This worked for me

Fiona Allan

27 June 2023

During this session

I’m not going to tell you what to teach

BUT

Please don’t teach them the hardest topics at GCSE when they probably have gaps in their basic knowledge

(If you missed Rebecca’s session this morning, do watch the recording of her session!)

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You don’t sort a house with subsidence by redoing the roof!

During this session

I’m not going to tell you what to teach

We are going to think about how we should be interacting with our students during the first half term

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Our students

- Probably think they are failures
- Probably aren’t enthusiastic about learning Maths
- Probably think they are never going to need Maths again after college
- Probably have lots of misconceptions and gaps in their early knowledge

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At the start of the year

- They got extra help from their school – did their school expect them to fail?
- They got their results in late August
- They were told they had to resit
- They feel failures – they don't want to resit
- They haven't done any Maths since May

- And then we give them a test at the start of the year….

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Find out what they know
1. Posters

- On a sheet of paper, write down everything you know about, for example, triangles.

(Activity can be done in groups, or in pairs or individually. Sheets can be passed round for others to edit/add to.)

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During the first few weeks

- Encourage them to believe that they can improve.
- Tell them that you really believe that they can all improve. (Research has shown that everyone can improve.*)
- Tell them about all your successful students in previous years.
- Tell them they are doing well – praise, praise, praise!

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During the first few weeks
Give them success

- At the end of each lesson – give them five easy questions to answer.
- Make them work against a countdown – but make sure they will be able to complete the work (or almost complete it).
- If possible, get a colleague who teaches a student a different subject to tell them how they have heard that they are doing well.

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During the first few weeks
Make lessons fun

Teach them a few Maths magic tricks

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https://www.google.com/search?client=firefox-b-d&q=simple+maths+magic

During the first few weeks
Make lessons fun

1. Think of any three-digit number in which each of the digits is the same. Examples include 333, 666, 777, and 999.
2. Add up the digits.
3. Divide the three-digit number by the answer in Step 2

And the answer is

37

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During the first few weeks
Make lessons fun

- Take any three-digit number and write it twice to make a six-digit number. For example, 371371 or 552552.
- Divide the number by 7.
- Divide it by 11.
- Divide it by 13.

(The order in which you do the division is unimportant!)

And the answer is ?

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During the first few weeks
Make lessons fun

Teach them a few Maths magic tricks
and use jokes.

(Sign up for Chris Smith's weekly newsletter: aap03102@gmail.com and for Andrew Jeffrey's newsletter: info@andrewjeffrey.co.uk)

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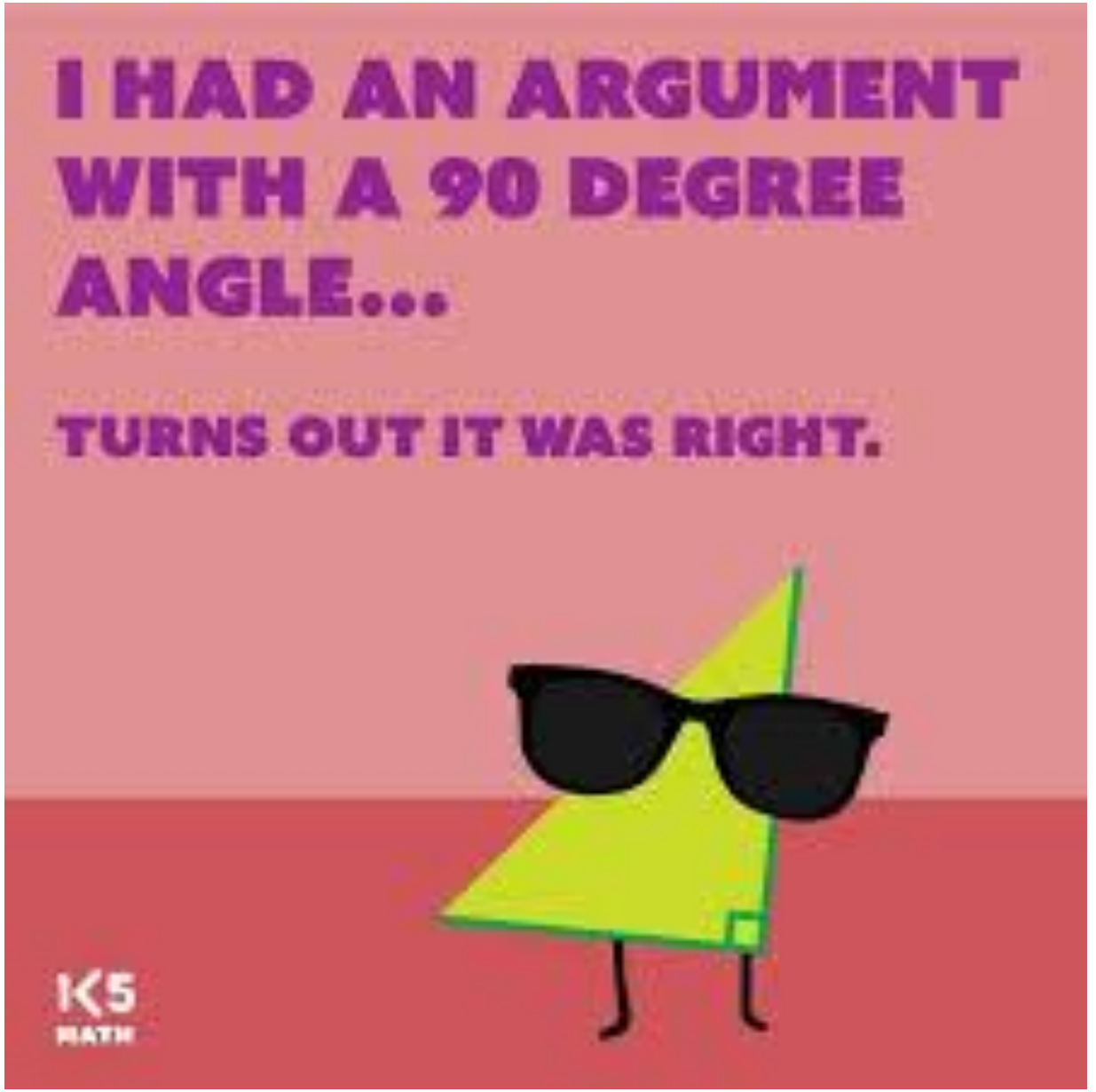
https://www.google.com/search?client=firefox-b-d&q=simple+maths+magic



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Why are obtuse angles so depressed?

Because they're never *right*.

