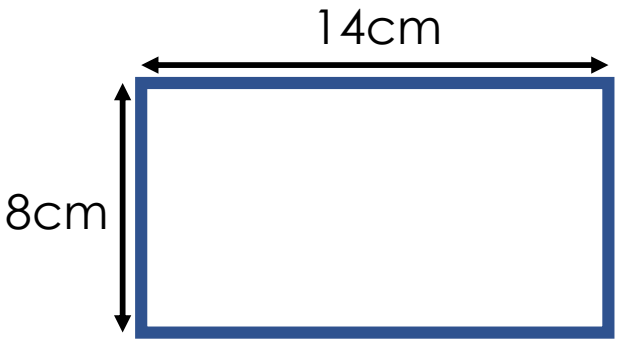


Perimeter = 10cm

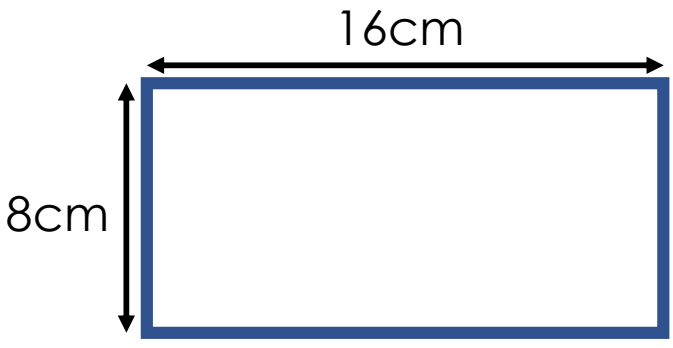


Perimeter = 18cm

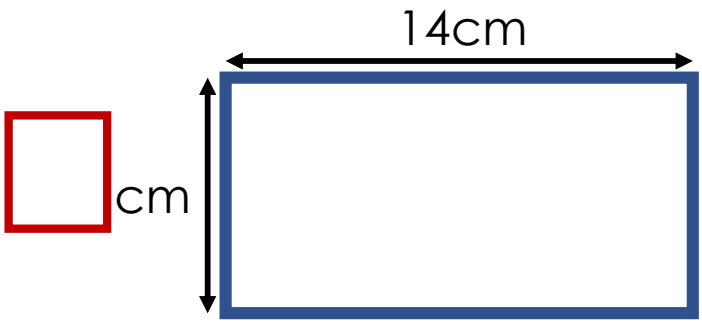
I know… so…



perimeter = 44cm



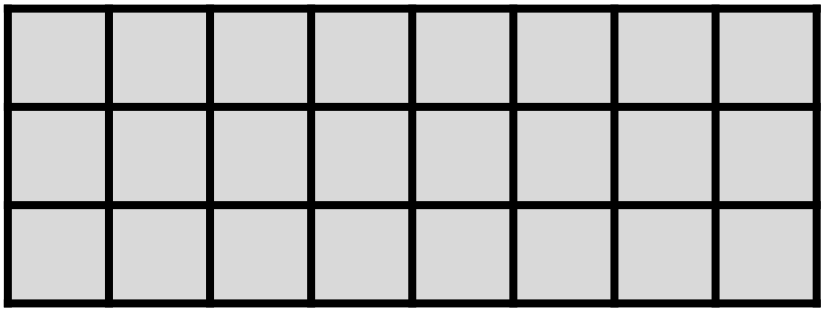
perimeter = ☐ cm



perimeter = 40cm

Explore

This rectangle has an area of 24 squares:



Make other rectangles with areas of 24 squares.

Make a rectangle with a larger perimeter.

Make a rectangle with a smaller perimeter.

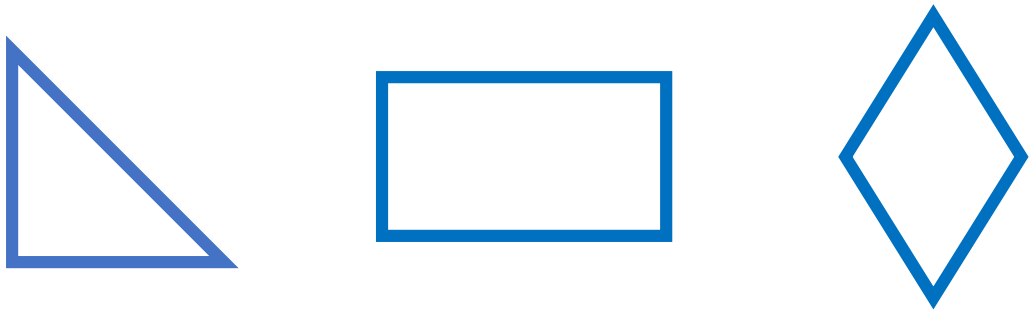
Explore

You will need squares with a side length of 1cm.

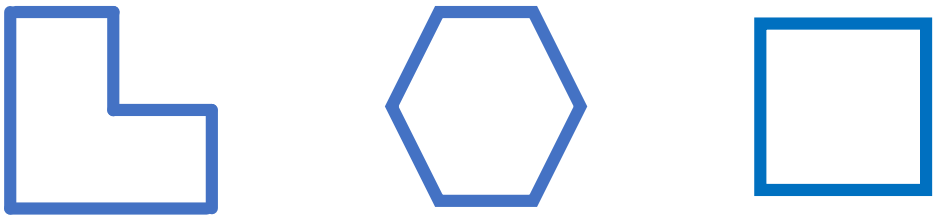
Using your squares, make shapes with a perimeter of 20cm and different areas.

Which type of shapes have a larger area?

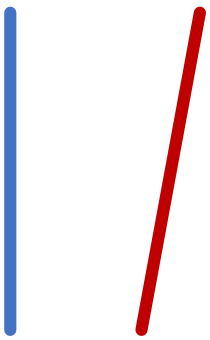
Odd one out



Odd one out



Agree or disagree?

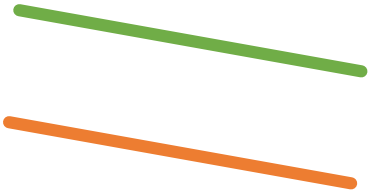


The blue line is vertical

The blue line and the red line are parallel as they never meet

Agree or disagree?

