Knowledge Organiser: Year 10 (Foundation 1 - 3)

HCF — 'Highest Common Factor'

GRADE 3

'Highest Common Factor' — all it means is this:

The BIGGEST number that will DIVIDE INTO ALL the numbers in question.

METHOD:
1) LIST the FACTORS of ALL the numbers.
2) Find the BIGGEST one that's in ALL the lists.
3) Easy peasy innit?

EXAMPLE: Find the highest common factor (HCF) of 36, 54, and 72.

Factors of 36 are: 1, 2, 3, 4, 6, 9, 12, (18), 36
Factors of 54 are: 1, 2, 3, 6, 9, (18), 27, 54
Factors of 72 are: 1, 2, 3, 4, 6, 8, 9, 12, (18), 24, 36, 72

So the highest common factor (HCF) of 36, 54 and 72 is 18.
Told you it was easy.

1

Just take care listing the factors — make sure you use the proper method (as shown on the previous page) or you'll miss one and blow the whole thing out of the water.

LCM — 'Lowest Common Multiple'

GRADE 3

'Lowest Common Multiple' — sure, it sounds kind of complicated, but all it means is this:

The SMALLEST number that will DIVIDE BY ALL the numbers in question.

METHOD:
1) LIST the MULTIPLES of ALL the numbers.
2) Find the SMALLEST one that's in ALL the lists.
3) Easy peasy innit?

The LCM is sometimes called the Least (instead of 'Lowest') Common Multiple.

EXAMPLE: Find the lowest common multiple (LCM) of 12 and 15.

Multiples of 12 are: 12, 24, 36, 48, (60), 72, 84, 96, ...
Multiples of 15 are: 15, 30, 45, (60), 75, 90, 105, ...

So the lowest common multiple (LCM) of 12 and 15 is 60.
Told you it was easy.

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Real-Life LCM and HCF Questions

GRADE 4

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You might be asked a wordy real-life LCM or HCF question in your exam — these can be tricky to spot at first, but once you have done, the method's just the same.

EXAMPLE: Maggie is making party bags. She has 60 balloons, 48 lollipops and 84 stickers. She wants to use them all. Each type of item must be distributed equally between the party bags. What is the maximum number of party bags she can make?

Factors of 60 are: 1, 2, 3, 4, 5, 6, 10, (12), 15, 20, 30, 60
Factors of 48 are: 1, 2, 3, 4, 6, 8, (12), 16, 24, 48
Factors of 84 are: 1, 2, 3, 4, 6, 7, (12), 14, 21, 28, 42, 84

The highest common factor (HCF) of 60, 48 and 84 is 12,
so the maximum number of party bags Maggie can make is 12.

So, in each bag there will be
60 ÷ 12 = 5 balloons,
48 ÷ 12 = 4 lollipops
and 84 ÷ 12 = 7 stickers.

You could use the prime factorisation method here if you wanted — use whichever method's easier for you.

Fractions without a Calculator

3) Multiplying

GRADE 3

Multiply top and bottom separately. Then simplify your fraction as far as possible.

EXAMPLE: Find $\frac{8}{5} \times \frac{7}{12}$.

Multiply the top and bottom separately: $\frac{8}{5} \times \frac{7}{12} = \frac{8 \times 7}{5 \times 12}$

Then simplify — top and bottom both divide by 4. $= \frac{56}{60} = \frac{14}{15}$

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4) Dividing

GRADE 3

Turn the 2nd fraction UPSIDE DOWN and then multiply:

When you're multiplying or dividing with mixed numbers, always turn them into improper fractions first.

EXAMPLE: Find $2\frac{1}{3} \div 3\frac{1}{2}$.

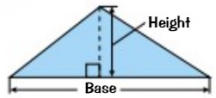
Rewrite the mixed numbers as improper fractions: $2\frac{1}{3} \div 3\frac{1}{2} = \frac{7}{3} \div \frac{7}{2}$

Turn $\frac{7}{2}$ upside down and multiply: $= \frac{7}{3} \times \frac{2}{7} = \frac{7 \times 2}{3 \times 7}$

Simplify — top and bottom both divide by 7. $= \frac{14}{21} = \frac{2}{3}$

Area Formulas for Triangles and Quadrilaterals

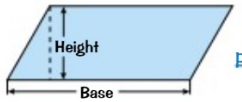
Learn these formulas:



Area of triangle = ½ × base × vertical height

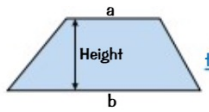
$$A = \tfrac{1}{2} \times b \times h$$

Note that in each case the height must be the vertical height, not the sloping height.



Area of parallelogram = base × vertical height

$$A = b \times h$$



Area of trapezium = average of parallel sides × distance between them (vertical height)

$$A = \tfrac{1}{2}(a + b) \times h$$

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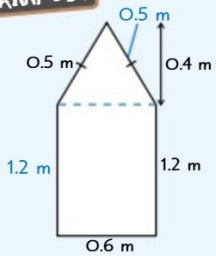
Perimeter and Area Problems

You might have to use the perimeter or area of a shape to answer a slightly more complicated question (e.g. find the area of a wall, then work out how many rolls of wallpaper you need to wallpaper it).