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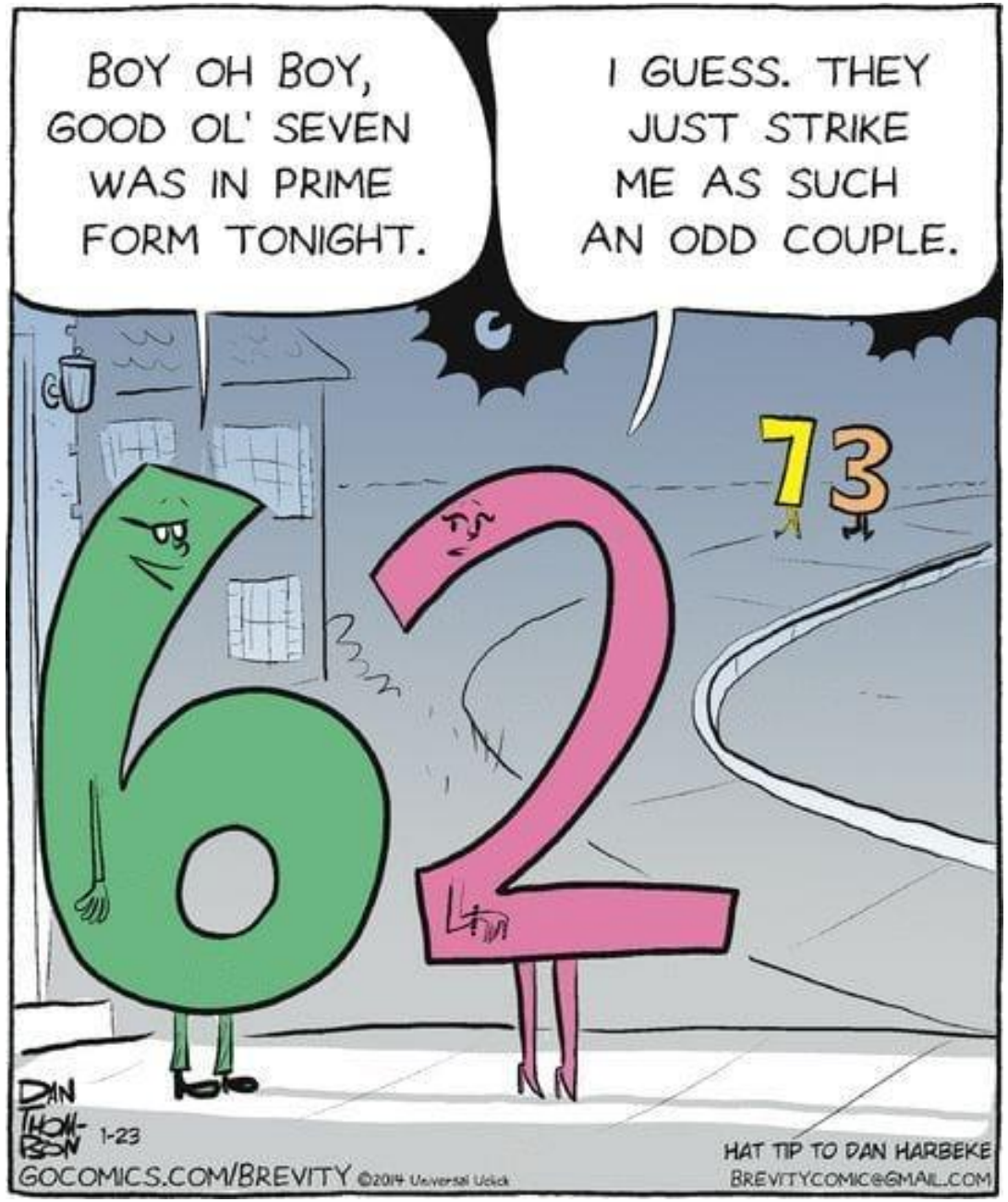

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During the first few weeks
Show that Maths is useful

What Maths have you used today?

What Maths do you need for your other course(s)?

Why are you doing Maths GCSE?

What Maths would you need to be self-employed/run your own business?

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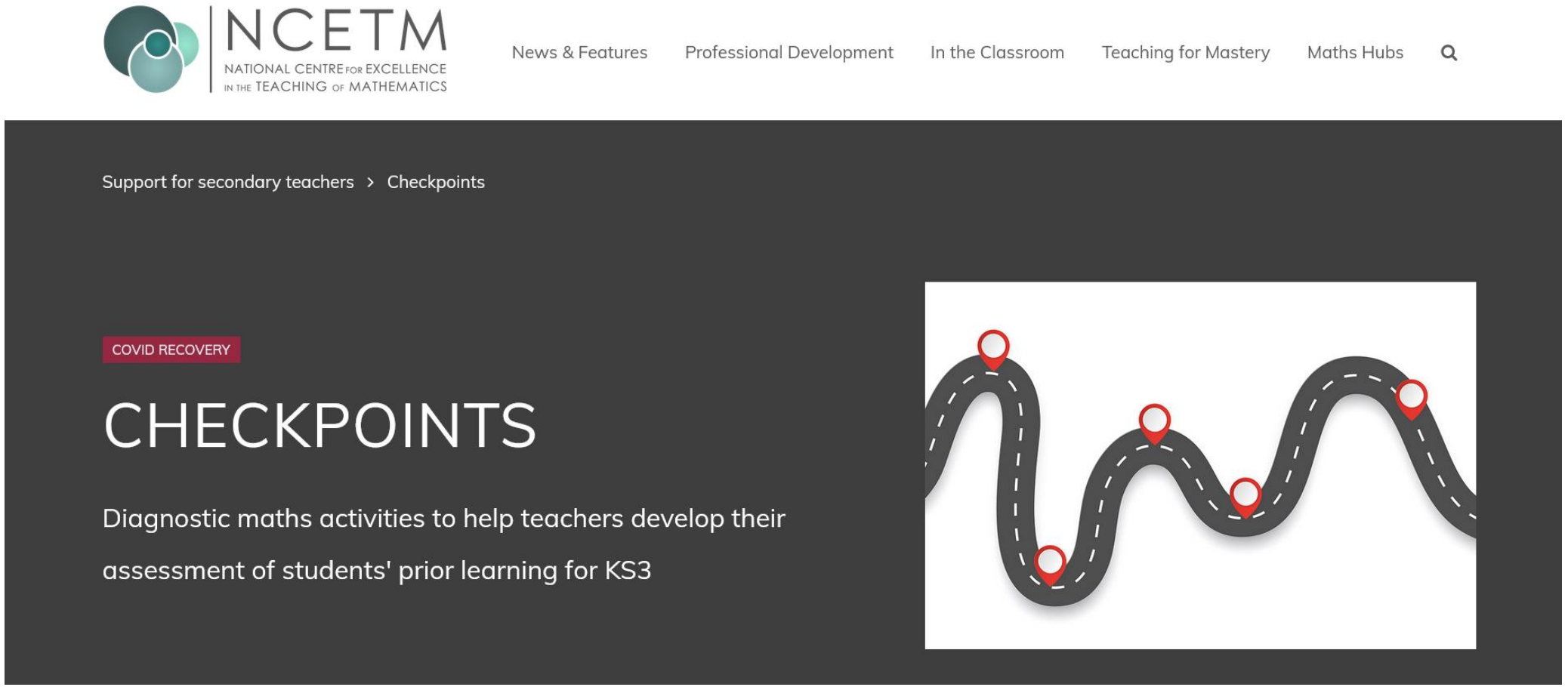
Find out what they know
2. NCETM Checkpoints



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https://www.ncetm.org.uk/classroom-resources/checkpoints/

Checkpoint 1: Arranging digits

Use the digit cards to create:

a) the largest possible 5-digit number

b) the smallest possible 5-digit number

c) the 5-digit number that is closest to 60 000

d) the 5-digit number that is closest to 90 000

e) a number with 76 tens

f) a number with 76 hundreds

? Using these cards, how many different 5-digit numbers can you create between 50 000 and 70 000? How do you know?

Make them do the work
Teacher-Pupil

Practise routine and exam questions

(with thanks to Tim Robbins, QMC, Basingstoke).

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Make them do the work
Activities

Pass it on / Maths Consequences

(Can be used with any operation that can be done and then undone.)

