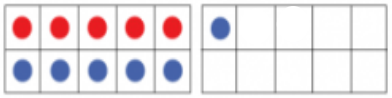
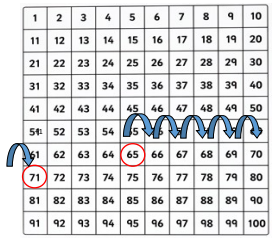
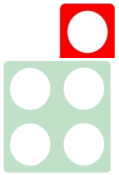
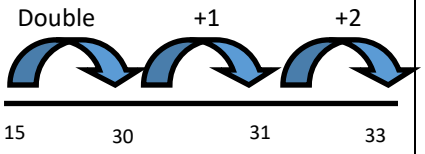
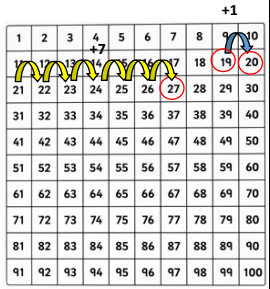
Mental Maths Calculation Policy: Addition

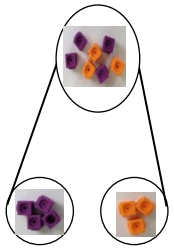
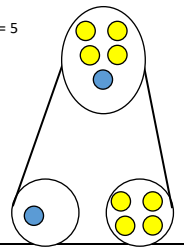
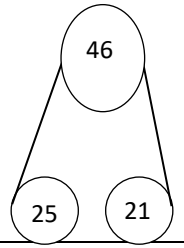
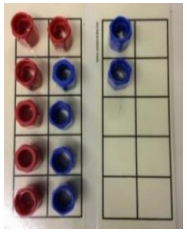
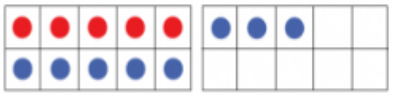
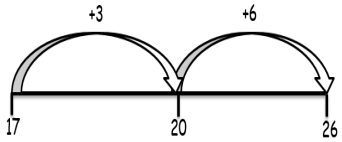
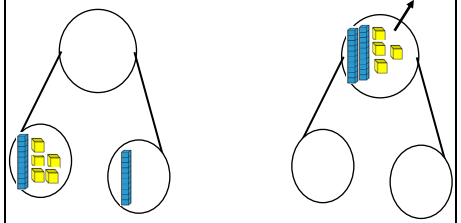
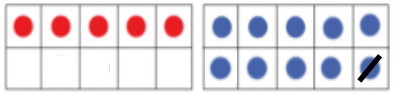
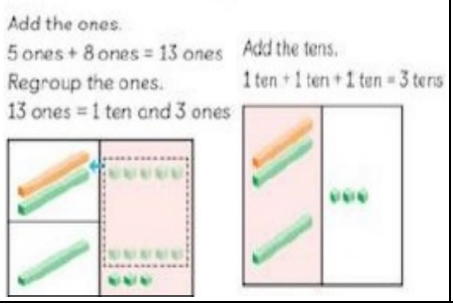
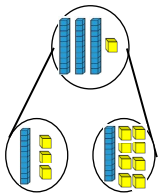
The rationale for the Mental Maths Calculation Policy is to help provide teachers and children with a variety of strategies to tackle arithmetic questions without being overly reliant on formal written methods. The aim of this document is to help children becoming fluent, flexible and accurate in their mental calculation and help them to draw on their knowledge of known facts. Below is a grid for all four categories of calculation, the potential strategies that can be applied and in which year groups you could use these strategies. This policy should be used in conjunction with the written methods calculation policy. This policy was inspired by the book Number Talks: Whole Number Computation by Shelly Parrish.

