

EPSS Guide to Mathematical Algorithms -





This document acts as a guide in our school to the minimum required for written calculations of the four core operations (+ - x ÷)

- It is designed for teacher and parent reference
- It is designed to promote consistency with the language and written methods used to make calculations.
- These methods for calculating algorithms are based on available guidelines from QSA – both past and present syllabi.

It is expected that all students master the methods of solving algorithms detailed in this document before experimenting with other methods.

EPSS Guide to Mathematical Algorithms -

When completing mathematical calculations at Emu Park State School -

- The language used and modelled is consistent across all year levels
e.g. 'ones' place; 'tens' place and 'hundreds' place, not the same as 'one' 'ten' and 'hundred'; 'Digit' as opposed to number
- Written calculations are completed using the vertical arrangement
- The visual representations are used to reinforce understanding, and may only need to be displayed for students who have not yet grasped understanding of the calculation.
- Visual calculations are made using array model (multiplication) and MAB representations;
- Thousands  ; Hundreds  ; Tens  ; Ones .

EPSS Basic Calculations and Number Facts Guide -

- Addition – without regrouping/renaming
- Addition – with regrouping/renaming
- Subtraction – without regrouping/renaming
- Subtraction – with regrouping/renaming
- Multiplication – without regrouping
- Multiplication – with regrouping
- Division – without remainder
- Division – with remainder

ADDITION – WITHOUT REGROUPING

Verbal (Student thinks or says)

What operation is it? (Addition)

What numbers are we adding? (582 and 311)

Calculate written method (by saying)

- What do we add first? (Ones)
- How many ones are there? (2 ones add 1 one is 3 ones)
- Where will we put the 3 ones? (Ones Place)
- What do we add next? (Tens)
- How many tens are there? (8 tens add 1 ten makes 9 tens)
- Where will we put the 9 tens? (Tens place)
- What do we add next? (Hundreds)
- How many hundreds are there? (5 hundreds add 3 hundreds makes 8 hundreds)
- Where will we put the 8 hundreds? (Hundreds place)

Read answer

What is 582 and 311? (893)

582 add/plus 311 makes 893 altogether

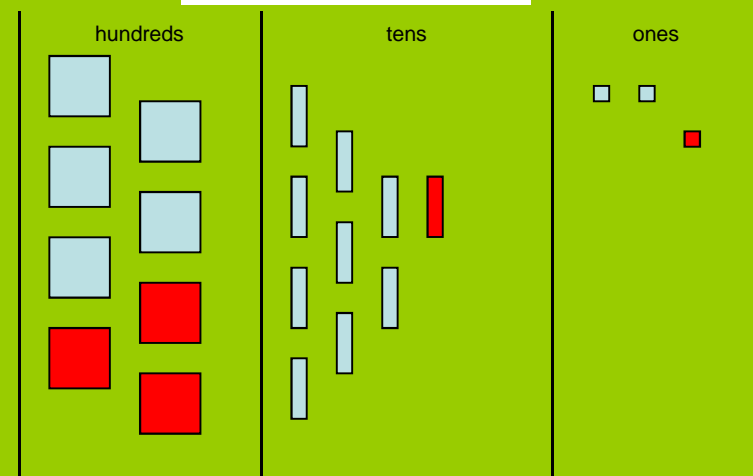
Check (by saying)

582 is close to 600 and 311 is close to 300. 600 add 300 makes 900 altogether so my answer is reasonable.

Symbolic

	hundreds	tens	ones
	5	8	2
+	3	1	1
	8	9	3

Visual – concrete



ADDITION – WITH REGROUPING

Verbal (Student thinks or says)

What operation is it? (Addition)

What numbers are we adding? (582 and 679)

Calculate written method (by saying)

- What do we add first? (Ones)
- How many ones are there? (2 ones add 9 ones is 11 ones)
- Have we enough ones to make a ten? (Yes)
- What will we do? (**Change** 10 ones for 1 ten)
- What do we have now? 1 ten and 1 one
- Where will we put the 1 one? (Ones Place)
- Where will we put the 1 ten? (**Tens place. The carry figure should be normal size and placed at the top of the Tens place.**)
- What do we add next? (Tens)
- How many tens are there? (1 ten add 8 tens add 7 tens makes 16 tens)
- Are there enough tens to make a hundred? (Yes)
- What will we do? (**Change** 10 tens for 1 hundred)
- What do we have now? (1 hundred and 6 tens)
• Where will we put the 6 tens? (Tens place)
- Where will we put the 1 hundred? (**Hundreds place**)
- What do we add next? (Hundreds)
- How many hundreds are there? (1 hundred add 5 hundreds add 6 hundreds makes 12 hundreds)
- Are there enough hundreds to make a thousand? (Yes)
- What will we do? (**Change** 10 hundreds for 1 thousand)
- What do we have now? (1 thousand and 2 hundreds)
- Where will we put the 2 hundreds? (Hundreds place)
- Where will we put the 1 thousand? (**Thousands place**)

Read answer - What is 582 and 679? (1261)

582 add/plus 679 makes 1261 altogether

Check (by saying) - 582 is close to 600 and 679 is close to 700. 600 add 700 makes 1300 altogether so my answer is reasonable.