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Make them do the work
Routine practice

Online practice

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Make them do the work
Ask them to prepare for lessons

https://www.youtube.com/watch?v=Wt3IrBqq6Uc

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Don’t reinvent the wheel!

- The NCETM KS3 Mastery Professional Development Materials are made up of six themes.
- The themes cover 17 core concepts.
- Each PowerPoint concentrates on one key idea and includes:
  - Prior learning;
  - Misconceptions;
  - Representations and structure;
  - Key vocabulary.

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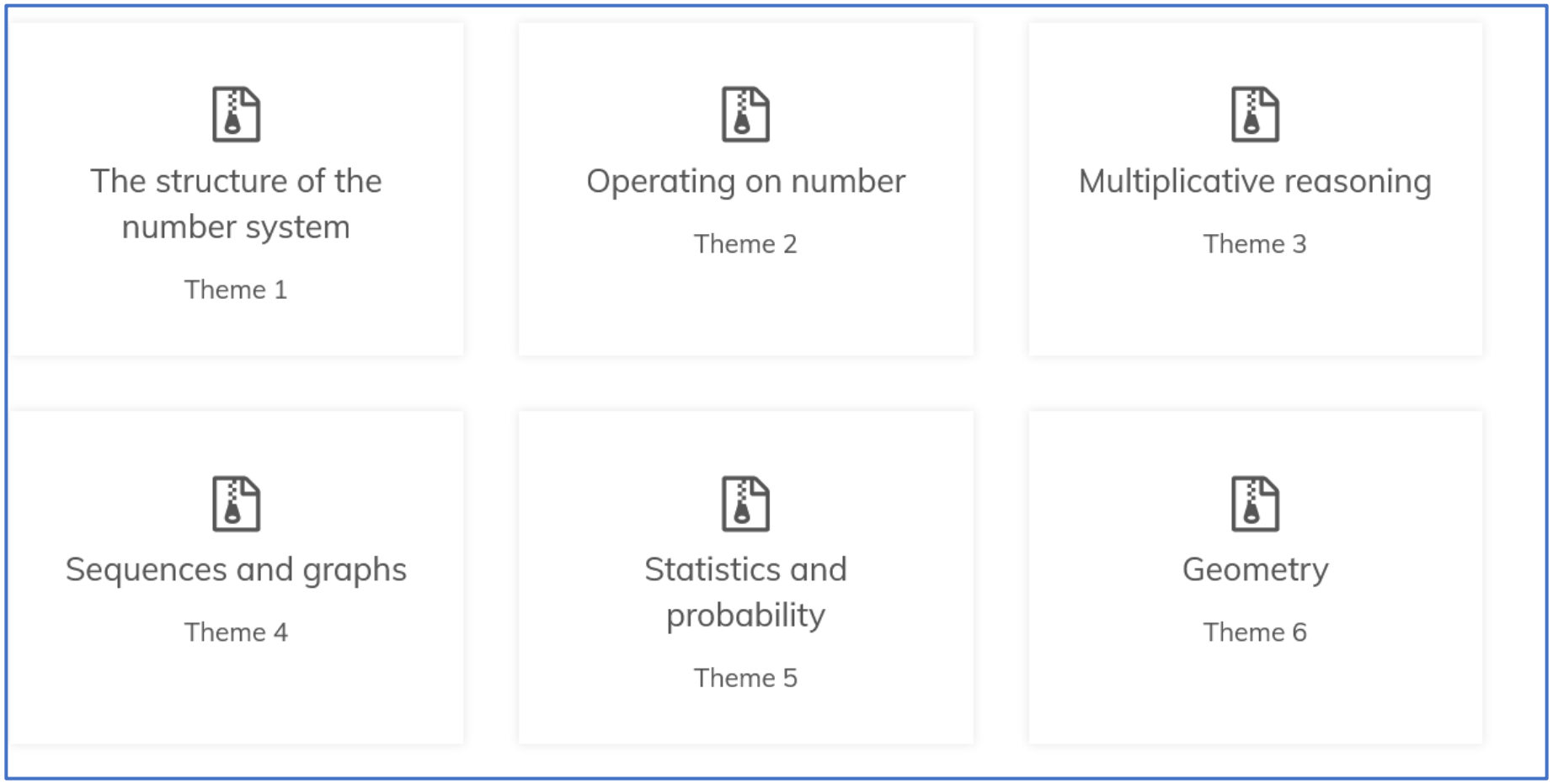
https://www.ncetm.org.uk/classroom-resources/ks3-key-ideas-exemplified/

Don’t reinvent the wheel!



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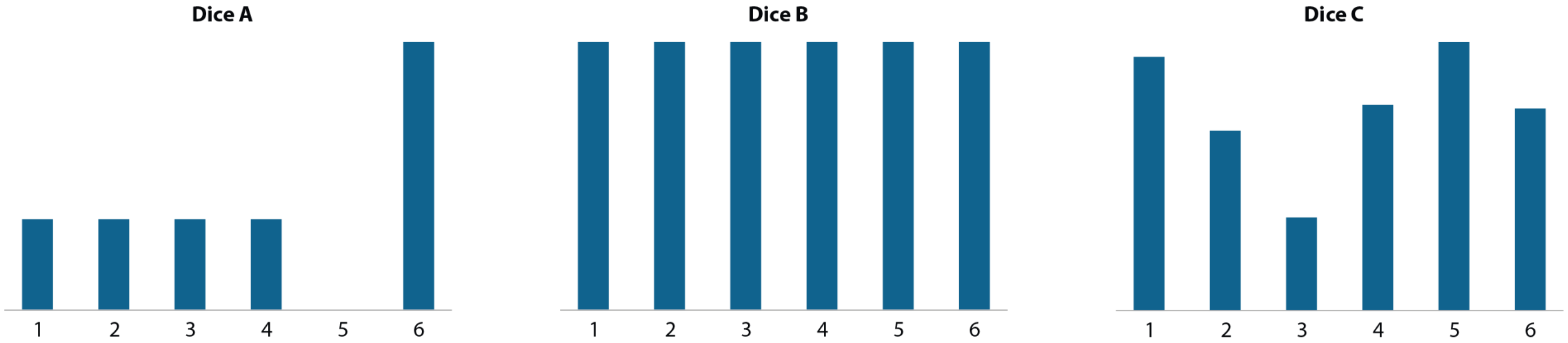
https://www.ncetm.org.uk/classroom-resources/ks3-key-ideas-exemplified/

Example 3

Libby rolled each of three dice over 200 times.
These bar charts show the frequency of each score.



Which dice would you use if you were one step away from finishing a game and needed to roll a 5 to win? Explain why.

https://www.ncetm.org.uk/classroom-resources/ks3-key-ideas-exemplified/

Find out what they know
3. Activities

Get into line!

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Mind your language

Do they understand what you are talking about?

