

Wath Victoria Primary School

2018-19

Maths Fluency Document.



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Revised October 2019.

Rationale

Children are required by the end of the key stage 1 and 2 to perform calculations at pace. In 2018, the year 6 children were asked to perform 36 calculations in 30 minutes: around 50 seconds per question. The final question on the paper was $8827 \div 97$ which will obviously take more than 50 seconds to answer. However, the opening question in the paper was $673 + 39$ which should be done in far less than 50 seconds: closer to 10 in fact. To do this it is imperative that children are using the most efficient method and not always relying on one method of calculation.

Whilst the year 2 arithmetic is not done under a designated time constraint, we should still be setting high expectation of those age-related children to complete this in 20-30 minutes and also be using the most efficient method for each calculation.

The year 6 arithmetic paper compiles the calculation statements from year 3- year 6 as seen in the table below. It should be our aim that each child leaves the year group not only secure in calculating questions based on the curriculum statements, but are calculating at an appropriate pace and using the most efficient method. For children to be judged as age related, they should be answering their year group specific questions within the designated time using the suggested methods within reason. This end of year assessment is intended to provide evidence towards the final end of year judgement of that child: it is not the only piece of evidence that should be used. If a child gets 100% on the assessment, they should only be judged as GD if PUMA scores and evidence from class work back up this judgement. The grade boundaries have been calculated on the principle that in year 6 an expected child should be achieving at least 75% on an arithmetic paper and GD child should be achieving around 95%.

Table showing the breakdown of arithmetic papers 2016-2018.

	2016	2017	2018
Y3	3	2	3
Y4	3	7	6
Y5	14	10	12
Y5/6	4	1	2
Y6	12	16	14

Implications for teaching.

In 2016 the KS2 mental maths test was replaced with a written arithmetic test. Since then, the teaching of mental arithmetic strategies to children has declined. However, as seen in the information outlined above, children need to be using the most efficient strategies to solve questions. This may, at times, be mental methods of calculation drawing on key known number facts or patterns.

Over the last two years, we have developed the importance of practice to embed the learning of concepts in children. We no longer teach addition and then be 'done' with it until next year. We now consistently build on the knowledge the children gain and practice it in weekly tribe quizzes. This should be carefully planned as seen in appendix 3. As outlined above, it is now imperative that we start enabling children to have a variety of different strategies to solve questions based on the situation: the key to this is the ability to spot patterns in numbers. For example, children who are just secure with one method would do the calculation $699 + 101$ in a column method. However, a children should be seeing the relationship of adding 1 then adding 100 which could in fact be done mentally or with only a small amount of notation. Weekly tribe quizzes need to be continued with careful thought into the questions being set to pupils. Children need to be set questions that provide practice in the formal methods of calculation but also ones that allow them to use other mental methods. Tribe quizzes should then also be followed up with whole class feedback with discussions developed around using efficient methods of calculation then an expectation that children take this on board. Opportunities for learning stops and plenaries should also be used during lessons to feedback on this also.

Again, key to this will be the relationships with adults in the classroom and the positive growth mindset of children and their ability to respond to challenge.

FS- Year 2

Whilst not to be done in a 'test' conditions, it is important that any assessment is undertaken in appropriate conditions. The focus will be on the fluency of children in recalling key facts of numbers as well as the subitising of numbers rather than counting. A variety of resources and tasks (including the pilot maths resource) should be used to demonstrate this.

FS stage

- Subitise numbers to 5.
- Recall number bonds to 5 and all the derived facts from this ($2 + \underline{\quad} = 5$ or $\underline{\quad} + 3 = 5$).
- Give one more one less than numbers to 10.
- Children will recognise that adding 0 to a number adds no value.

Year 1

- Subitise numbers to 10.
- Recall number bonds to 10 and all derived facts from this ($6 + \underline{\quad} = 10$ or $\underline{\quad} + 4 = 10$).
- Recall facts for all numbers to 10 (i.e. $3 + 4 = 7$)
- Give one more and one less than numbers to 20.
- Add one hundred to any number starting with 1 or 0.

Year 2

- Recall all number bonds to twenty and all derived facts ($7 + \underline{\quad} = 20$ or $\underline{\quad} + 13 = 20$).
- Recall facts for all numbers to 20 (i.e. $13 + 4 = 17$)
- Give 2,3 or 5 more or less than any number up to 100.

- 1) $31 + 7 =$
- 2) $26 + 34 =$
- 3) $37 + 14 =$
- 4) $18 - 9 =$
- 5) $56 - 8 =$
- 6) $5 \times 6 =$
- 7) $16 \div 2 =$
- 8) $30 \div 10 =$
- 9) $\frac{1}{2}$ of 22
- 10) $\frac{2}{4}$ of 32

Guidance

Children should complete the questions in around 10 minutes. Children who are age related would score 5 or above and greater depth children 8.