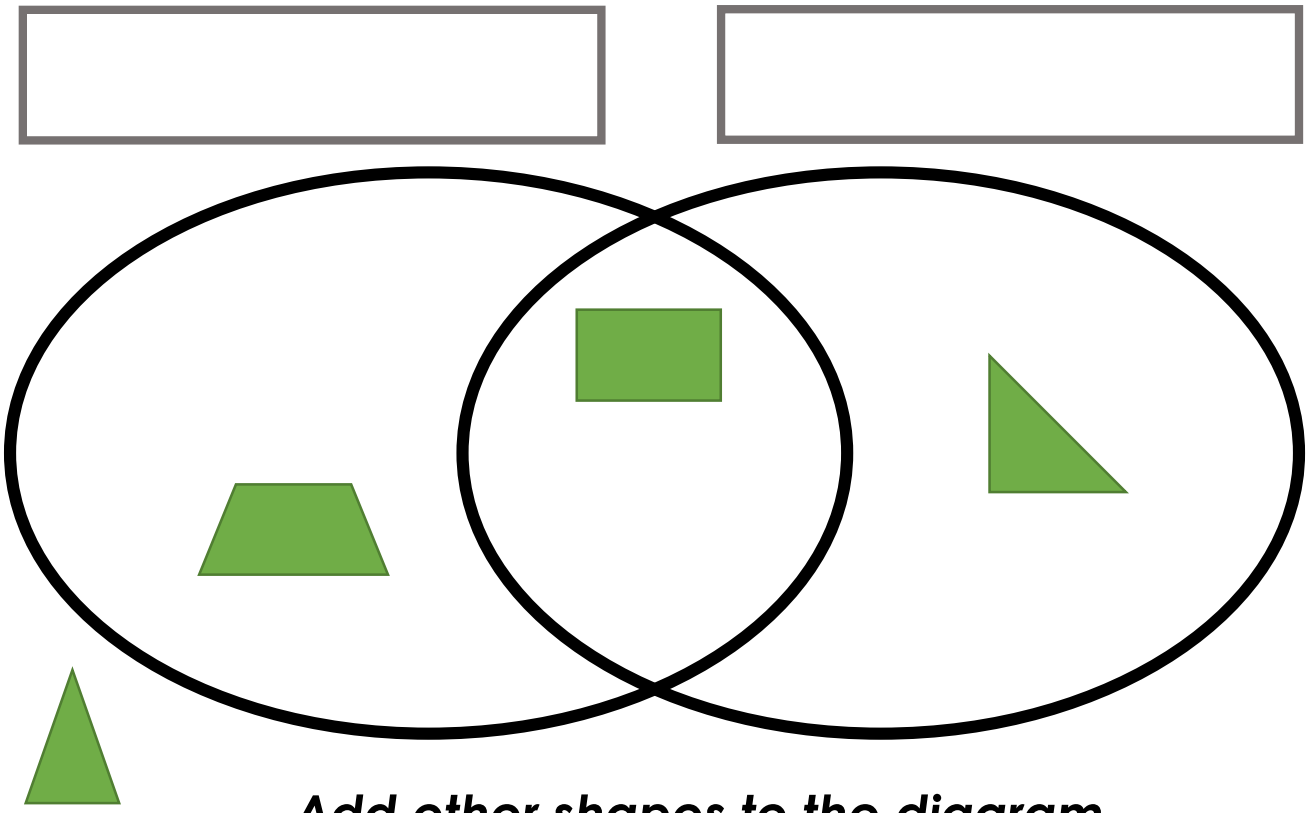
The green line is horizontal



The lines are parallel

Explore

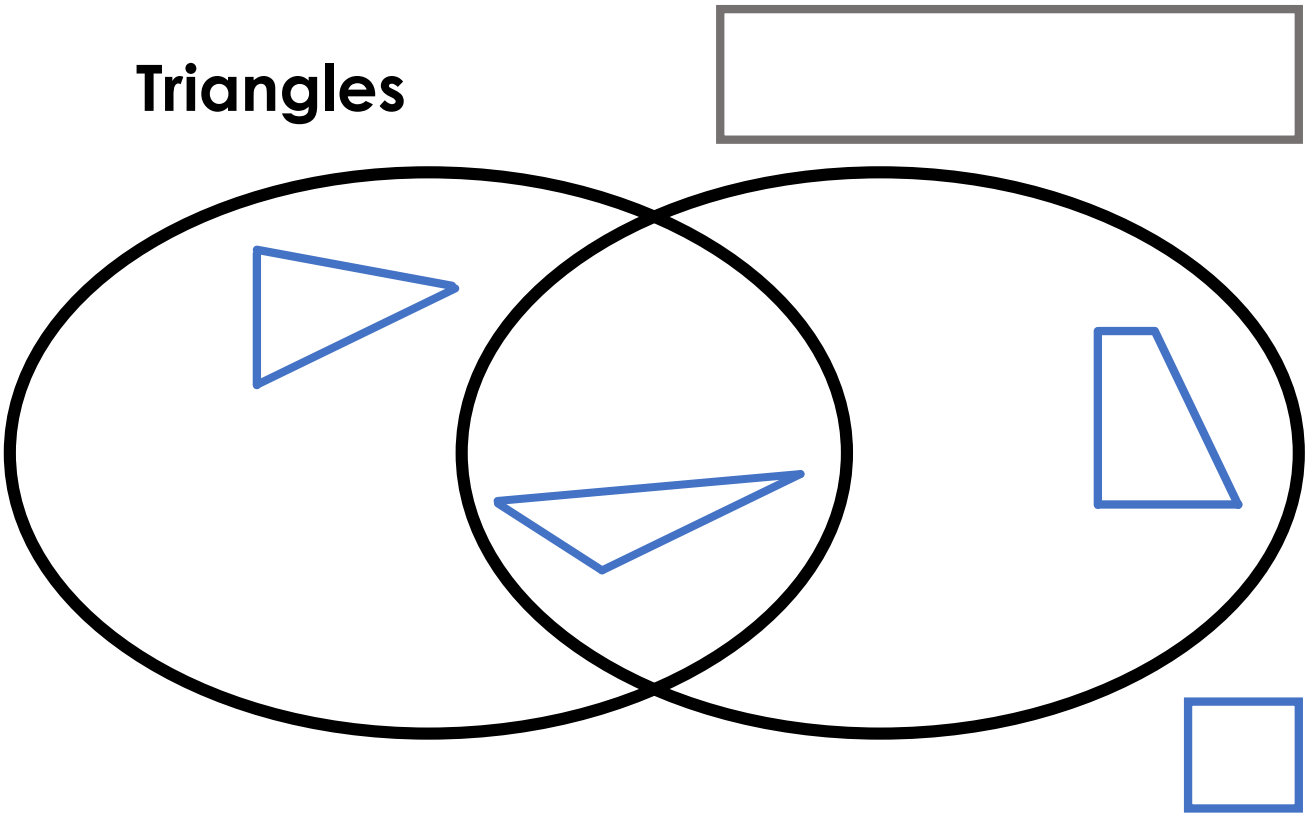
Write the headings for the Venn diagram



Add other shapes to the diagram

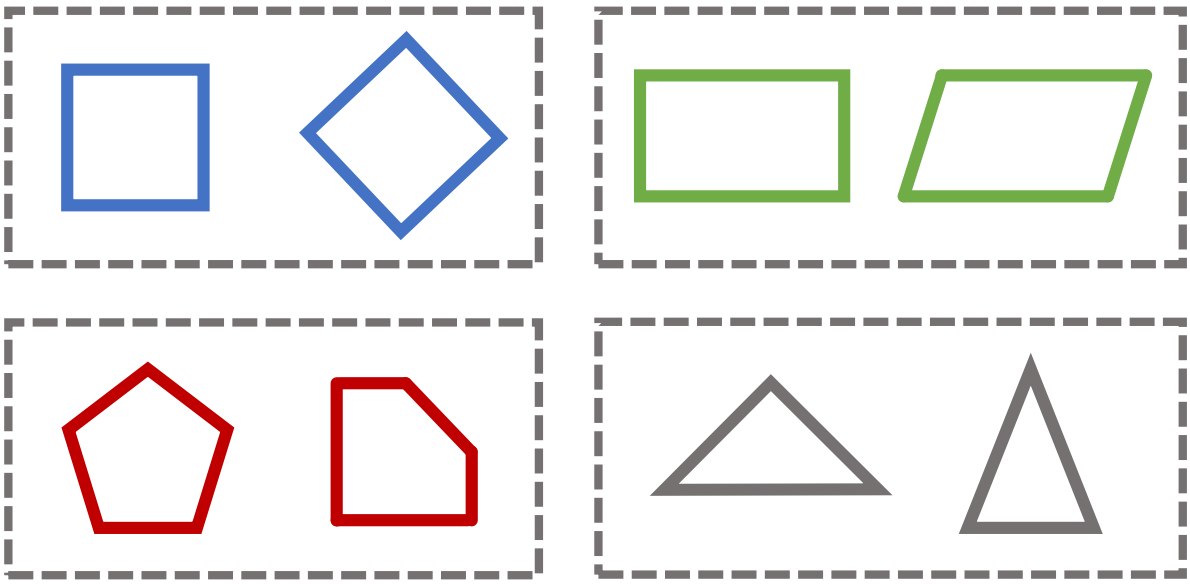
Explore

Write the missing heading for the Venn diagram. Add shapes to each section.