Category	Strategy	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Addition	Combining two parts to make a whole.	✓	✓	✓			
	Counting all/counting on	✓	✓				
	Doubles and near doubles	✓	✓	✓	✓	✓	✓
	Making 10	✓	✓	✓	✓	✓	✓
	Making landmark/friendly numbers		✓	✓	✓	✓	✓
	Partition and then add		✓	✓	✓	✓	✓
	Compensation		✓	✓	✓	✓	✓
	Adding up in chunks.		✓	✓	✓	✓	✓

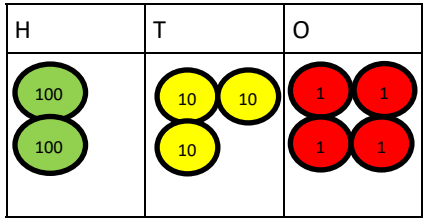
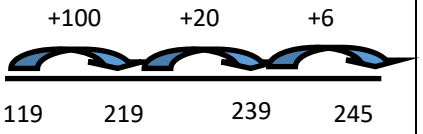
Mental Maths Calculation Policy: Addition

Strategy and method	Recorded Strategy	Representation (and practical strategy) Concrete	Pictorial	Abstract
Counting all/Counting on. Simple counting on strategy that should be replaced by more efficient strategies as a child moves into KS2.	4 + 5 = Start from 5 and count up 6, 7, 8, 9,	 Numicon, 10s frames, multilink all work here. 5 + 6 could be answered 6+5 Start from 6, count up: 7, 8, 9, 10, 11	Number line and 100 squares work here. 65 + 6 Start from 65 66, 67, 68, 69, 70, 71 	Children reach a point of confidence with their counting forwards that they can do this mentally, potentially using fingers to support.
Doubles and near doubles. Similar to the compensating method but both numbers can be changed so knowledge of doubles can be utilised.	8 + 9 Recognise Double 8 8 + 8 = 16 Add on the additional 1 16 + 1 = 17	10s frames, Numicon, Place Value Counters and Dienes rods can all be used to support this calculation approach as outlined in other strategies. Overlapping Numicon  5+4 Double 4 = 8 8 + 1 = 9	16 + 17 Double 15  Add the 1 to move from adding 15 to 16 add 2 move from adding 15 to 17.	116 + 118 (116 - 1= 115) (118 - 3= 115) 115 + 115= 130 130 + 4 = 134
Making landmark/friendly numbers. Landmark numbers are those that are easy to use in mental computation. Multiples of 5s, 10s and monetary numbers fall into this.	23 + 46 Turn 46 into 50 which is a friendly number (46 + 4 = 50) 23 + 50 = 73 73 - 4 = 69 You must remove the extra 4 added onto the 46.	Deines Rods, PVC, Numicon can all be used to support here in ways previously displayed.	19 + 8 19 + (1 + 7) 19 + 1 = 20 20 + 7 = 27 	23 + 46 (46 + 4 = 50) 23 + 50 = 73 73 - 4 = 69 You must remove the extra 4 added onto the 46.

Mental Maths Calculation Policy: Addition

Strategy and method	Recorded Strategy	Representation (and practical strategy) Concrete	Pictorial	Abstract
Combining 2 parts to make a whole.	Lots of practise making 10 e.g. 6 + 4 and bonds within 10. Moving onto use to add two 2-digit numbers.	4 + 3 = 7 	 Work with and draw arrays 1 + 4 = 5 	Children working in the abstract. 
Making 10. Use knowledge of number bonds to 10 to jump to next set of ten and add remaining ones.	8 + 5 = 13 8 + 2 = 10 10 + 3= 13 Use of tens frames, Numicon and number lines to practise.	 6 + 6 = 12 6 + 4=10 10 +2 = 12	5 + 8 = 13 Children draw arrays on empty tens frames. 	Mental addition, number line to support if necessary. 
Compensation: Adding a number like 8 or 9. Adding 10 instead and compensating by subtracting the extra numbers added,	36 + 9 = 45 57 + 8 = 65 36 + 10 = 46 57 + 10 = 67 46 - 1 = 45 67 - 2= 65	15 + 9 9+1 = 10 15 + 10 = 25 25-1=24 	5 + 9 = 14  5 + 10 = 15 15 - 1 = 14	Reasoning: What is the most efficient method to answer: 76 + 9 =_____
Partition and then add 46+ 23 = 69 Including situations involving exchanging ten 1s for a 10.	Intelligent practise to explore both ways. 46-23 40 + 20= 60 or 46 + 20 = 66 6 +3= 9 66 + 3= 69 60 + 9 = 69	15 +18= 33 	Draw base 10 on whiteboards to show partitions, addition and exchanging. 13+18=31  Pupils can rub out 10 ones and draw a replacement 10 stick.	If 35+26=61 'Make then take' 50 + 11 Make a 10 from ones and take away to swap for a ten stick. This becomes 60 + 1 = 61