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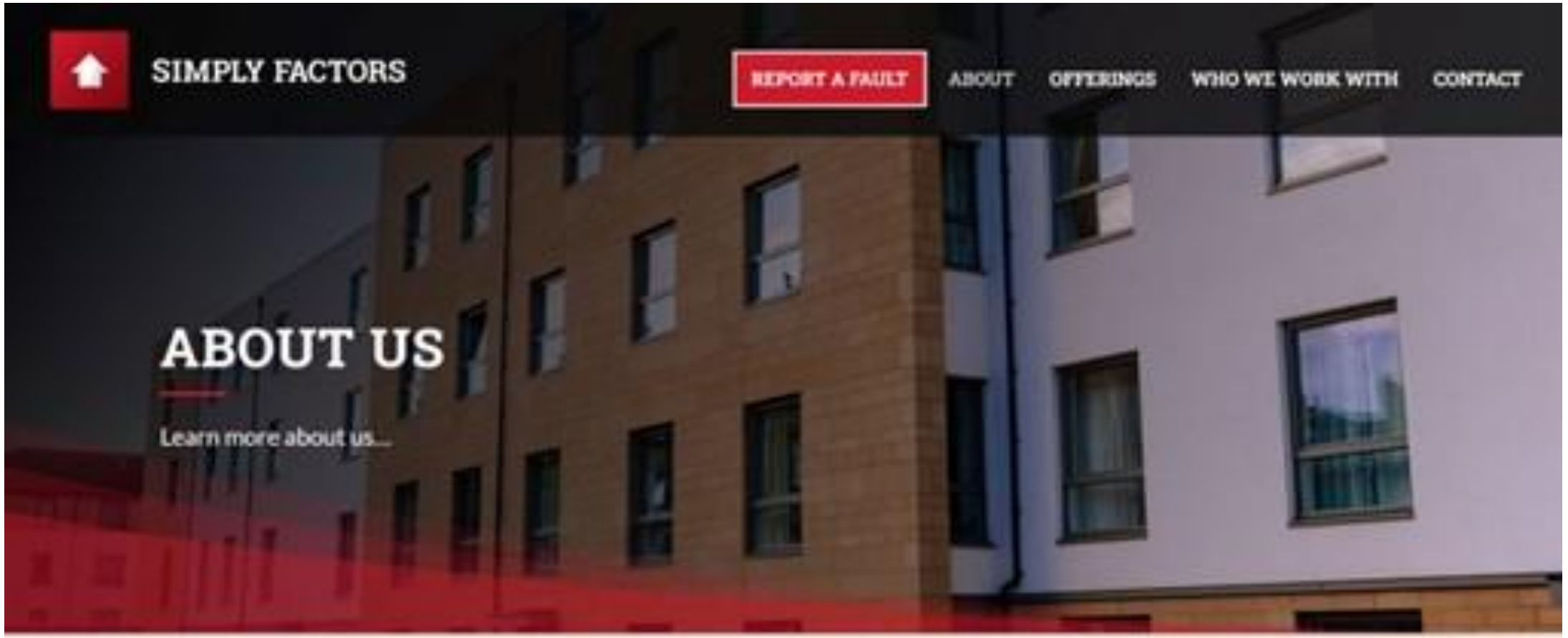

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What do you mean?

On a piece of paper, draw a sketch to show this instruction:

‘Always label your axes’

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Words that have different meanings

acute
arc
area
average
bar
base
box plot
capacity
cell
chord
common
commute
complement (compliment)
complex
conversion
coordinate
cos
cosine (cousin)
cycle
degree
deviation
difference
differentiate
differentiation
digit
direct
divide
dot
evaluate
even
ex (x)
expand
explain
exponent
express
expression
face
factor
flat
foot
form
function
general
gill
gross
hour (sounds like our)
imaginary
improper
index
integrate
integration
interest
interval
inverse
irrational
irregular
key
kite
leaf
legend
line
log
log table
magic
mass
mean
metre (meter)
minute
mode
multiple
natural
nature
negative
net
multiple
natural
nature
negative
net
none (heard as nun)
normal
notation
obtuse
odd
of
one (heard as won)
operation
opposite
order
origin
outlier
pi(e)
plane
plot
point
positive
power
prime
problem
product
proof
prove
quotient
radical
range
rational
real
reflect
reflection
reflex
regression
regular
reverse
right
root
ruler
satisfy
sector
segment
series
show
similar
sin/sine
sketch
solution
solve
space
square
stationary (heard as stationery)
stem
stem and leaf
steps
subject
substitution
sum (heard as some)
supplement
table
tail
take away
tan
tangent
transformation
translation
volume
vulgar
wave
weight (heard as wait)
yard

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Find out what they know
3. What questions could you ask?

Write 36 in the middle of the sheet of paper. What questions could you ask with 36 as the answer?

OR

A game uses 15 coloured cards. There are:

- 5 red (R) cards numbered 1 to 5,
- 5 yellow (Y) cards numbered 1 to 5,
- 5 pink (P) cards numbered 1 to 5.

The cards are all placed in a box.

What questions could you ask about this information?

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Give them the tools they need

- Bar models
- Ratio tables
- Double number lines

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https://study.com/academy/lesson/ratio-tables-definition-practice-problems.html

Give them the tools they need
The bar model

The bar model ‘supports the transformation of real-life problems into a mathematical form and can bridge the gap between concrete mathematical experiences and abstract representations. ‘

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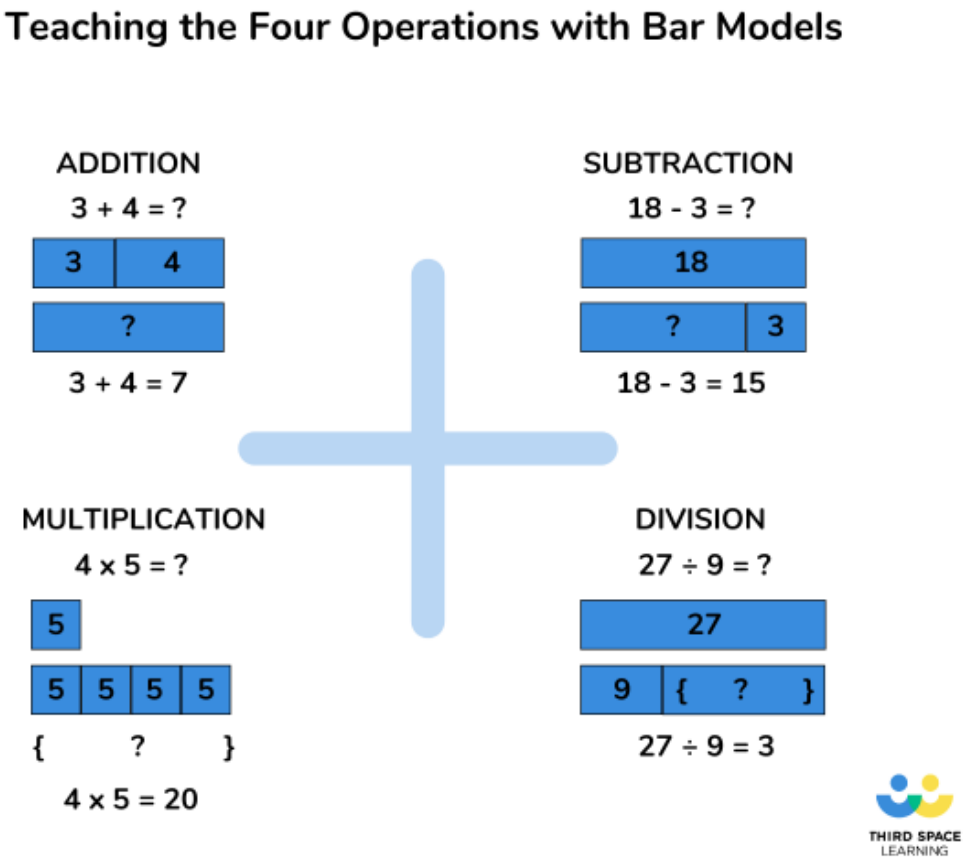
https://www.ncetm.org.uk/classroom-resources/ca-the-bar-model/

The bar model
Four operations



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https://thirdspacelearning.com/us/blog/teach-bar-model-method/

The bar model
Percentages

A computer game is reduced in a sale by 30%. Its reduced price is £77. How much was the original price?