- 1) *Children should calculate this mentally*
- 2) *Children should use a written method of calculation and some may draw it. Strategies will include $(20+30) + (6+4)$, $26 + 30 + 4$ or $26+4+30$*
- 3) *Most children will draw this using an efficient method. Some children may use $(30+40) + (7+4)$, $37 + 10 + 4$ or $37+4+10$.*
- 4) *Children should calculate this mentally.*
- 5) *Children should calculate $56 - 6 - 2$ some may count in ones but this must be done at pace.*
- 6) *Children should see this as 6×5 and count in steps of 5 mentally.*
- 7) *Children will either count in steps of two or most should use their knowledge of halves.*
- 8) *Children will use knowledge of multiples of tens and they may choose to make notes. Children **should not** draw 30 dots.*
- 9) *Children should calculate this mentally.*

10) Most should use the equivalent of half. Some children may split into two groups 32 using visual representation. Some children may do $\frac{1}{2}$ of 30 and $\frac{1}{2}$ of 2. Some children may split into 4 groups using visual representation and circle two of these groups and add together.

Year 3

- 1) $455 + 10 =$
- 2) $563 - 20 =$
- 3) $368 + 6 =$
- 4) $607 - 10 =$
- 5) $587 + 9 =$
- 6) $14 \times 4 =$
- 7) $64 \div 8 =$
- 8) $2/7 + 4/7 =$
- 9) $124 - 40 =$
- 10) $157 + 58 =$
- 11) $546 - 132 =$
- 12) $654 - 97 =$
- 13) $425 + 187 =$
- 14) $13 \times 8 =$
- 15) $39 \div 3 =$
- 16) $7/8 - 4/8 =$

Guidance

Children should complete the complete the 16 questions in 20 minutes. They should use (within reason) the methods indicated below. For a child to be working at age related they should be achieving at least 10 out of 16 using the appropriate methods. For GD children should be achieving 14 out of 16.

- 1) *Children should answer this question mentally.*
- 2) *Children should answer this question mentally.*
- 3) *Children should answer this question mentally ($368+2+4$ or $368+5+1$)*
- 4) *Children should answer this question mentally.*
- 5) *Children should answer this question mentally. ($587 + 10 - 1$)*
- 6) *Children should break this down to $10 \times 4 = 40$ $4 \times 4 = 16$ and add them together. They may do this mentally or written down.*
- 7) *Children should answer this question mentally through recalling times table facts.*
- 8) *Children should try to answer this question mentally but may choose to use images if needed.*
- 9) *Children should try to answer this question mentally (count back in tens or $-20-20$) but may choose to use written method.*
- 10) *Children should use the column method for this question.*
- 11) *Children may recognise this can be done mentally due to no regrouping but they may choose to record it using written column method.*
- 12) *Children may recognise this can be done mentally ($-100 + 3$) but they may choose to record it using written column method.*
- 13) *Children should use formal column method.*
- 14) *Children should break this down into 10×8 and 3×8 and add them together. They may do this mentally but most will record it in a written form.*
- 15) *Children should recognise that $3 \times 12 = 36$ so this is one more 3 and equal 13. They may also choose to do $30 \div 3$ and $9 \div 3$ and add the answers together.*
- 16) *Children should try to answer this question mentally but may choose to use images if needed.*

Year 4

- 1) $3683 + 10 =$
- 2) $309 - 10 =$
- 3) $45 \div 0 =$
- 4) $4683 + 1000 =$
- 5) $9623 - 2000 =$
- 6) $= 243 + 125$
- 7) $673 - 231 =$
- 8) $14 \times 6 =$
- 9) $69 \times 8 =$
- 10) $127 \times 7 =$
- 11) $683 \times 7 =$
- 12) $5 \times 4 \times 3 =$
- 13) $83 \div 1 =$
- 14) $190 \div 10 =$
- 15) $200 \div 100 =$
- 16) $56 \div 10 =$
- 17) $68 \div 100 =$
- 18) $7/10 - 4/10 =$
- 19) $3004 - 1452 =$
- 20) $3999 + 1456 =$
- 21) $3784 + 198 =$
- 22) $2106 - 198 =$

Guidance

Children should complete the complete the 22 questions in 25 minutes. They should use (within reason) the methods indicated below. For a child to be working at age related they should be achieving at least 15 out of 22 using the appropriate methods. For GD children should be achieving 19 out of 22. Children should also be monitored to ensure they are track to be fluent in the recall of times tables up to 12×12 and begun to be fluent in the subsequent division facts.

