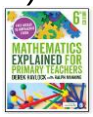
Maths Audit Instructions

Please complete this audit (this is not a test; we expect you to undertake self-study in the process of completing this audit). Please complete in your own words but consult references such as Mathematics Explained by Derek Haylock. We suggest you purchase this key text (any edition) to support you through the course as well supporting you with this audit. 

Web sites such as NCETM https://www.ncetm.org.uk/ and NRICH https://nrich.maths.org/ may also be useful. Resources and links are provided within the audit to support you in answering individual questions (these are in italics after relevant questions), use these links alongside relevant chapters in Haylock's Mathematics Explained (any edition).

Once you start the course at university you can support one another to explore your solutions further, before you hand in. We are really looking for clear explanations in your own words with helpful illustrations.

PLEASE EITHER **TYPE OR WRITE** ON SEPARATE PAPER PROVIDING NEAT, WELL SPACED, LEGIBLE EXPLANATIONS WITH ILLUSTRATIONS.

You will hand in your completed **action plan (attached to this audit) and self-study** with your audit in late September, but it is a good idea to begin your self-study and start this audit in advance of the course.

Mathematics Audit

NUMBER

1. The number system

a)

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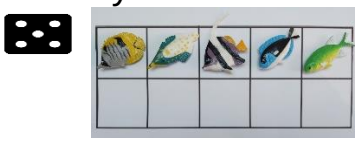
A child counts the dots above and says there are 7 dots altogether. What difficulties might this pupil have? (*This article may support your answer: http://prekmathte.stanford.edu/system/files/media/document/2017/The%20Principal%20Counting%20Principles.pdf*) Please keep answers concise.

1b) A child says, "There are more pencils than animals." What is the misconception?

Some of these questions are taken from McIntosh, A., Reys, B., Reys, R., Bana, J. and Farrell, B. (1997). *Number Sense in School Mathematics. Student Performance in Four Countries*. Perth: MASTE

1c) When asked, ‘how many?’ a child is able to respond quickly and correctly with “5” each time, **without counting**. How is this possible?



1d) You ask a pupil to count out 23 cubes, which she does successfully. You then ask her to show you how many cubes are represented by the 3 in 23 and she counts out 3 cubes. You then ask her to show you how many cubes are represented by the 2 in 23 and she counts out 2 cubes. What difficulty is this pupil having? *(See Derek Haylock’s chapter on Place Value in Mathematics Explained (any edition))*

d) Write the following numbers as powers of 10
   i. ten thousand
   ii. one million
   iii. one hundredth

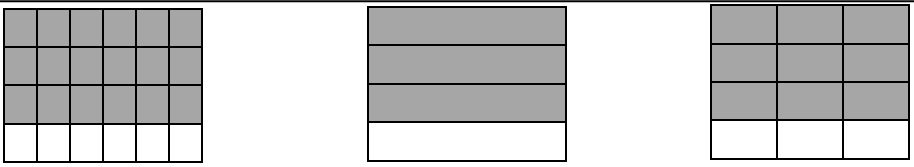
2. Fractions, decimals, percentages and ratio

a) Write the following decimals in order, smallest first and in each case give a reason why a school pupil might give a wrong answer.

i) 0.07, 0.23, 0.1

ii) 0.735, 0.74

b) These area models below might be used to explore equivalent fractions (fractions that are different but represent the same amount). What fractions do they each represent?



c) A vegetable patch is planted with potatoes, cabbages and carrots. 2/3 of the garden is planted with potatoes and ¼ of the garden is planted with cabbages. What fraction of the garden is planted with carrots? **Use a bar model** ***https://mathsframe.co.uk/en/resources/resource/402/ITP- Fractions***
or an area model (as above) to explain your answer.

(Fractions videos supporting subject knowledge
https://www.youtube.com/playlist?list=PLtSRQXuslNrhYPLwXPkofUgBZ-mYsGAT1)

d) Which of these percentages is equal to 0.26?
0.26%, 2.6%, 26%, 260%
Explain why, using place value.

e) There are five toffees to every two chocolates in a box of 28 sweets. How

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many chocolates are there? **Explain how you worked it out.**

f) In 15 minutes I travelled 18 km. How far would I go in 25 minutes if I travelled at the same speed? **Explain how you worked it out.**

g) Some children are making pink paint by mixing together white and red. Lisa uses 4 spoonfuls of red paint and 12 spoonfuls of white paint. Eric uses 9 spoonfuls of red paint and 21 spoonfuls of white paint. Whose paint will be darker pink? **Explain why.**

3. Calculation

Understanding operations:

a) Write two stories for 10 divided by 2 to illustrate the difference between sharing *(partitive)* and grouping (also known as *quotative or inverse of multiplication)* ***(See Haylock, Mathematics Explained for definitions of division structures)***

b) Illustrate 3 x 4 using an array **and** repeated addition

c) Show 96÷6 using an open array, using the distributive law (*article on arrays and open arrays: https://nrich.maths.org/8773)*

d) What might a child need to know and understand to answer this missing number problem: 8+?=15

e) **Reason why. You can provide models to support your answers**.