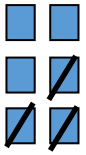
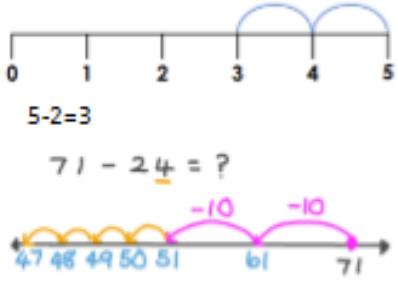
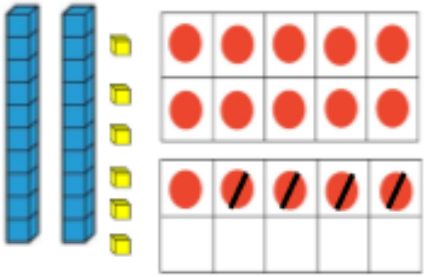
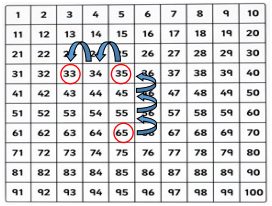
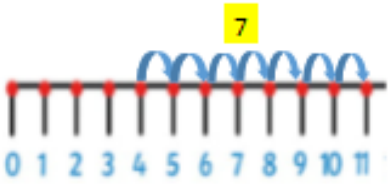
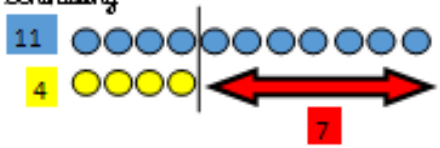
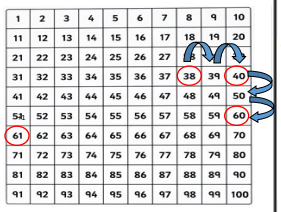
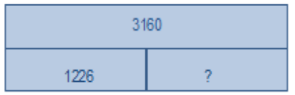
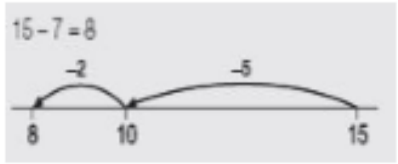
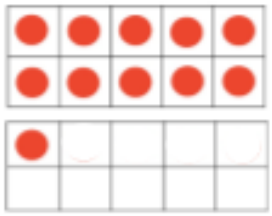
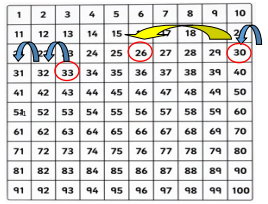
Mental Maths Calculation Policy: Addition

Strategy and method	Recorded Strategy	Representation (and practical strategy) Concrete	Pictorial	Abstract
Adding up in chunks. From the starting number, the number is partitioned and each element of place value	119 + 126 119 + (100 + 20 + 6) 119 + 100 = 219 219 + 20 = 239 239 + 6 = 245	Base 10 with grid method.  234 + 228 234 + 200 = 434 434 + 20 = 454 454 + 8 = 462 Children will still need to be competent with exchanging	119 + 126  100 squares can be used to support computation of individual steps within 100.	245 + _____ = 468 245 + 200 = 445 445 + 20 = 465 465 + 3 = 468 A lot more challenging when exchanging is required.

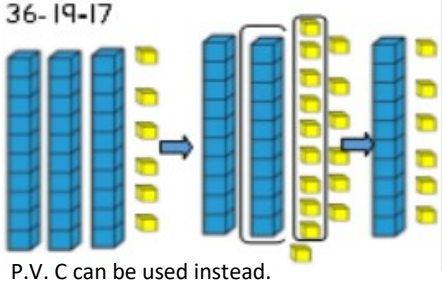
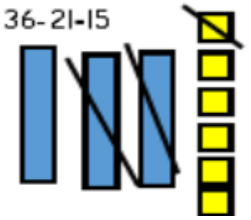
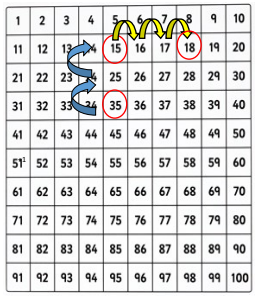
Mental Maths Calculation Policy: Subtraction