Dividing the bar into ten equal pieces allows us to represent 30% and keep the other pieces the same size.

£77 ÷ 7 = £11

The original cost (the whole bar) is £11 × 10 = £110

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https://www.ncetm.org.uk/classroom-resources/ca-the-bar-model/

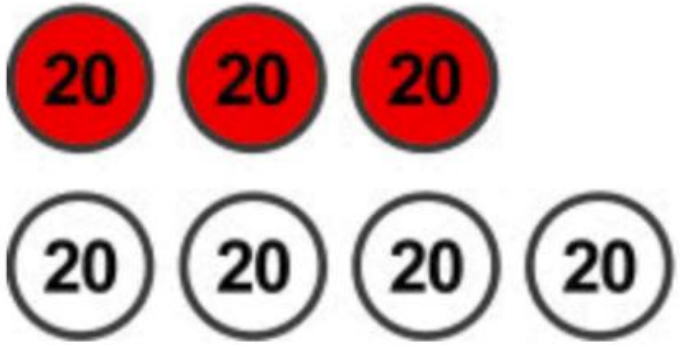
The bar model
Ratio

A gardener plants tulip bulbs in a flower bed.

She plants 3 red bulbs for every 4 white bulbs.

She plants 60 red bulbs.

How many white bulbs does she plant?



Answer =
80 white bulbs

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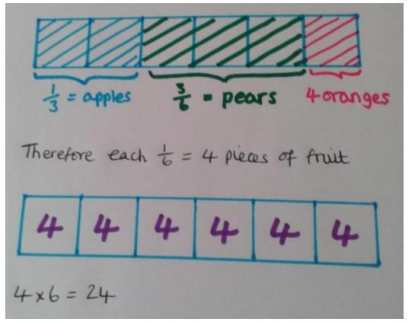
https://www.ncetm.org.uk/classroom-resources/ca-the-bar-model/

The bar model
Fractions

Problem to solve:	**A fruit bowl holds a range of different fruit, $^1/_3$ of the fruit are apples, $^3/_6$ of the fruit are pears and the rest are oranges. If there are 4 oranges, how many pieces of fruit are there in the bowl altogether?**
Bar model:	You need to use your knowledge of equivalent fractions here… The fruit bowl represents the whole bar. 3/6 of the fruit are pears, that is the same as ½ . 1/3 of the fruit are apples, that is the same as 2/6. There are 6/6 in one whole. Therefore 1/6 of the fruit are oranges. 4 pieces of fruit represents 1/6 of the fruit bowl. This can be shown in the bar model below: 
Answer in context of the problem:	There are 24 pieces of fruit in the bowl altogether. There are 4 oranges, 8 apples and 12 pears.

Hampshire County Council
https://maths.hias.hants.gov.uk › resource › view PDF

Using a bar model to solve problems involving Fractions

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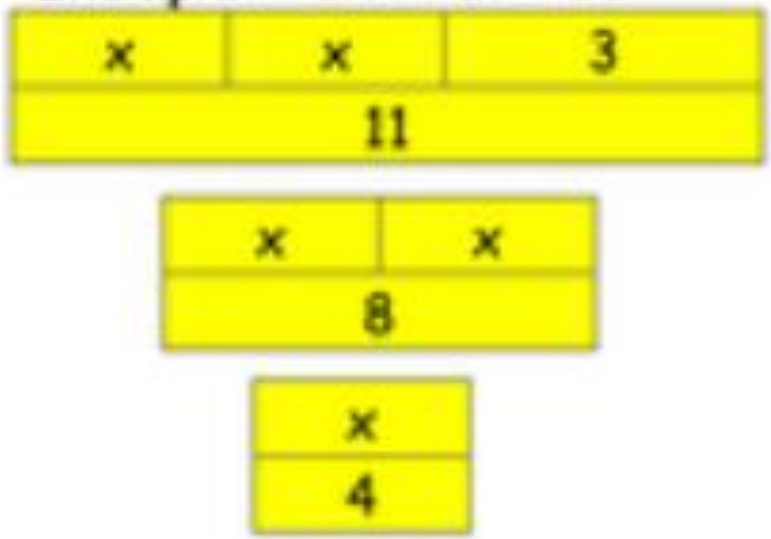
The bar model
Algebra

Example: $2x + 3 = 11$



$$2x + 3 = 11$$
$$2x + 3 - 3 = 11 - 3$$

$$2x = 8$$
$$\frac{2x}{2} = \frac{8}{2}$$
$$x = 4$$

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https://www.tes.com/teaching-resource/solving-linear-equations-using-the-bar-method-11000712

Find out what they know
4. Card activities

1. Sorting

2. Show me

3. Activities, including dominoes and jigsaws, from ILIM

https://www.stem.org.uk/elibrary/collection/2933

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Give them the tools they need
Ratio tables

‘A **ratio table** is a table that displays the constant relationship between two values.’

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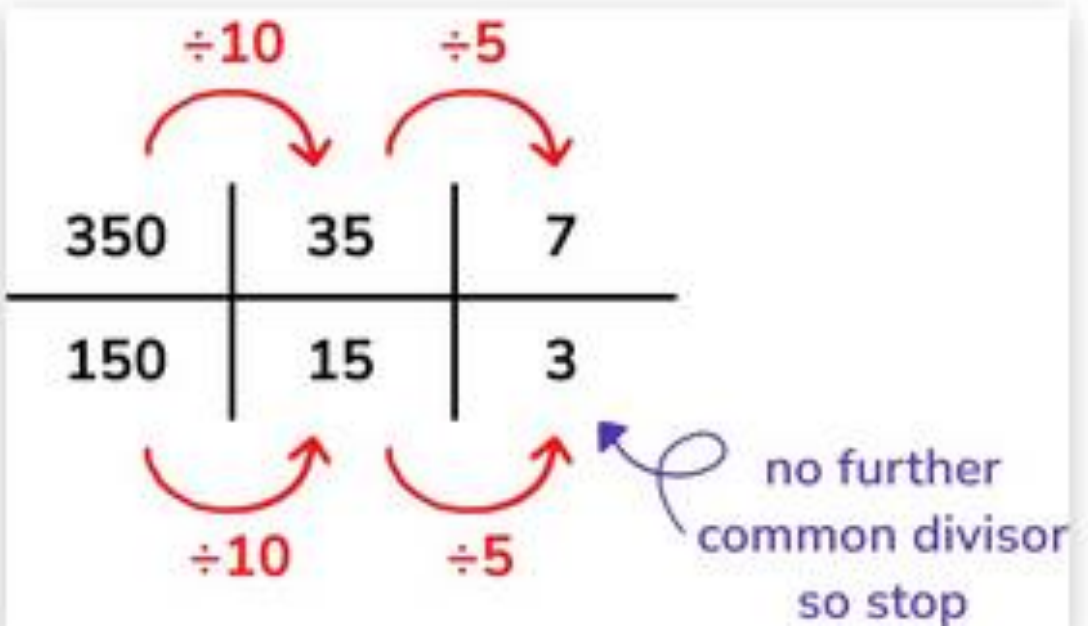
https://study.com/academy/lesson/ratio-tables-definition-practice-problems.html

Ratio tables
Ratio in its simplest form

Write down the ratio of grams to 150 grams.
Give your answer in its simplest form.