I. Multiplying makes things bigger. Is this always true, sometimes true or never? **Why?**
II. An even number that is divisible by 3 is also divisible by 6. Is this always true, sometimes true or never? **Why?**
III. When you multiply an odd number by an odd number you get an even number. Is this always true, sometimes true or never? **Why?**

4. Mental Strategies

a) Use different strategies to calculate 182 – 97 and show these different strategies on an empty number line or use another model:

I. partition and bridge
II. counting up
III. rounding and compensating
IV. same difference

(Subtraction strategies explained: https://www.youtube.com/playlist?list=PLn0hWIiHk5d7QYSQFt2yQzu2sgzm1-zbk)

b) A child at my school is nine years old. She says she is 30 000 days old. Is that possible? Without calculating the exact answer, explain why.

i. Yes
ii. No
iii. Maybe

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c) *Without calculating the exact answer,* select the best estimate for: 21 x 19 Say why.

i. 299
ii. 399
iii. 499

d) *Without calculating the exact answer*, select the best answer for: 29 x 0.98 Say why?

i. more than 29
ii. less than 29

e) *Without calculating the exact answer,* identify the largest number? Say how you worked it out.

i. 29 + 0.8
ii. 29 x 0.8
iii. 29 ÷ 0.8
iv. 29 - 0.8

f)Using a number line as a model to show your working, calculate the time spent on homework if I start working at 17:15 and finish at 9.07pm the same day.

5. Written calculations

a. Calculate 325 x 34 using the grid method **and** using a formal written method. (*This video demonstrates both the grid method and long multiplication: https://www.youtube.com/watch?v=5ppOF53x_q0*)

b. Calculate 7214 ÷ 21 using knowledge of multiplication facts and place value **and** also using a formal method

(*See part 4 of Teaching Written Calculation which can be downloaded using this link: https://www.stem.org.uk/elibrary/resource/29220*)

6. General laws of arithmetic & relationships

a) Explain the **commutative** law and **distributive** law, including which operations they apply to and **give an example**. (*See Haylock, Mathematics Explained)*

b) 930 x 134 is equal to 124620. Use this to find the answer to: 124620 ÷ 93 Show your working.

c) The farmer has stored all his apples in 80 boxes with 40 apples in each box. He now needs to repack them all into 40 new boxes. How many apples will there be in each box? **Explain your working and relate to 6a.**

d) 93 x 134 is equal to 12462. Use this to write the answer to: 93 x 135. **Explain your working and relate to 6a.**

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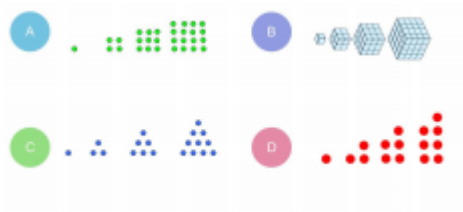
7. Pattern and algebra: draw and identify how many counters or cubes would be needed for the fifth in the sequence, for each of the growing patterns A, B, C and D below:



(*Link to articles about pattern in mathematics: https://nrich.maths.org/9968*)

8. Statistics and Sorting Data

a) A teacher calculated the mean points score achieved by pupils in an end of Key Stage 2 mathematics test.

There were 48 pupils in the year group.

The mean points score is given by the formula:

$$\text{Mean points score} = \frac{\text{total points for the year group}}{\text{total number of pupils in the group}}$$

Level achieved	Number of pupils	Points per level	Total points per level
3	5	21	105
4	29	27	783
5	8	33	
6	6	39	
Total	48		

What was the mean points score for the year group?

Give your answer to the nearest whole number.

The total points for Levels 3 and 4 have been done for you.

b) Draw and use a Venn and Carrol Diagram to sort multiples of 2 and multiples of 5.

i) Carroll diagram

ii) Venn diagram

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9. Measures

a) Give examples of concrete **non–standard** units for measuring the following (that might be used by children in the classroom):

- weight
- length
- capacity
- area
- time

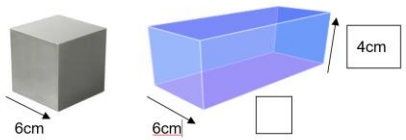
b) Metric-imperial conversions

- Which is further: half a mile or one kilometre? Explain how to calculate this.
- The scale of a map is 1: 200 000. What is 1cm equivalent to in km? Explain how you calculated this.
- How tall are you in feet and inches? Convert this into metres and centimetres. Explain how you calculated this.

c) Metric units and relationships

I. How many centimetres are there in a metre and a kilometre?
II. How many millilitres are in half a litre?

d) Volume: If the cube and the cuboid are the same volume, calculate the missing length on the cuboid.



10. SHAPE AND SPACE ***(please see Haylock's shape classification chapter)***

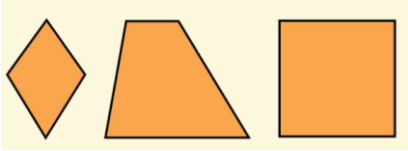
a) Regularity and irregularity

Draw a *regular* and an *irregular* example of each of these:

I. triangle
II. rectangle
III. octagon

b) Polygons - names and relationships

I. Draw an isosceles triangle and an isosceles trapezium
II. Which of the shapes below are parallelograms. Explain how you know using an understanding of classification.



c) 3D shapes – names and properties

Draw each of these, say how many faces, vertices and edges they have:

I. a cuboid
II. a pentagonal prism
III. a square based pyramid

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Name:

Action Plan

Complete this action plan and hand in with audit and self-study. When completing this action plan ensure you specify the aspects of mathematics for which further self-study is needed or have already been undertaken. I**dentify the action of self-study**: if more work on fractions is needed, indicate the action, e.g. types of worked examples from Haylock workbook or refer to a specific reading. Your self-study should then include notes from readings or actual worked examples that you have done.

AUDIT	**Record of action of self-study**	**Evidence seen** (tutor to sign)
The number system		
Fractions, decimals, percentages and ratio		
Calculations		
Mental Strategies and Written Calculations		
General laws of arithmetic		
Patterns and algebra		
Statistics and sorting data		
Shape		
Space		
Tutor signature (Date)		

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