Category	Strategy	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Subtraction	Reduction by taking away/Counting Back	✓	✓	✓			
	Removal/ Counting back in 10s and ones		✓	✓	✓	✓	✓
	Comparative difference/ Adding Up	✓	✓	✓	✓	✓	✓
	Adjusting One Number to Create an Easier Problem			✓	✓	✓	✓
	Place Value and Negative Numbers					✓	✓

Mental Maths Calculation Policy: Subtraction

Strategy and method	Recorded Strategy	Representation (and practical strategy) Concrete	Pictorial	Abstract
Reduction by 'taking away' or 'counting back' concrete apparatus and counting how many are left.	6-3=3	 6 -3=3 Fingers can also be used here.	Draw cubes and cross out. 	Harry has 8 sweets. He eats 4 of them. How many does he have left?
Removal/counting back in 10s and ones. Children explore practically the subtractions of ones and tens through objects e.g. Base 10.			Arrays used in a similar way to counters. 100 squares and number line can be used.  65-32 65 - 30 = 35 35- 2 = 33	There were 17 birds on a branch. Then 8 flew away. How many are left? 17-8-9
Adding Up/Comparative Difference: Count up to find the difference E.g. 82-79 79 + ___ = 82	11-4 by doing 4 + ___ = 11 	Find/show the difference by comparing/ contrasting 	6-3=3 100 square 61-38 38 + 2= 40 40+20 = 60 60 + 1 = 61 2 + 20 + 1 =23 	This approach with bar model can be used to find missing numbers.  1226 + _____ = 3160
Partition and bridge through 10. 45-8 45-5-3	 15-5- 10 then 10-2-8	11-7- 4 (Partition the 7 into 1+6)  11-1=10 10-6=4 This can also work as drawn arrays where counters are crossed off.	33-7 = 33 - 3 and then -4 more. 33-3 = 30 30 - 4 = 26 	45–8- _____ Partition the 8 into 5 and 3 45-5-40 40-3-37

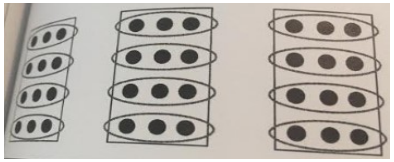
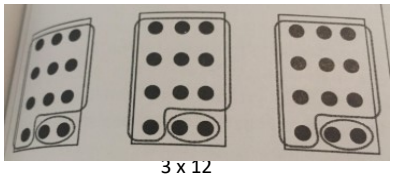
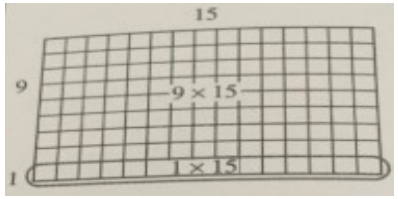
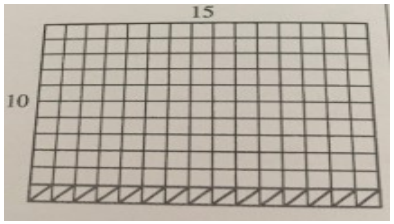
Mental Maths Calculation Policy: Subtraction

Strategy and method	Recorded Strategy	Representation (and practical strategy) Concrete	Pictorial	Abstract
Partition and then subtract 46– 23 = 23	Intelligent practise to explore both. 46-23 40–20- 20 or 46-20 - 26 6-3- 3 26-3- 23 20+ 3 - 23	36-19-17  P.V. C can be used instead.	Draw base 10 and cross off 36-21-15 	If 43-26 'Take then make' Take ten from 43 to make 30 and 13 Then subtract 20 and 6.
Place Value and Negative Numbers	123 - 59 (100 + 20 + 3) (50 + 9) 100 20 3 - 0 50 9 100 -30 -6 100 - 30 = 70 70 - 6 = 64	Would not recommend this strategy if child is still reliant on concrete apparatus/pictorial arrays.	Would not recommend this strategy if child is still reliant on concrete apparatus/pictorial arrays.	Using this approach, the chld approaches the problem by looking at individual columns. The value of each number is kept intact and used in the final computation.
Adjusting One Number to Create an Easier Problem. Similar to Compensation method in addition.	151 - 96 96 + 4 = 100 151 - 100 = 51 51 + 4 = 55	Place Value Counters, Dienes Rods, tens frames can be used to support this method.	35 - 17 17 + 3 = 20 35 - 20 = 15 15 + 3 = 18 	Brian has 271 packs of stickers. He sells 68 packs in one day. How many packs did he have left? 271 - 68 68 + 2 = 70 271 - 70 = 201 201 + 2=