(adapted from Edexcel, November 2018, 3F Q16)



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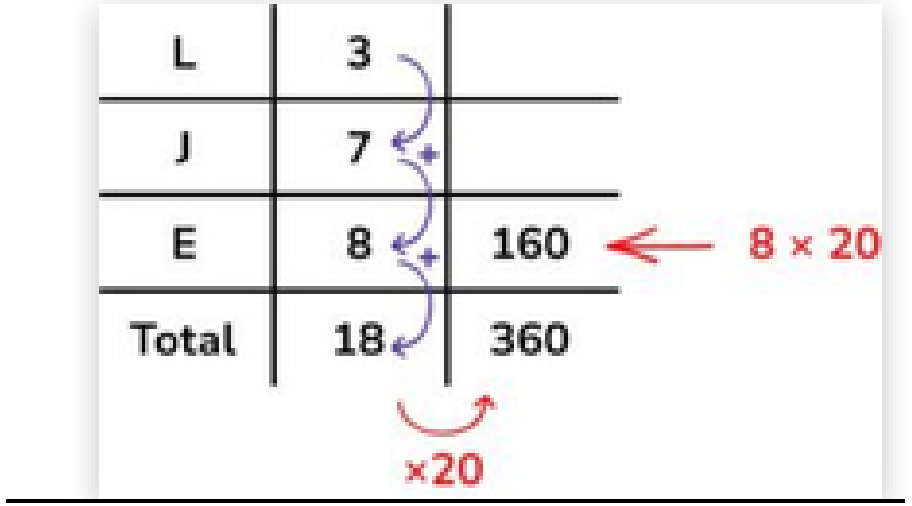
https://thirdspacelearning.com/blog/ratio-table/#0-ratio-table-applications-in-gcse-maths

Ratio tables
Ratio

Luca, Jayden and Emma share £360 in the ratio 3:7:8.
How much money does Emma get?

(adapted from Edexcel, November 2017, 1F Q18)



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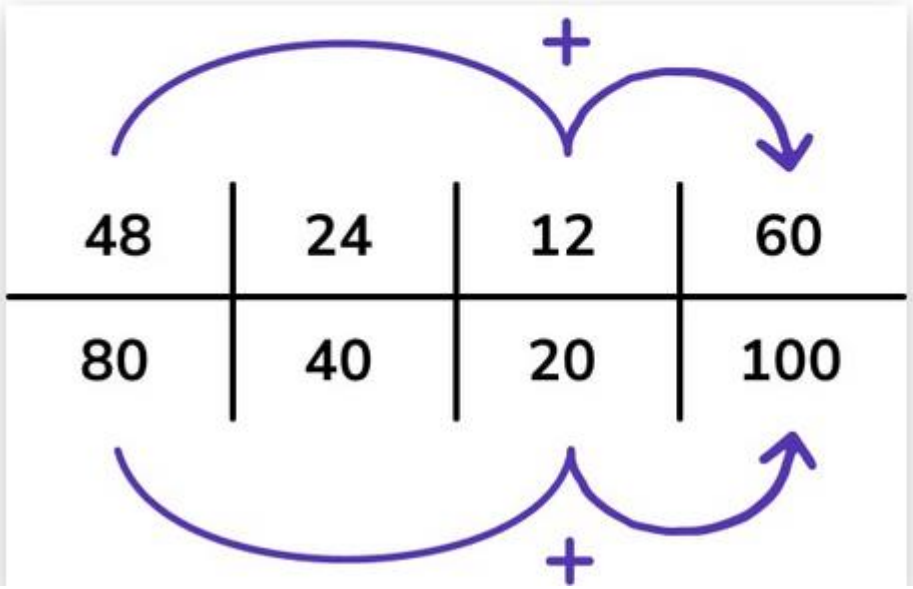
Ratio tables
Fractions as percentages

Write 48 out of 80 as a percentage



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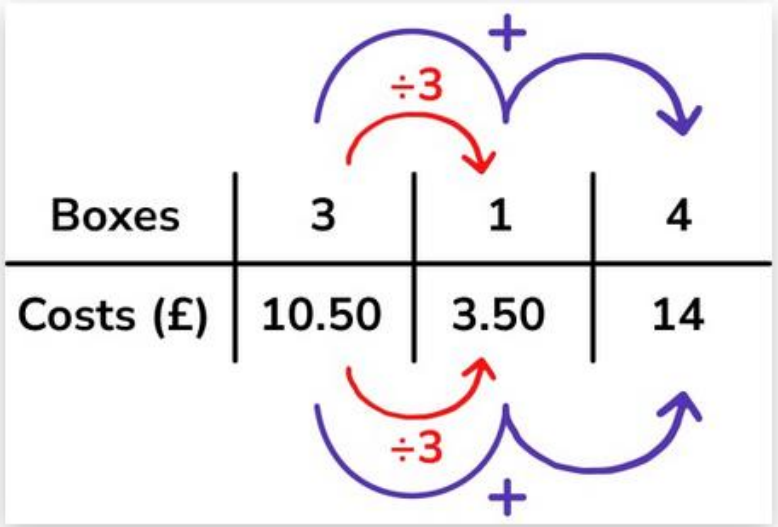
Ratio tables
Proportion

3 boxes of chocolates cost £10.50
Work out the cost of 4 boxes of chocolates

(adapted from Edexcel, June 2018, 1F Q8)



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https://thirdspacelearning.com/blog/ratio-table/#0-ratio-table-applications-in-gcse-maths

Ratio tables
Proportion

Here is a list of ingredients for making 32 flapjacks:


240g butter

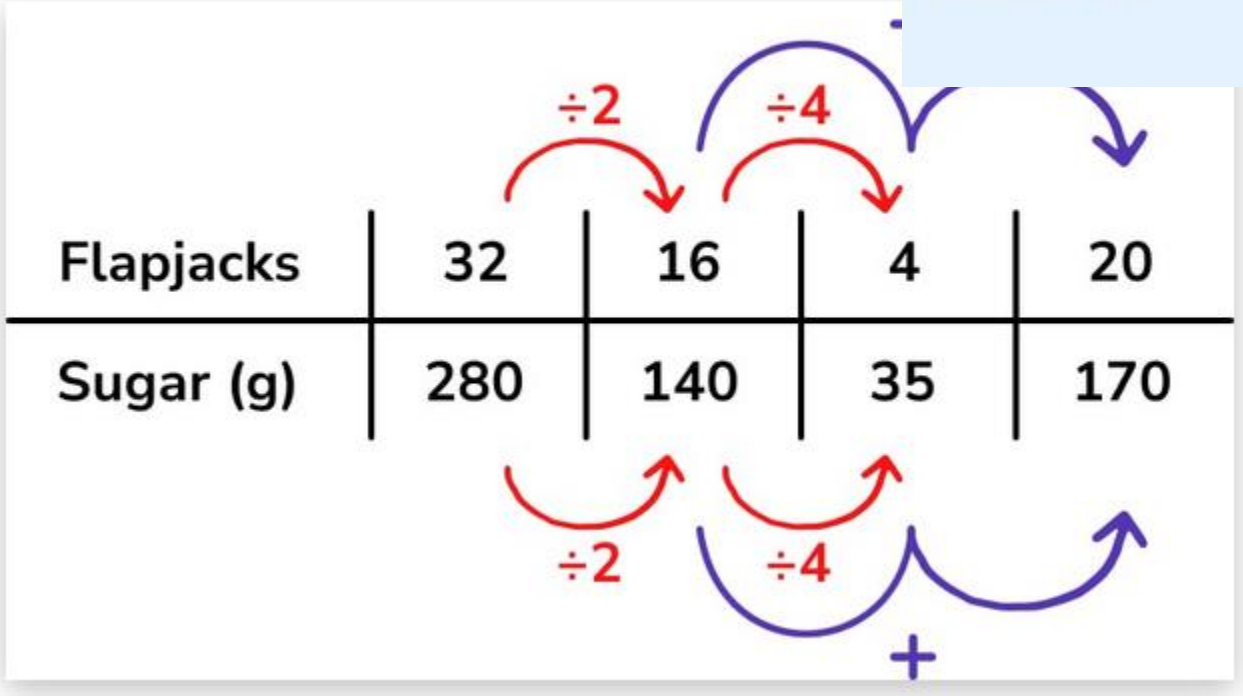

280g brown sugar


500g oats


4 tbsp syrup

Alexis wants to make 20 flapjacks. How much brown sugar should she use?

Edexcel, November 2017 1F Q19(adapted)



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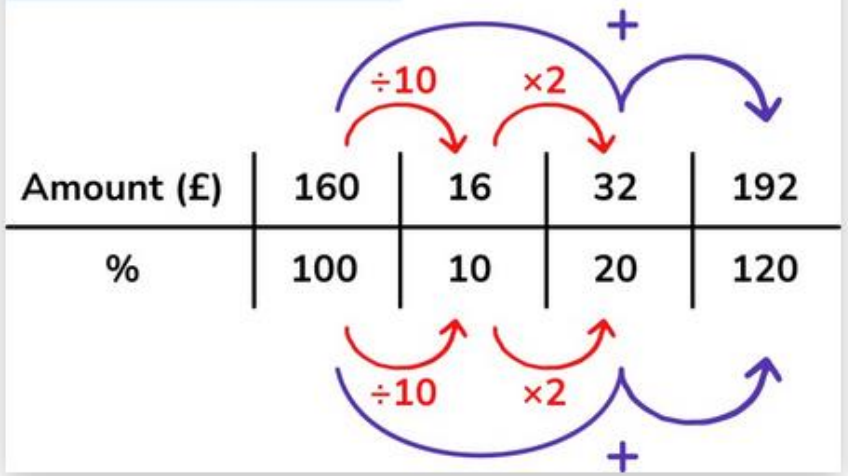
https://thirdspacelearning.com/blog/ratio-table/#0-ratio-table-applications-in-gcse-maths

Ratio tables
Percentage increase

Increase 160 by 20%

Edexcel, June 2022, 1F Q19 (adapted)

Increase 160 by 20%



- Begin the table by writing the whole amount (160) as equal to 1
- If we're increasing by 20%, then we need to find 20% of 160 an
- To find 20%, we can divide by 10 and multiply by 2.
- Finally, add 160 and 32 to get the answer 192.

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https://thirdspacelearning.com/blog/ratio-table/#0-ratio-table-applications-in-gcse-maths

Ratio tables
Speed, time and distance

Amy left her home at 1pm and walked to the park.
She got to the park at 1:45pm.
Amy walked at the speed of 3mph.

Work out the distance Amy walked.

(adapted from Edexcel, June 2019, 1F Q9)

d (miles)	3	1.5	0.75	2.25
t (mins)	60	30	15	45

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Find out what they know
5. Maths jigsaws written by them

- Give out the simplified form of a Tarsia jigsaw.
- Ask the class working in pairs to write a jigsaw on a topic of your choosing
- Each pair/group then cuts up their jigsaw and gives it to the next pair
- Each pair then do the jigsaw they have been given
- Continue passing jigsaws round the room

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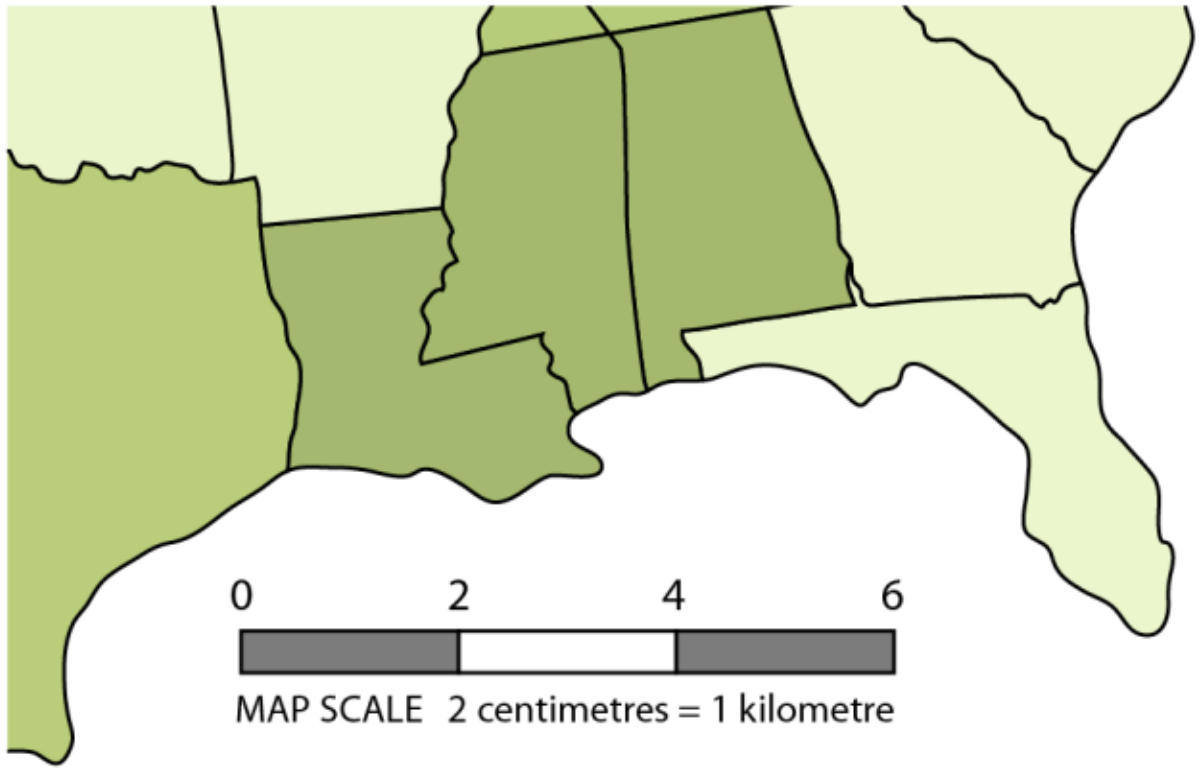
http://www.mmlsoft.com/index.php/products/tarsia