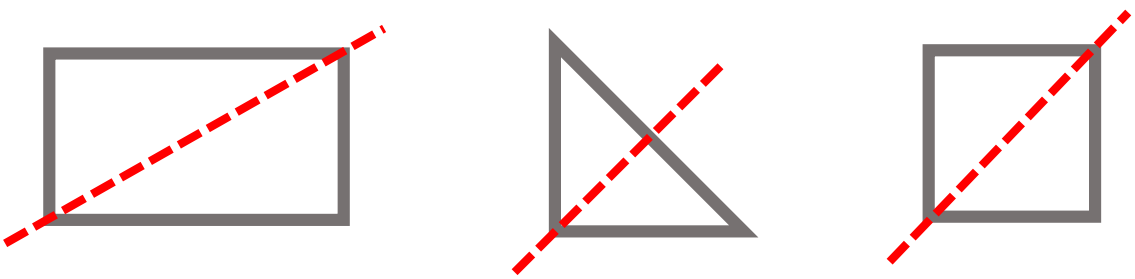
Explain

What's the same? What's different?



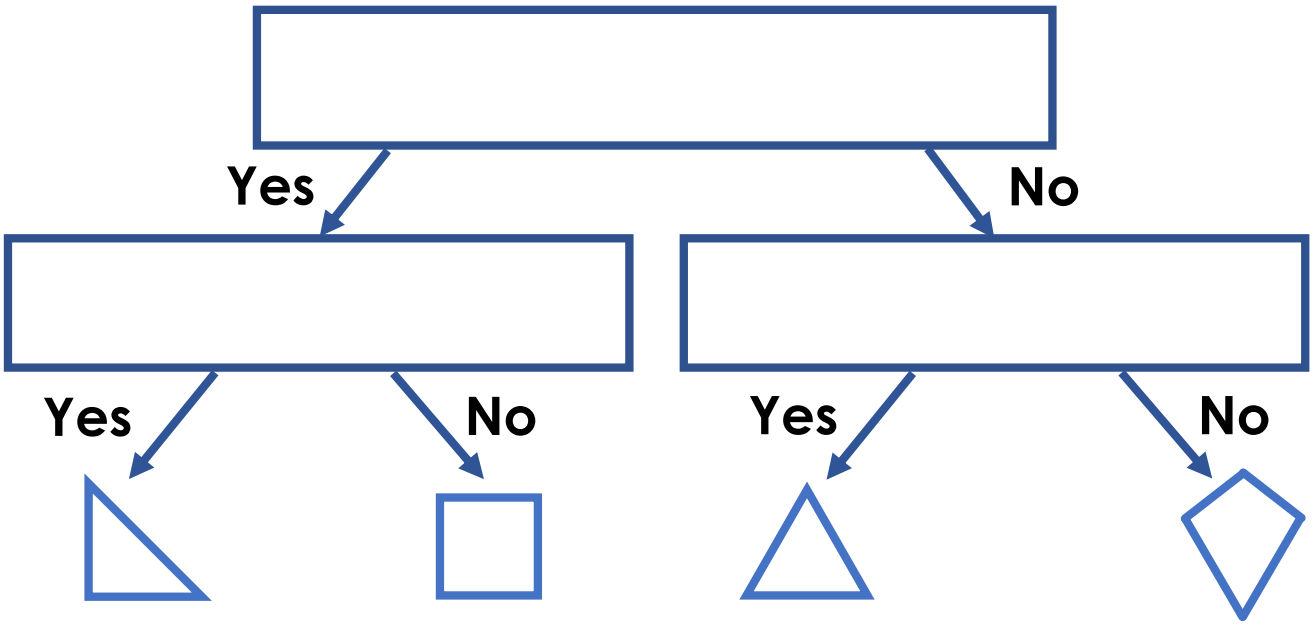
Is it correct?

Are the lines of symmetry correct?



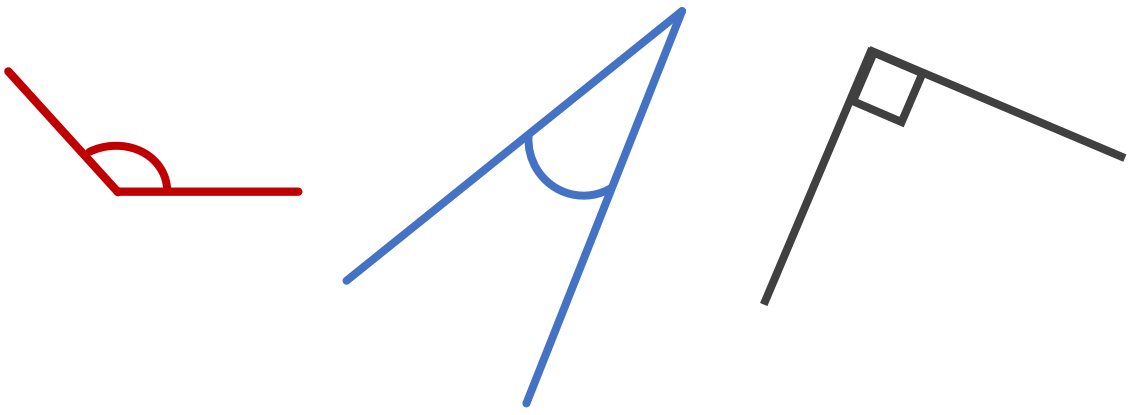
Explore

Write the questions in the branching database:



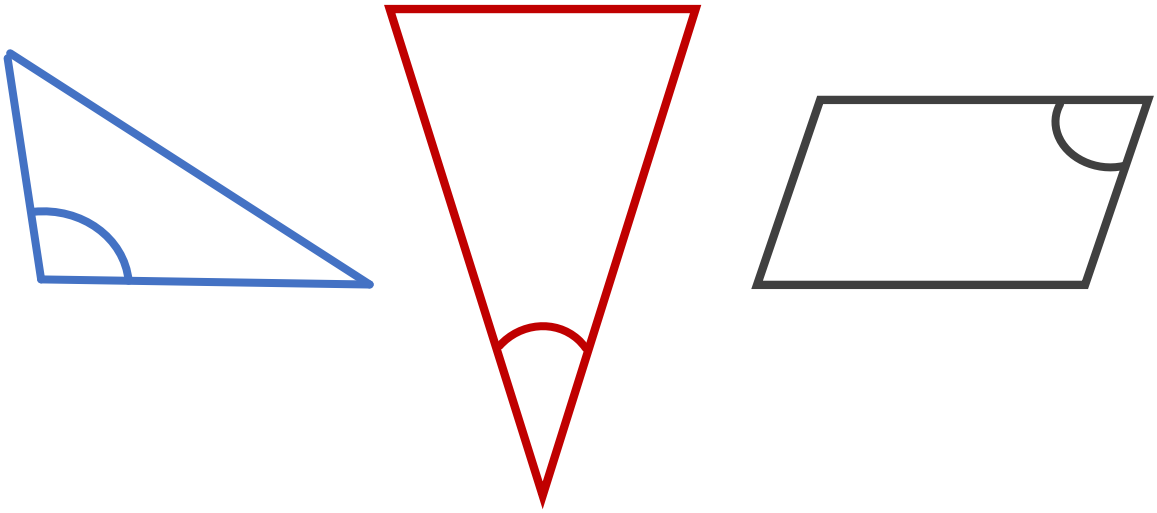
Order

Order the angles from smallest to largest:

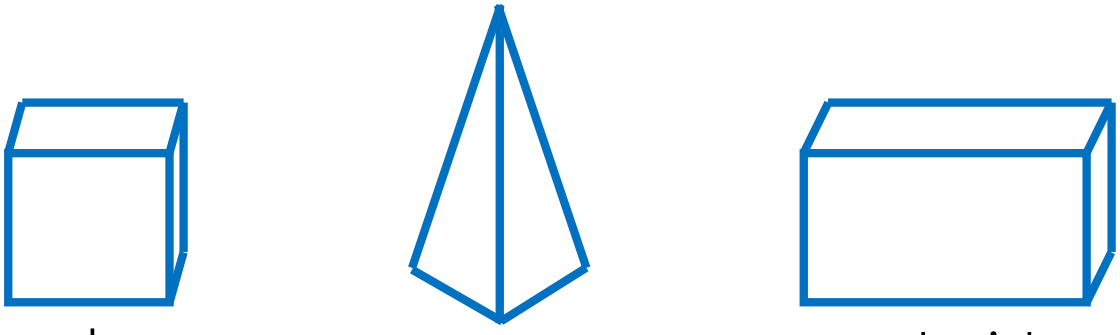


Order

Order the marked angles from smallest to largest:



Odd one out



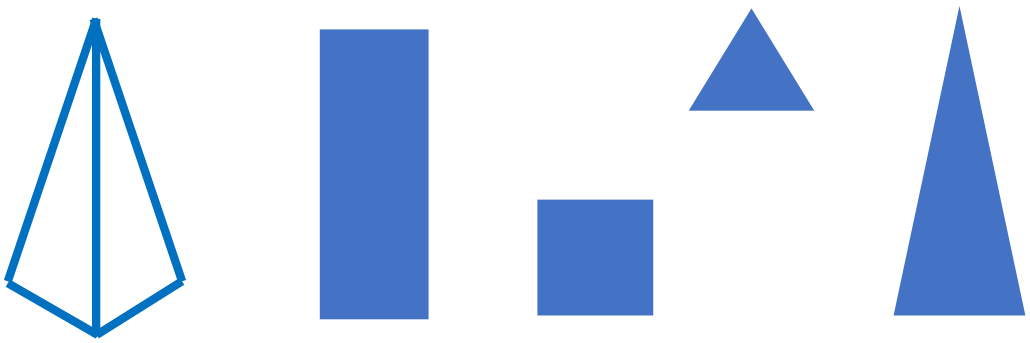
cube

square-based pyramid

cuboid

Read the picture

Which shapes can be printed using this square-based pyramid?



Two ways

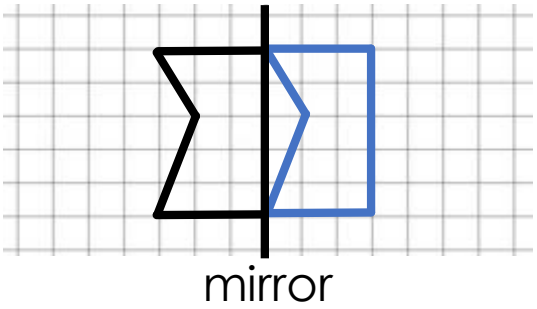
One more square needs adding to each net to complete the net of a cube.

Complete in two ways.

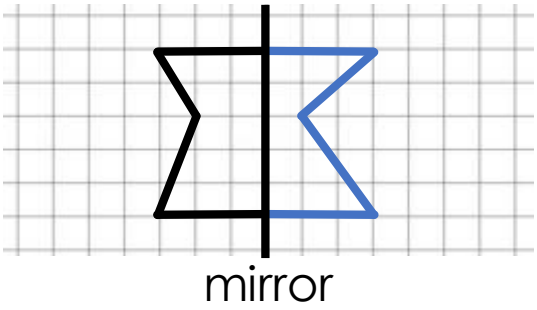
Explain the mistakes

Reflect the shape in the mirror line.

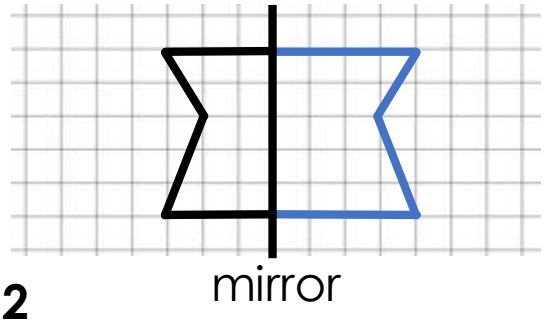
Mistake 1



Mistake 2



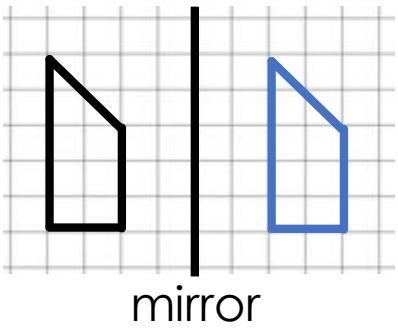
Mistake 3



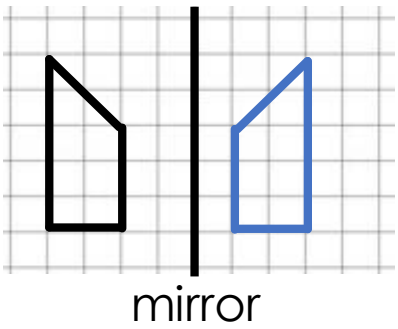
Explain the mistakes

Reflect the shape in the mirror line.

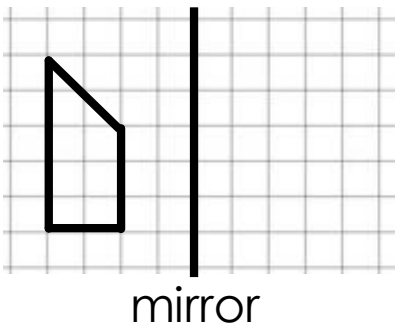
Mistake 1



Mistake 2

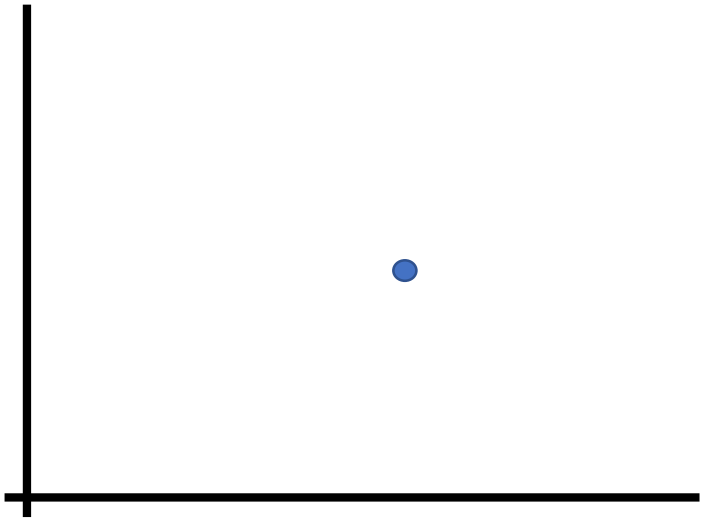


Correct way:



Different ways

Think of possible coordinates for the blue dot.