EXAMPLE: Greg is making a stained-glass window in the shape shown below.



When you're adding side lengths it's a good idea to mark them off as you go along to make sure you don't repeat or miss any.

a) Find the perimeter of the window.

Label all the side lengths, then add them up:

0.5 m + 1.2 m + 0.6 m + 1.2 m + 0.5 m = 4 m

b) Coloured glass costs £82 per m². Work out the cost of the glass needed for the window.

Split the shape into a triangle and a rectangle (as shown) to find the area:

Area of rectangle = length × width = 0.6 × 1.2 = 0.72 m²

Area of triangle = $\frac{1}{2}$ × base × height = $\frac{1}{2}$ × 0.6 × 0.4 = 0.12 m²

Total area of shape = 0.72 + 0.12 = 0.84 m²

Then multiply the area by the price to work out the cost:

Cost = area × price per m² = 0.84 × 82 = £68.88

Ratio Nelson — he proportionally divided the French at Trafalgar...

There's loads of stuff to learn about ratios, so have another look over it and then try these questions:

Q1 Orange squash is made of water and concentrate in the ratio 11 : 2.
a) What fraction of the squash is made up from concentrate? [1 mark]
b) How many litres of water are needed if 6 litres of concentrate are used? [1 mark]

Q2 The ages of Ben, Graham and Pam are in the ratio 5 : 3 : 1. Their combined age is 108. How old is Graham? [2 marks]

Q3 Square A has an area of 36 cm². The areas of square A and square B are in the ratio 4 : 9. What is the side length of square B? [2 marks]

Q4 In an office, the ratio of people who drink tea to people who drink coffee is 8 : 5. 18 more people drink tea than coffee. How many people drink coffee? [3 marks]

Ratios

Proportional Division

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In a proportional division question a TOTAL AMOUNT is split into parts in a certain ratio.
The key word here is PARTS — concentrate on 'parts' and it all becomes quite painless:

EXAMPLE: Jess, Mo and Greg share £9100 in the ratio 2:4:7. How much does Mo get?

1) ADD UP THE PARTS:
The ratio 2:4:7 means there will be a total of 13 parts: 2 + 4 + 7 = 13 parts

2) DIVIDE TO FIND ONE "PART":
Just divide the total amount by the number of parts: £9100 ÷ 13 = £700 (= 1 part)

3) MULTIPLY TO FIND THE AMOUNTS:
We want to know Mo's share, which is 4 parts: 4 parts = 4 × £700 = £2800

Watch out for pesky proportional division questions that don't give you the total amount.
You can't just follow the method above, you'll have to be a bit more crafty.

EXAMPLE: A baguette is cut into 3 pieces. The second piece is twice as long as the first and the third piece is five times as long as the first.

a) Find the ratio of the lengths of the 3 pieces. Give your answer in its simplest form.

If the first piece is 1 part, then the second piece is 1 × 2 = 2 parts and the third piece is 1 × 5 = 5 parts. So the ratio of the lengths = 1:2:5.

b) The first piece is 28 cm smaller than the third piece. How long is the second piece?

1) Work out how many parts 28 cm makes up. 28 cm = 3rd piece − 1st piece = 5 parts − 1 part = 4 parts
2) Divide to find one part. 28 cm ÷ 4 = 7 cm
3) Multiply to find the length of the 2nd piece. 2nd piece = 2 parts = 2 × 7 cm = 14 cm

7) Fractions of something

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EXAMPLE: What is $\frac{9}{20}$ of £360?

'$\frac{9}{20}$ of £360' means '$\frac{9}{20}$ × £360'.

Multiply by the top of the fraction and divide by the bottom.

$$\frac{9}{20} \times £360 = (£360 \div 20) \times 9$$
$$= £18 \times 9 = £162$$

The order that you multiply and divide in doesn't matter — just start with whatever's easiest.

How do we use Knowledge Organisers in Mathematics

How can you use knowledge organisers at home to help us?

- **Retrieval Practice**: Read over a section of the knowledge organiser, cover it up and then write down everything you can remember. Repeat until you remember everything.
- **Flash Cards:** Using the Knowledge Organisers to help on one side of a piece of paper write a question, on the other side write an answer. Ask someone to test you by asking a question and seeing if you know the answer.
- **Mind Maps:** Turn the information from the knowledge organiser into a mind map. Then reread the mind map and on a piece of paper half the size try and recreate the key phrases of the mind map from memory.
- **Sketch it:** Draw an image to represent each fact; this can be done in isolation or as part of the mind map/flash card.
- **Teach it:** Teach someone the information on your knowledge organiser, let them ask you questions and see if you know the answers.

How will we use knowledge organisers in Mathematics?

Knowledge organisers will be used before I complete a Learning Check or Common Assessment. I will spend part of the lesson looking over each of the key topics of the half term before completing the Learning Check or Common Assessment.

I will also use these at home to complete my own independent learning and revision of these key topics.

Mathematics (Foundation 1-3): Low Stake Test scores (Autumn)

Tudor Values
Character Habits
Learning Habits

Topics	Date	Score
Fraction of an amount, Multiplying Fractions, Dividing Fractions, Sharing using Ratio, Area of a Triangle, Lowest Common Multiple (LCM) and Highest Common Factor HCF).		
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