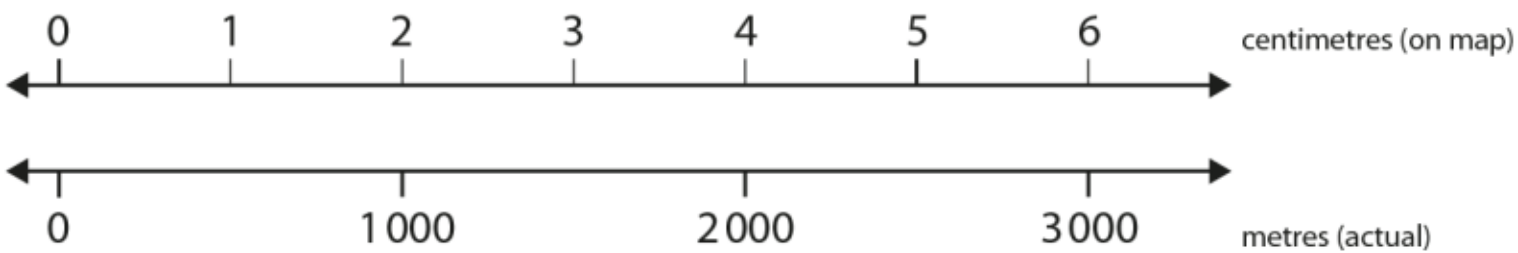
Give them the tools they need
Double number lines

‘Double number lines provide a way to visually compare two quantities.’

https://www.ncetm.org.uk/media/8d84e7902c198f9/ncetm_ks3_representations_double_number_lines_ratio_tables.pdf
https://www.ncetm.org.uk/media/8d8608cb751466f/mpdtv-double-number-line-understanding-a-multiplicative-relationship.pptx

Double number lines (also known as 'stacked number lines') consist of two single number lines with corresponding pairs of values lined up. A scale on a map, with distances on the map often measured in centimetres and corresponding distances measured in (kilo)metres, is an example of a double number line that students are likely to already be familiar with.

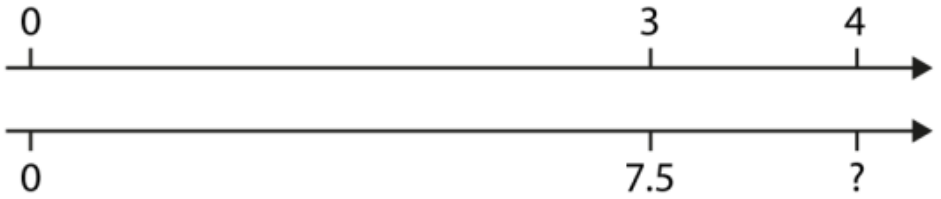


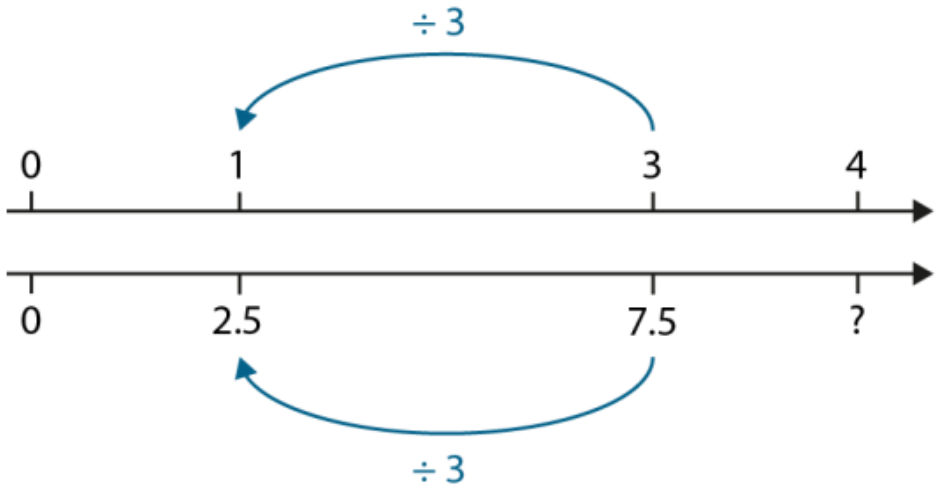


Double number lines

The double number line offers a way of supporting students in exploring multipliers, as they build upon prior strategies involving additive and multiplicative thinking.

For example, if we have a linear relationship that maps 3 onto 7.5 and we want to find what 4 would map onto, we can do this using two different methods.

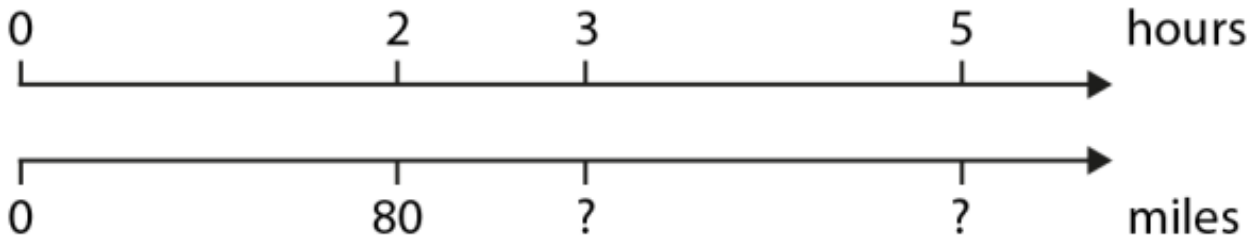




Double number lines

Compound measures

The double number line can help students to think about problems involving compound measures. For example, if a car has travelled 80 miles in two hours, the distance travelled by the car in one hour gives the average speed of the car in miles per hour. Showing the given information on a double number line enables predictions for how far the car could travel, if it maintained the same average speed, to be made for different lengths of time.



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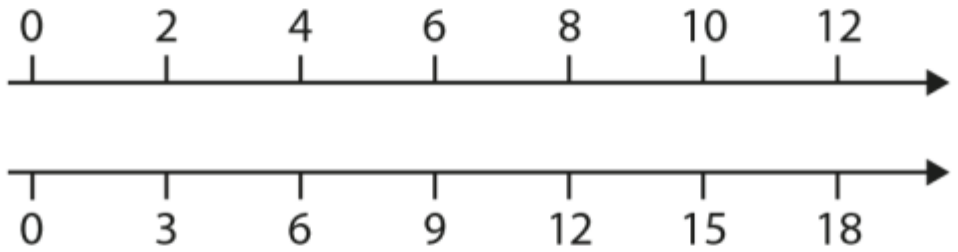
Double number lines

Ratio relationships

Double number lines are a powerful way of representing ratios and, once students have used the double number line in practical contexts, it may be appropriate to introduce more abstract ones. A ratio of 2:3, for example, modelled using a double number line, would have one number line showing the multiples of two and the other the multiples of three, with respective multiples in line, one underneath the other.



Any number on the top number line is in the ratio 2:3 with the number below, making it visible that there are infinitely many pairs of *numbers* in the same ratio and allowing students to develop a greater insight into the nature of ratio relationships. Any two of the numbers from the top number line with the corresponding pair of numbers on the bottom number line can be used to form a ratio table, and this direct link between ratio tables and double number lines can again be emphasised.

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In conclusion

- Find out what they know (but NOT through a test).
- Encourage them to realise that Maths is useful.
- Encourage them to realise that they can/will improve.
- Make them work (without realising it!)

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What you need now

'This worked for me!'

To be published by the ATM in late 2023/early 2024

Would you like to write a chapter? Or do you know anyone working in FE who should be writing a chapter?

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Thank you!

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That's Mathematics

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