Could the coordinates of the blue dot be:

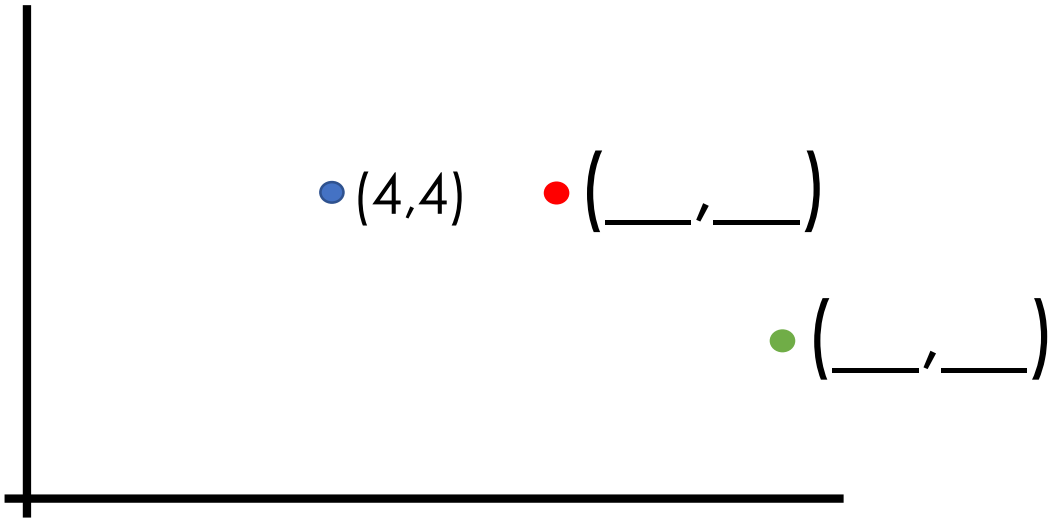
(3,5)

(5,3)

(10,9)

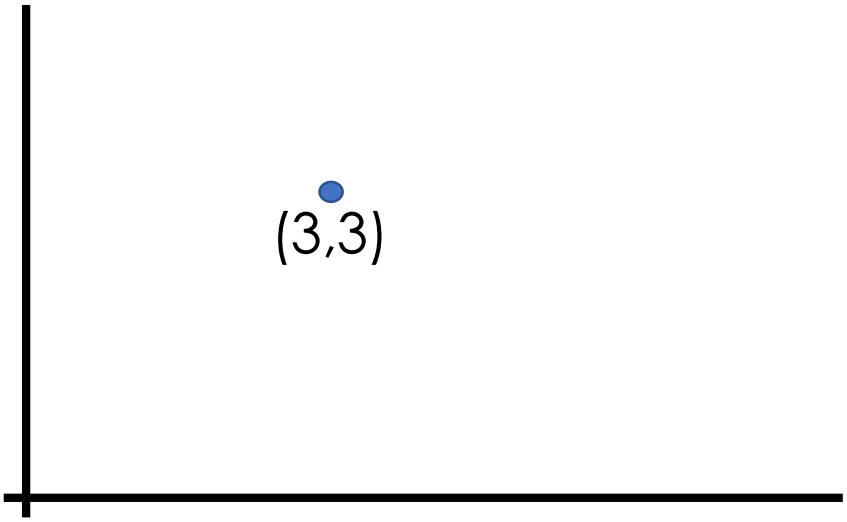
Estimate

Estimate the coordinates of the red and green dots.



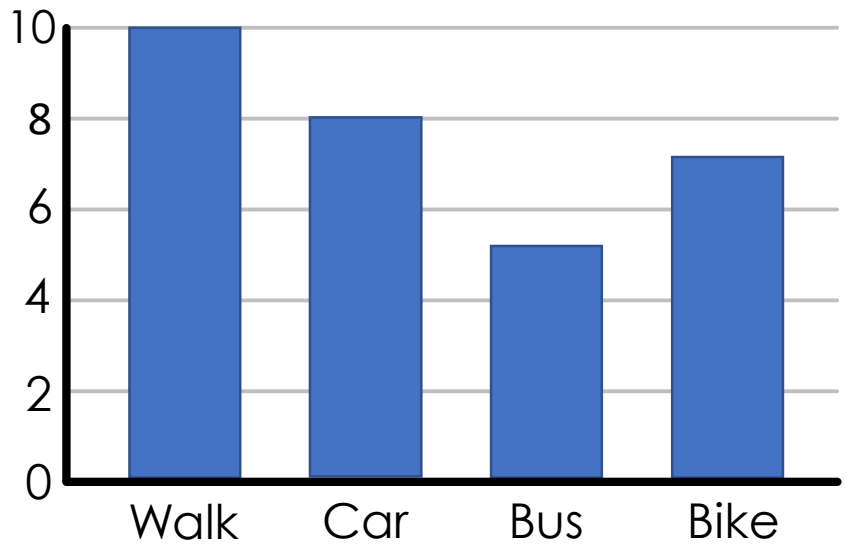
Draw

Draw a dot to show the approximate position of the coordinate point (6,4):



True or false?

How Children in Class 3A Travel to School



There are 10 children in the class

There are 30 children in the class

Most of the children in the class walk to school

Explain

Grace does a traffic survey to see which types of vehicles drive past school. Here are her results:

Cars: 𝍸 𝍸 𝍸 𝍸 |||
Vans/Lorries: 𝍸 |||
Bikes: 𝍸 |
Motorbikes: ||
Other: |||

Why did Grace use tally marks to record her results rather than numbers?

When else would you use tally marks?

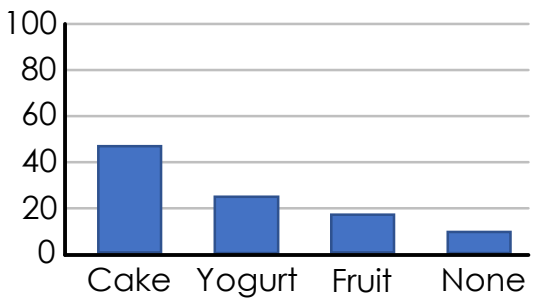
Mark the work

Cake	48
Yogurt	26
Fruit	18
None	8

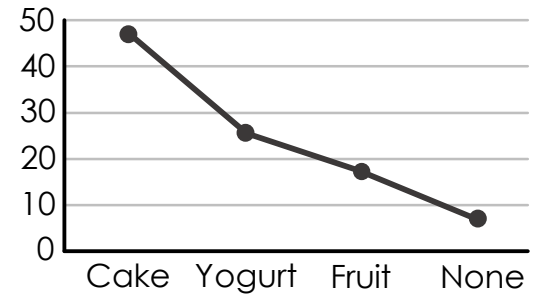
The table shows the puddings that 100 children ate at school.