- 1) *Children should answer this mentally.*
- 2) *Children should answer this mentally.*
- 3) *Children should answer this mentally.*
- 4) *Children should answer this mentally.*
- 5) *Children should answer this mentally.*
- 6) *Children may use a written method of calculation. Children working at or towards GD should identify that there is no regrouping so this could be done mentally.*
- 7) *Children may use a written method of calculation. Children working at or towards GD should identify that there is no regrouping so this could be done mentally.*
- 8) *Children may use a written long multiplication. A more appropriate method would be mentally (with possible note making of the two answer) calculating 10×6 and 4×6 and adding them together.*
- 9) *Written long multiplication*
- 10) *Written long multiplication*
- 11) *Written long multiplication*
- 12) *Children should calculate this mentally using their known facts. However, they may choose to note down their working.*
- 13) *Children should answer this mentally.*
- 14) *Children should answer this mentally.*
- 15) *Children should answer this mentally.*
- 16) *Children should answer this mentally. Some children may choose to draw a place value grid to support their thinking.*

- 17) Children should answer this mentally. Some children may choose to draw a place value grid to support their thinking. Some children may choose to note their thinking i.e. $68 \div 10 = 6.8$ $6.8 \div 10$.
- 18) Most children should calculate this mentally. Some children may choose to note down their thinking.
- 19) Children should use written method with correct use of regrouping.
- 20) Children should use written method with correct use of regrouping. GD or working towards this children may see that you can do $3999 + 1 = 4000$ then add 1455 mentally but this should not be expected.
- 21) Children should use written method with correct use of regrouping.
- 22) Children should use written method with correct use of regrouping.

Year 5

- 1) $17 \times 5 =$
- 2) $156 \div 12 =$
- 3) $1009 - 10 =$
- 4) $236 + 563 =$
- 5) $919 - 717 =$
- 6) $45 \div 10 =$
- 7) $95 \div 100 =$
- 8) $789 \div 1000 =$
- 9) $5.6 \times 1000 =$
- 10) $0.5 \times 100 =$
- 11) $1997 + 7843 =$
- 12) $9106 - 1987 =$
- 13) $8920 + 12368 =$
- 14) $29038 - 2783 =$
- 15) $1637 - \underline{\hspace{2cm}} = 1124$
- 16) $40 \times 60 =$
- 17) $392 \times 8 =$
- 18) $1748 \times 9 =$
- 19) $1275 \times 12 =$
- 20) $121 \div 11 =$
- 21) $1422 \div 9 =$
- 22) $490 \div 7 =$
- 23) $\frac{3}{4} + \frac{3}{4} =$
- 24) $\frac{3}{4} - \frac{1}{12} =$
- 25) $\frac{1}{2} + \frac{1}{3} + \frac{2}{6} =$
- 26) $15 \times \underline{\hspace{2cm}} = 90$
- 27) $194.7 + 23.64 =$
- 28) $30 - 15.67 =$
- 29) $0.12 + 5.6 + 125 =$
- 30) $\underline{\hspace{2cm}} + 237 = 2379$

Guidance

Children should complete the complete the 30 questions in 30 minutes. They should use (within reason) the methods indicated below. For a child to be working at age related they should be achieving at least 21 out of 30 using the appropriate methods. For GD children should be achieving 27 out of 30. Children should also be routinely checked on their times tables up to 12×12 and the subsequent division facts. They should be tested on the times table check (appendix 2) and achieve above 85% in 12 minutes as evidence towards an at judgment.

- 1) Children should use known facts of 10×5 and 7×5 and calculate this mentally. They may choose to note down answer to add together to find the answer.
- 2) Children should use the known fact of $144 \div 12 = 12$ so 156 is one more 12 therefore 13. They should recognise this mentally rather than needing a bus stop method.