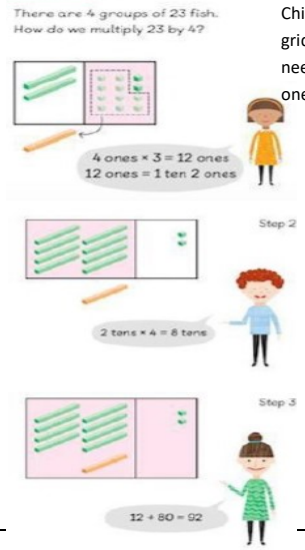
Mental Maths Calculation Policy: Multiplication

Category	Strategy	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Multiplication	Skip Counting	✓	✓	✓	✓	✓	✓
	Repeated Addition		✓	✓	✓	✓	✓
	Making Landmark Numbers			✓	✓	✓	✓
	Partial Products			✓	✓	✓	✓

Mental Maths Calculation Policy: Multiplication

Strategy and method	Recorded Strategy	Representation (and practical strategy) Concrete	Pictorial	Abstract
Skip Counting Counting forwards by a number other than 1.	5 x 3 3, 6, 9, 12, 15	Introducing the vocabulary of 'times' 4 times 3. Get a 4, 3 times. 8 3 x 4 = 12	12 x 3 I saw 12 threes and I knew how to count in 3s. 	Michelle baked 3 pans of cookies. Each Pan has 12 cookies. How many cookies did Michelle bake?
Repeated Addition Adding the same number repeatedly.	3 x 12 12 + 12 + 12 12 + 12 = 24 24 + 12 = 36	5 X 4  2 x 5 2 x 5 5 + 5 = 10 5 + 5 = 10 10 + 10 = 20	Can also draw on related addition facts.  3 x 12 12 + 12 + 12 (3 x 10) 10 + 10 + 10 = 30 (3 x 2) 2+ 2 + 2 = 6 30 + 6 = 36	The use of the Bar model to support abstract problem solving. 4 Children go to the cinema. They each spend £15. How much do they spend altogether. 
Making Landmark Numbers Landmark numbers are familiar numbers that making solving maths problems easier.	9 x 15 10 x 15 = 150 150 - 15 = 135	Concrete apparatus used to support in skip counting, repeated addition and partial products can be used here also.	  	A DVD costs£6. David buys 8. How much does he spend altogether. 8 X £6 (8 + 2) X £6 10 X £6= £60 2 X £6 = £12 £60 - £12 = £48

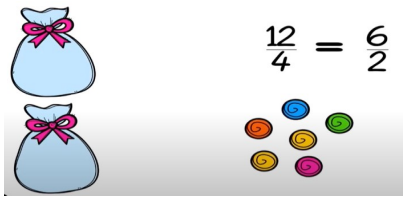
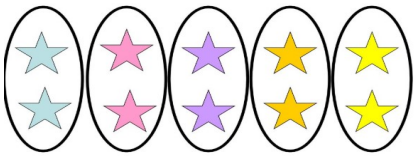
Mental Maths Calculation Policy: Multiplication

Strategy and method	Recorded Strategy	Representation (and practical strategy) Concrete	Pictorial	Abstract
Partial Products Based on distributive property and keeps place value intact. Links to standard written method of long multiplication.	12 x 15 (10 + 2) X (10 + 5) 10 x 10 = 100 10 x 5 = 50 2 x 10 = 20 2 x 5= 10 100 + 50 + 20 + 10 = 180	473 x 2 Using Place Value Counters  400 x 2 = 800 70 x 2 = 140 3 x 2 = 6 800 + 140 + 6 = 946	 Children can use grids to draw the needed tens and ones.	Partitioning can be done in different ways. 12 x 15 (4 + 4 + 4) x 15 4 x 15 = 60 4 x 15 = 60 4 x 15 = 60 60 + 60 + 60 = 180