Mrs Yates asked her class to create a graph using this data.

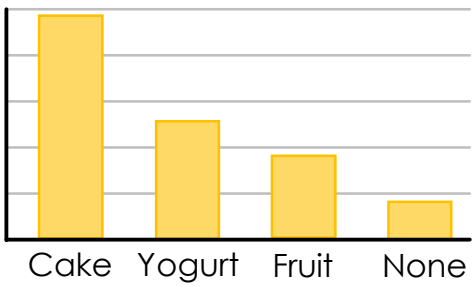
Mark their work: find good things, suggest improvements.



Feedback:

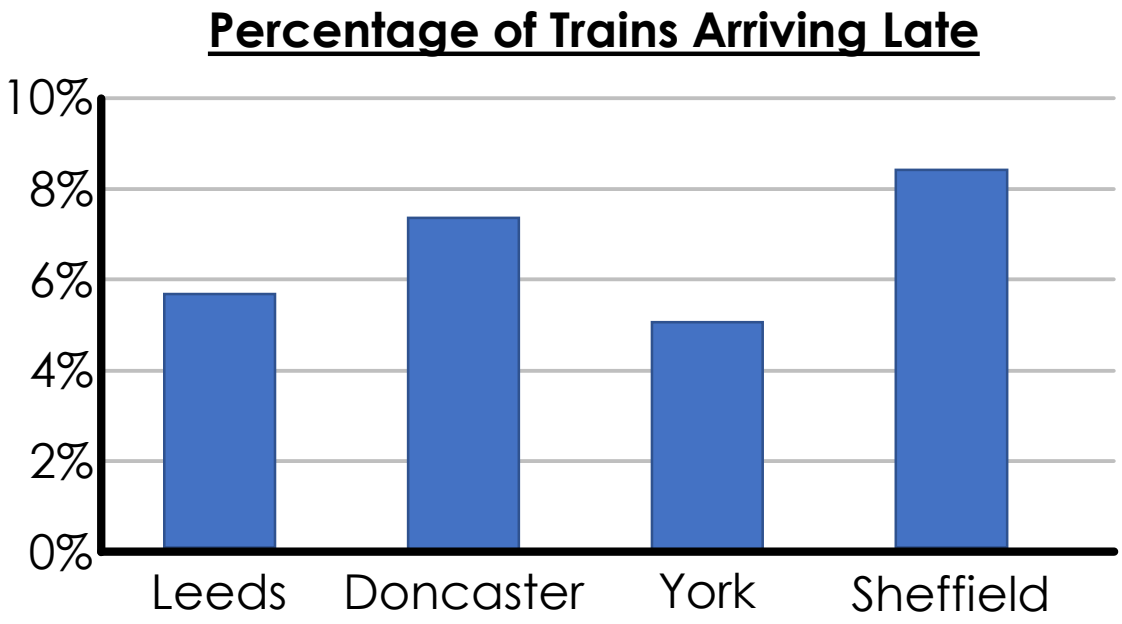


Feedback:



Feedback:

Explain



Which is the best performing train station?

Which graph?

For each example, should the data should be presented as a bar graph or a line graph?

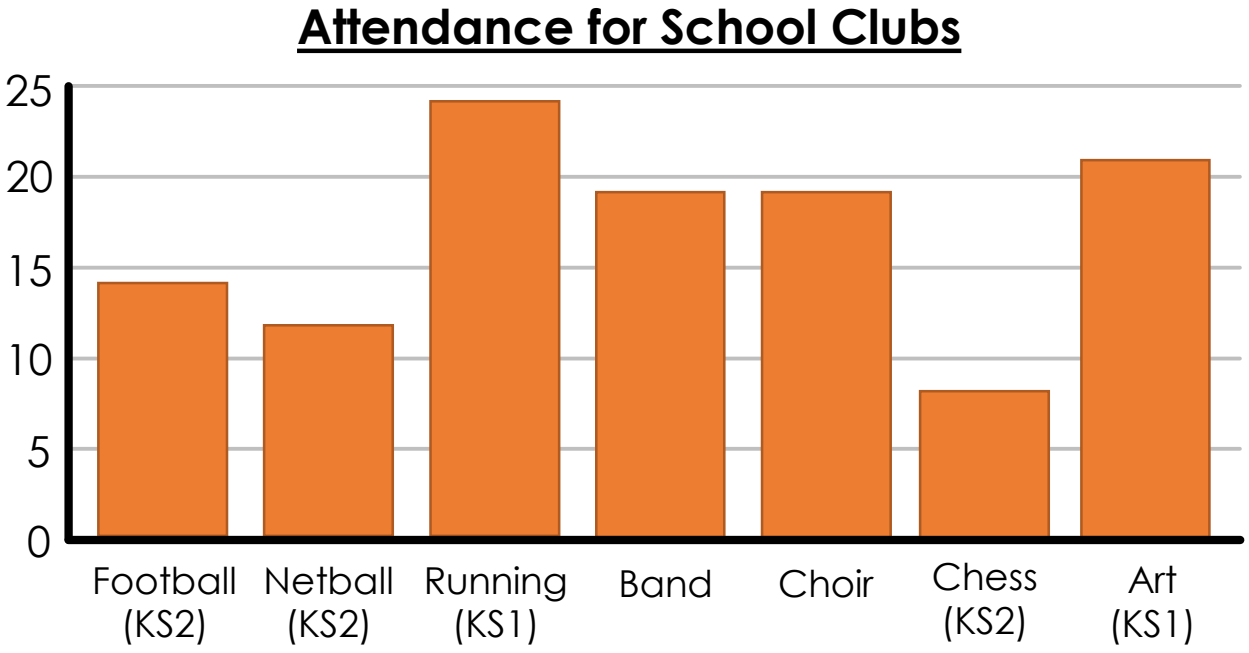
Types of pets owned by children in the class.

Height of a sunflower measured over 2 weeks.

Today's temperature, measured every hour.

Number of children at each after-school club.

Read the graph



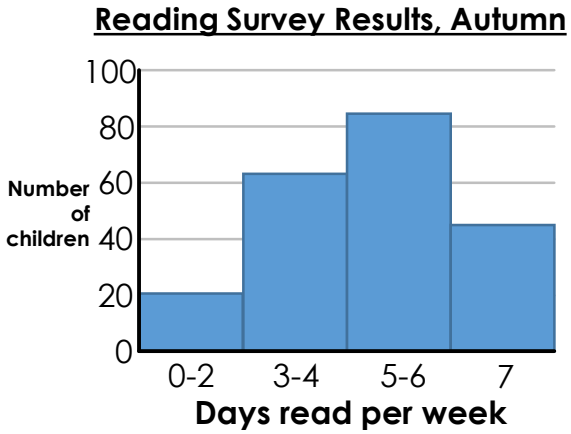
What does this graph show? Explain.