- 3) Children should calculate this mentally. $1009 - 9 = 1000 - 1$
- 4) Children may choose to use a column method. However, it would be hoped that children would recognise there is no regrouping and calculate it mentally.
- 5) Children may choose to use a column method. However, it would be hoped that children would recognise there is no regrouping and calculate it mentally.
- 6) Children should calculate this mentally.
- 7) Children should calculate this mentally. They may choose to break it down and note their thinking ($95 \div 10 = 9.5$ $9.5 \div 10 = 0.95$). **They should not use short division method.**
- 8) Children should calculate this mentally. They may choose to break it down and note their thinking ($789 \div 10 = 78.9$ $78.9 \div 10 = 7.89$ $7.89 \div 10 = 0.789$). **They should not use short division method.**
- 9) Children should calculate this mentally. They may choose to break it down and note their thinking ($5.6 \times 10 = 56$ $56 \times 10 = 560$ $560 \times 10 = 5600$). **They should not use formal written multiplication.**
- 10) Children should calculate this mentally. They may choose to break it down and note their thinking ($0.5 \times 10 = 5$ $5 \times 10 = 50$). **They should not use formal written multiplication.**
- 11) Most children will perform a column method which is fine. Ideally, children will see that you can add 3 to make 2000 then add 7840.
- 12) Children should use the formal column method with correct regrouping.
- 13) Children should use the formal column method with correct regrouping.
- 14) Children should use the formal column method with correct regrouping.
- 15) After identifying the part and whole situation (they may choose to draw a bar diagram to support their thinking), children should use the formal column method with correct regrouping.
- 16) Children should calculate this mentally using known facts. They may record their thinking ($4 \times 6 = 24$ $40 \times 6 = 240$ $40 \times 60 = 2400$). **Children should be discouraged from using formal written methods.**
- 17) Children will use formal long multiplication.
- 18) Children will use formal long multiplication.
- 19) Children will use formal long multiplication.
- 20) Children should calculate this mentally using known facts.
- 21) Children should calculate using formal short division.
- 22) Children should recognise that $49 \div 7 = 7$ so $490 \div 7 = 70$. Children may use the formal short division.
- 23) Children should calculate mentally and then ensure that they turn an improper fraction into a mixed number.
It is important that children always convert improper fractions to mixed numbers unless asked otherwise.
- 24) Children should convert $\frac{3}{4}$ to $\frac{9}{12}$ then perform the calculation. They may choose to turn it into other common denominators (i.e. 24ths) but should be encouraged to choose the option that requires fewer steps.
- 25) Children should convert the $\frac{1}{2}$ and $\frac{1}{3}$ into 6ths then perform the calculation. They may choose to turn it into other common denominators (i.e. 12ths) but should be encouraged to choose the option that requires fewer steps.
- 26) Children should calculate this mentally using strategies like $15 \times 2 = 30$ so three lots of this = 90 therefore the answer is 6 or children may choose to count in 15s.
- 27) Children should use a formal column method ensuring that correct place value is used when written down. Children should be using place holders in order to support their thinking and the correct use of regrouping.
- 28) Children should use a formal column method ensuring that correct place value is used when written down. Children should be using place holders in order to support their thinking and the correct use of regrouping.
- 29) Children should use a formal column method ensuring that correct place value is used when written down. Children should be using place holders in order to support their thinking and the correct use of regrouping.
- 30) After identifying the part and whole situation (they may choose to draw a bar diagram to support their thinking), children should use the formal column method with correct regrouping.

Year 6

Work throughout year 6 should be aimed towards ensuring the children are well equipped for the demands of the KS2 arithmetic test.

Appendix 1: examples of formal written methods of calculation.

Addition and subtraction

789 + 642 becomes

$$\begin{array}{r} 789 \\ + 642 \\ \hline 1431 \\ \hline \end{array}$$

Answer: 1431

874 - 523 becomes

$$\begin{array}{r} 874 \\ - 523 \\ \hline 351 \\ \hline \end{array}$$

Answer: 351

932 - 457 becomes

$$\begin{array}{r} 8 \quad 12 \quad 1 \\ 932 \\ - 457 \\ \hline 475 \\ \hline \end{array}$$

Answer: 475

932 - 457 becomes

$$\begin{array}{r} 1 \quad 1 \\ 932 \\ - 457 \\ \hline 475 \\ \hline \end{array}$$

Answer: 475

Long multiplication

24 × 16 becomes

$$\begin{array}{r} 2 \\ 24 \\ \times 16 \\ \hline 240 \\ 144 \\ \hline 384 \\ \hline \end{array}$$

Answer: 384

124 × 26 becomes

$$\begin{array}{r} 1 \quad 2 \\ 124 \\ \times 26 \\ \hline 2480 \\ 744 \\ \hline 3224 \\ \hline \end{array}$$

Answer: 3224

124 × 26 becomes

$$\begin{array}{r} 1 \quad 2 \\ 124 \\ \times 26 \\ \hline 744 \\ 2480 \\ \hline 3224 \\ \hline \end{array}$$

Answer: 3224

Short division

98 ÷ 7 becomes

$$\begin{array}{r} 14 \\ 7 \overline{) 98} \\ \underline{7} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

Answer: 14

432 ÷ 5 becomes

$$\begin{array}{r} 86 \text{ r } 2 \\ 5 \overline{) 432} \\ \underline{40} \\ 32 \\ \underline{30} \\ 2 \end{array}$$

Answer: 86 remainder 2

496 ÷ 11 becomes

$$\begin{array}{r} 45 \text{ r } 1 \\ 11 \overline{) 496} \\ \underline{44} \\ 56 \\ \underline{55} \\ 1 \end{array}$$

Answer: 45 $\frac{1}{11}$