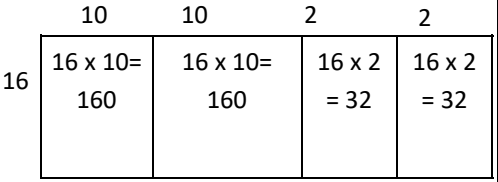
Mental Maths Calculation Policy: Division

Category	Strategy	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Division	Repeated subtraction or sharing/ dealing out	✓	✓	✓			
	Proportional reasoning		✓	✓	✓	✓	✓
	Multiplying up				✓	✓	✓
	Partial Quotients				✓	✓	✓

Mental Maths Calculation Policy: Division

Strategy and method	Recorded Strategy	Representation (and practical strategy) Concrete	Pictorial	Abstract
Repeated Subtraction or Sharing/ Dealing Out. Repeated subtraction maybe used when first starting to divide. It is one of the least efficient methods especially as sizes of numbers increase.	30 ÷ 5 30 - 5 = 25 25 - 5 = 20 20 - 5 = 15 15- 5= 10 10- 5 = 5 5- 5 = 0 There were six groups of 5.	Martha has 8 cookies she shares between 2 children. 8 ÷ 2 = 4  The child picks two faces to represent two children and shares out the 8 counters/multilink cubes to represent cookies.	Martha has 30 cookies that she shares between 5 friends. How many cookies will each friend receive? 2 2 2 | 2 2 2 | 2 2 2 | 2 2 2 | 2 2 2 Numbers could be replaced by dots. 2 + 2 + 2 = 6 Teacher can scaffold a child's understanding of dealing out/ repeated subtraction using multiplication. (See abstract).	Looking at the pictorial problem First dealing out of 2 cookies per person: 5 x 2 = 10 Second dealing out: 5 x 2 = 10 Third Dealing out: 5 x 2 = 10 So 5 x 6 = 30 and 30 ÷ 5 = 6
Proportional Reasoning This is where you can divide the dividend and divisor by the same amount to create a simpler problem. If the dividend and divisor share common factors, then the problem can be simplified.	12 ÷ 4 Children can apply their knowledge of common factors that both the dividend (12) and the divisor (4). Both numbers have a common factor of 2. So this can be simplified 12 ÷ 4 ÷2 ÷2 6 ÷ 2 = 3	Multilink cubes can be used to support here in a similar way to the sharing/ dealing out method.  This becomes:  	 20 ÷ 4  Becomes 10 ÷ 2 = 5 This can be solved through sharing or grouping	384 ÷ 16 384 ÷ 16 ÷2 ÷2 192 ÷ 8 ÷2 ÷2 96 ÷ 4 ÷2 ÷2 48 ÷ 2 = 24 So 24 is the answer to all the above equations including 384 ÷ 16= 24

Mental Maths Calculation Policy: Division

Strategy and method	Recorded Strategy	Representation (and practical strategy) Concrete	Pictorial	Abstract
Multiplying Up Similar to the Adding Up strategy in Subtraction. Children can access division by building on their strengths with multiplication.	384 ÷ 16 10 x 16 = 160 10 x 16 = 160 (320) 2 x 16 = 32 (352) 2 x 16 = 32 (384)	Would not recommend children using this strategy if still reliant on concrete apparatus or arrays.	This method can be used in conjunction with the Bar model.  160 + 160 = 320 320 + 32 = 352 352 + 32 = 384	
Partial Quotients This strategy maintains place value and mathematically correct information. Children can work their way to the quotient by using friendly multipliers such as tens, fives and twos.	384 ÷ 16 384 - 160 = 224 (10) 224- 160 = 64 (10) 64- 32 = 32 (2) 32 - 32 = 0 (2) 10 + 10 + 2 + 2 = 24	Would not recommend children using this strategy if still reliant on concrete apparatus or arrays.	Would not recommend children using this strategy if still reliant on concrete apparatus or arrays.	This method can become more efficient when the child uses larger multipliers. 384 ÷ 16 384 - 320 = 64 (20) 64 - 64 = 0 (4) 20 + 4 = 24