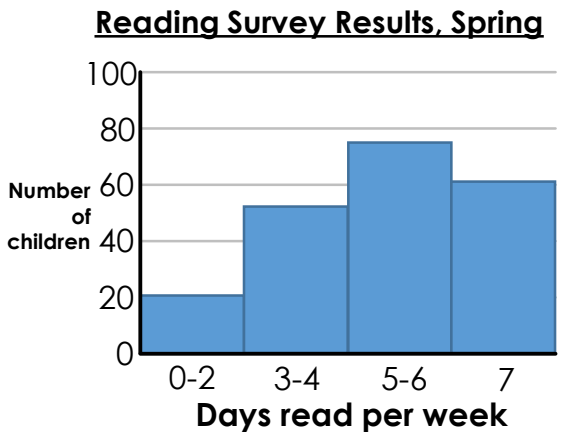
Explain

In the Autumn term, Darmford Primary School carried out a survey to find out how many days per week children read at home.

In the Spring term, Darmford Primary School ran a 'Love to Read' scheme to get more children reading at home.

At the end of the term they repeated the survey.





How successful was the 'Love to Read' scheme?

Explore

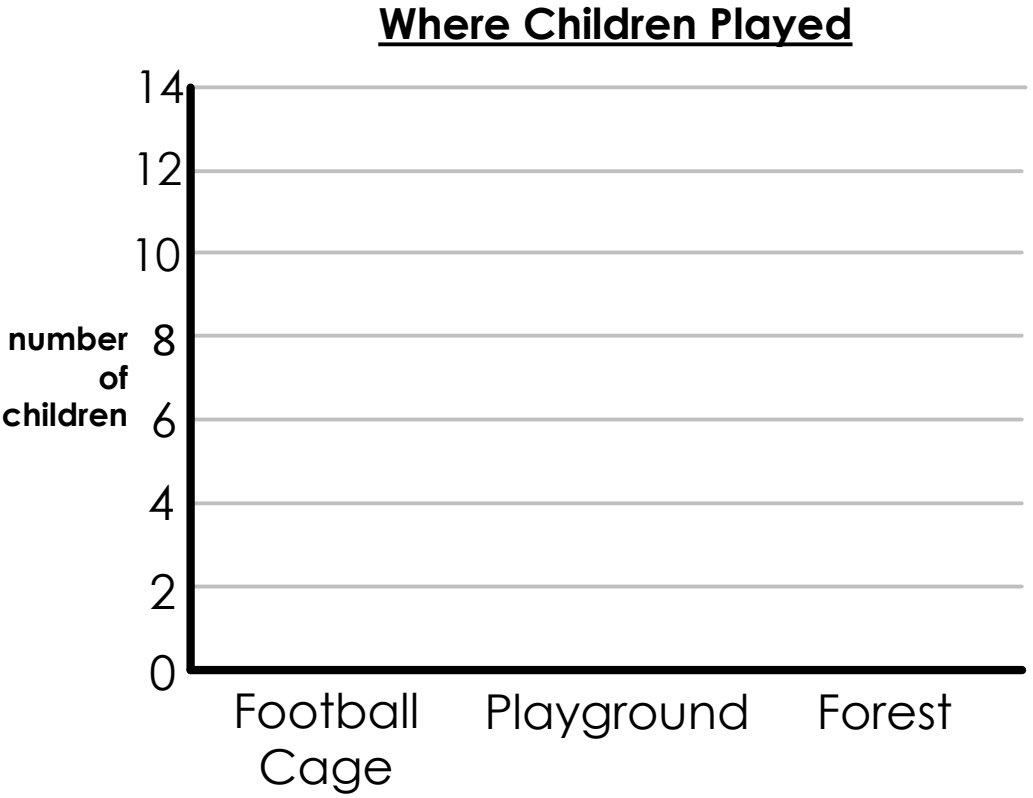
The 22 children in Oak class went out to play.

Most children played on the playground or in the forest.

The number of children playing in the football cage was double the number playing in the forest.

There were 2 more children playing on the playground than playing in the forest.

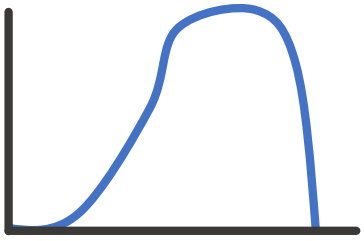
Complete the bar graph to show where the children were playing.



Read the graphs

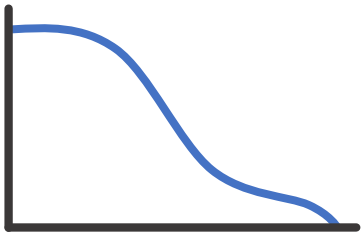
Draw lines to match each heading to the correct graph.

Height above ground of child on slide



Time (seconds)

Weight of child on slide



Time (seconds)

Speed of child on slide

Time (seconds)

I SEE REASONING – LKS2

Answers

Place value

How many ways? example 1: Three ways (two 100s and three 10s; one 100 and thirteen 10s; twenty-three 10s)

How many ways? example 2: Five ways (four 1000s and one 100; three 1000s and eleven 100s; two 1000s and twenty-one 100s; one 1000 and thirty-one 100s; forty-one 100s)

Explore: 803

Investigate example 1: 102 and 43 (difference of 59)

Investigate example 2: Greatest possible difference is 792, made by using the digits 1, 9 and any other digit e.g. 941 – 149 = 792

How many ways? example 3: Nine ways (361, 415, 433, 451, 505, 523, 541, 613, 631)

Missing digits: 30+76=106, 30+86=116, 30+96=126

Place value – negative numbers

Different ways example 2: Example solutions 12, 7, 2 or 15, 9, 3

Place value – rounding

Which answer? 154

How many ways? Two ways (251 and 253)

Explain example 1: 163 and 238 rounded to the nearest 100 are 200 and are 160 and 240 when rounded to the nearest 10

Explain example 2: Ben could have as little as £150 and Helen as much as £154

Place value – Roman Numerals

True or false? example 1: IV and XII are the true examples

True or false? example 2: XL is the only true example

I SEE REASONING – LKS2

Answers

Place value – Roman Numerals (continued)

Order: Here, the smaller the number the greater the number of digits

Estimate: Note that there is no symbol for zero in Roman Numerals as it is an additive number system

Addition

Missing digits example 1: 88+44=132

Missing digits example 2: 193+156=349

Missing digits example 3: 739+346=1085

How many ways? example 1: Three ways (78+28=106, 88+28=116, 98+28=126)

How many ways? example 2: Four ways (937+64=1001, 937+74=1011, 937+84=1021, 937+94=1031)

Investigate: Example answers 479+81=560, 759+64=823

Subtraction

Missing digits example 1: 30-12=18

Missing digits example 2: 121-22=99

How many ways? 3 ways (75-59=16, 85-59=26, 95-59=36)
Note: four ways if you include 65-59=06

Missing digits example 3: 346-152=194

How many ways? example 1: Two ways (61-7=54, 60-7=53)

How many ways? example 2: Four ways (80-17=63, 80-13=67, 90-23=67, 90-27=63)

Addition and subtraction

How many ways? example 1: Six ways (1&6, 2&5, 3&4, 4&3, 5&2, 6&1)

How many ways? example 2: Six ways (1&1, 1&2, 1&3, 2&1, 2&2, 3&1)

I SEE REASONING – LKS2

Answers

Multiplication

Missing digits example 1: 45×3=135

Missing digits example 2: 68×5=340 or 78×5=390

Missing digits example 3: 12×8=96

Missing digits example 4: 241×4=964 or 246×4

How many ways? Four ways (225×5=1125, 425×5=2125, 625×5=3125, 825×5=4125)

Explore: Multiple of 5 and multiple of 3.

Division

Explain: both correct – sharing and grouping strategies used

Explore (Venn diagram example 1): Divides by 3 is 18; both is 24; divides by 4 is 16 and 20; 14 is on the outside.

Investigate: 100 can be divided by 9 whole numbers without leaving a remainder (1,2,4,5,10,20,25,50,100) whereas 60 can be divided by 12 numbers (1,2,3,4,5,6,10,12,15,20,30,60). Children can consider the consequent benefits of a base-60 time system.

How many ways? 3 ways (34÷2=17, 54÷3=18, 84÷7=12)
Note: excludes solutions with 1-digit answer e.g. 14÷2=07

Multiplication and division

Different ways example 1: 8 and 9, also appropriate decimals.

Different ways example 2: Whole numbers in the range 34→39, also appropriate decimals.

Which answer? example 1: 2

How many ways? example 1: four ways (4×8=40-8, 3×8=40-16, 2×8=40-24, 1×8=40-32)

I SEE REASONING – LKS2

Answers

Multiplication and division (continued)

How many ways? example 2: Five ways (numbers 1→5)

How many ways? example 3: Four ways (60÷1=4×15, 60÷3=4×5, 60÷5=4×3, 60÷15=4×1)

How many ways? example 4: Sixteen ways (4×3=12, 3×4=12, 12=4×3, 12=3×4, 4×12=48, 12×4=48, 48=12×4, 48=4×12, 12÷4=3, 12 ÷3=4, 4=12 ÷3, 3=12 ÷4, 48 ÷12=4, 48 ÷4=12, 12=48 ÷4, 4=48 ÷12)

Which picture? example 1: Red bar model (4 people in total)

Which picture? example 2: Cherries=blue, pizzas=grey, sweets=red

Which picture? example 3: Grey picture represents four 7-day weeks

Which answer? example 2: 24

Fill the gaps: 18 egg cups fill a bottle; 6 glasses fill a jug; 36 egg cups fill a jug.

Fractions

Two ways: $\frac{1}{2}+\frac{1}{4}$; $\frac{1}{4}+\frac{2}{4}$

How many ways? example 1: Three ways ($\frac{6}{7}-\frac{1}{7}=\frac{3}{7}+\frac{2}{7}$; $\frac{6}{7}-\frac{2}{7}=\frac{2}{7}+\frac{2}{7}$; $\frac{6}{7}-\frac{3}{7}=\frac{1}{7}+\frac{2}{7}$)

How many ways? example 2: Three ways ($\frac{7}{10}-\frac{1}{10}>\frac{1}{10}+\frac{3}{10}$; $\frac{7}{10}-\frac{1}{10}>\frac{2}{10}+\frac{3}{10}$; $\frac{7}{10}-\frac{2}{10}>\frac{1}{10}+\frac{3}{10}$)

Decimals

Is it the same? 0.24 can be made with a 0.1 and fourteen 0.01s

Two ways: Decimals with the smallest possible difference 0.5 and 0.28. Decimals with the largest possible difference 0.2 and 0.85

I SEE REASONING – LKS2

Answers

Measures

Explore: Metric measures – kilograms; both – metres; measures of length – inches; outside – stones

Measures - money

Explain example 1: This gives £5 change, which may save the shopkeeper from having to find change using coins

How many ways? 3 ways (50p and four 5ps; three 20ps and two 5ps; two 20ps and three 10ps)

Different answers: How many ways? 4 possible answers (38p, 39p, 48p, 49p)

Which picture? example 1: Blue bar model

Which picture? example 2: Green bar model

Explain example 2: cheaper than

Measures - time

Estimate: The times can be approximated based on the position of the hour hand. The bottom-right clock shows the minute hand: three-quarters past an unknown hour.

Measures – area and perimeter

Explore example 1: A 12×2 rectangle has a larger perimeter; a 6×4 rectangle has a smaller perimeter. The thinner the rectangle, the larger the perimeter.

Explore example 2: A 5×5 square has a perimeter of 20cm and an area of 25cm²; a 9×1 rectangle has a perimeter of 20cm and an area of 9cm². The children may also explore non-rectangular shapes.

I SEE REASONING – LKS2

Answers

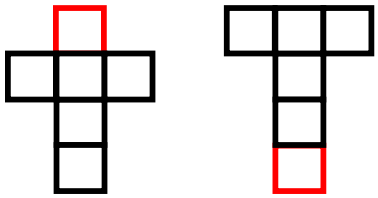
Geometry - shape

Explore example 1: Quadrilaterals (left), 1+ right-angle (right)

Explore example 2: Has an obtuse angle

Explore example 3: An example top question is 'Does it have a right angle?', many possible questions for bottom boxes

Two ways:



Statistics

Explain example 1: Tally charts are used to record a count over time (e.g. animals in the nature area in a day); numbers record a data set recorded instantly (e.g. number of boys/girls in a class).

Mark the work: 1st example: scale based on the number of people in the survey rather than the largest amount. 2nd example: line graph inappropriate for discrete data (no meaning to intermediate readings). 3rd example: y axis is not labelled.

Which graph: Data recorded over time is presented as a line graph as intermediate points having meaning (sunflower & temperature). School clubs could be bar graph (numbers at clubs in one week) or line graph (attendance at each club over the course of the year).

Read the graph: Examples: the KS1 clubs are most popular, music clubs are well attended, there are more sports clubs than any other type of club.

Explain example 2: There was a significant increase in the number of children reading every night, but still the same number of children reading between 0-2 times per week.

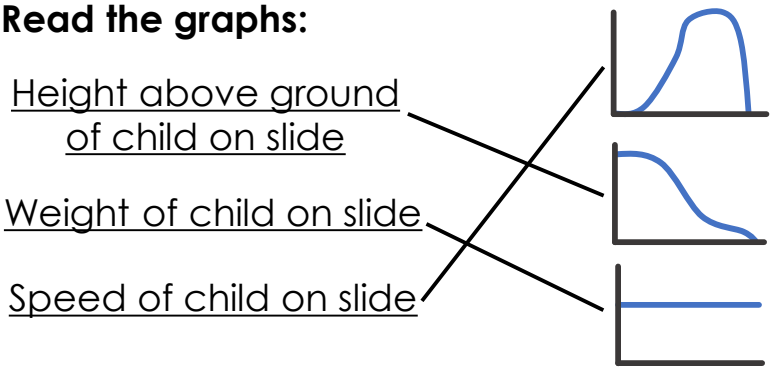
I SEE REASONING – LKS2

Answers

Statistics (continued)

Explore: 10 children in the football cage, 7 children on the playground, 5 children in the forest.

Read the graphs:



I SEE MATHS RESOURCES

A range of resources for developing deep, visual mathematics can be found at www.iseemaths.com

I See Reasoning – UKS2 provides a range of thought-provoking tasks and questions for children in Year 5&6.

Maths Outside the Box is a compilation of 15 varied, thought-provoking mathematical investigations. The tasks are ideal for enriching mathematics for high-attaining children in year 4.

iPad app Logic Squares, ideal for children in LKS2, gets children applying calculation facts and thinking strategically. Numbers have to be positioned to complete the crossword-style number sentences.

iPad apps I See + - and I See × ÷ allow teachers to create a range of visual representations.

Information about conferences and in-school training led by Gareth Metcalfe can be found at www.iseemaths.com