Symbolic

	thousands	hundreds	tens	ones
		1	1	
		5	8	2
+		6	7	9
	1	2	6	1

12
16
11

Visual – concrete

thousands	hundreds	tens	ones

The visual representation shows the process of regrouping. A yellow box highlights 10 red rods in the tens column, which are moved to the hundreds column to form 1 additional blue square. Another yellow box highlights 10 red units in the ones column, which are moved to the tens column to form 1 additional red rod. A final yellow box highlights 1 red unit in the ones column, which remains as 1 red unit.

SUBTRACTION – WITHOUT REGROUPING

Verbal (Student thinks or says)

What operation is it? (Subtraction)

What number do we start with? (582)

How many are we taking away? (311)

Calculate written method (by saying)

- How many ones do we have? (2)
- How many ones are we taking away? (1)
- How many ones do we have left? (1 one)
- Where will we put the 1 one? (Ones place)

- What do we take next? (Tens)
- How many tens do we have? (8)
- How many tens are we taking away? (1)
- How many tens do we have left? (7)
- Where will we put the 7 tens? (Tens place)

- What do we take next? (Hundreds)
- How many hundreds do we have? (5)
- How many hundreds are we taking away? (3)
- How many hundreds do we have left? (2)
- Where will we put the 2 hundreds? (Hundreds place)

Read answer

582 take away 311 leaves 271

What is 582 take 311? 271

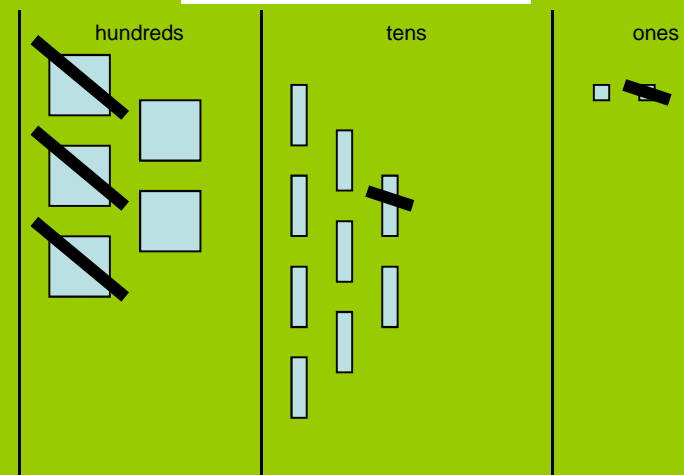
Check (by saying)

582 is close to 600 and 311 is close to 300. 600 take away 300 leaves 300. My answer is close to 300 so it could be correct.

Visual – written

	hundreds	tens	ones
	5	8	2
-	3	1	1
	2	7	1

Visual – concrete



SUBTRACTION – WITH REGROUPING – STEP 1

Verbal (Student thinks or says)

What operation is it? (Subtraction)

What number do we start with? (612)

How many are we taking away? (488)

STEP 1

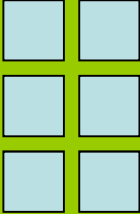





Calculate written method (by saying)

- How many ones do we have? (2)
- How many ones are we taking away? (8)
- Have we enough ones to take away 8? (No)
- What will we do? (**Change 1 ten for 10 ones. Mark off 1 ten and write the changed figure of 12 ones at the top of the ones column. Write the remaining tens at the top of the tens column.**)
- What do we have now? (0 tens and 12 ones)
- Where did we put the ones? (Ones place)
- How many ones do we have? (12)
- 12 ones take 8 ones leaves 4 ones.

Visual – written

	hundr eds	tens	ones
		0	12
	6	1	2
-	4	8	8
			4

Visual – concrete

hundreds	tens	ones
		
		
		
		

SUBTRACTION – WITH REGROUPING – STEP 2

Verbal (Student thinks or says)

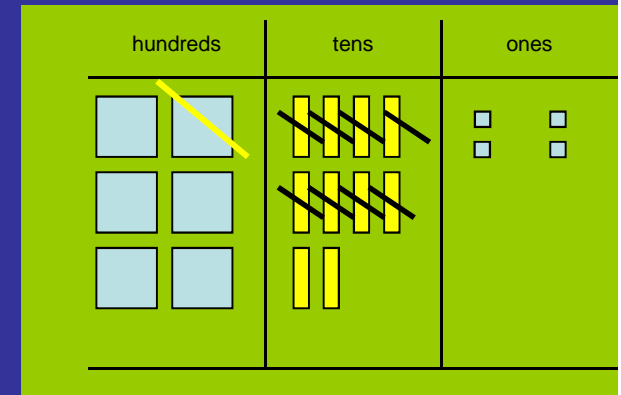
STEP 2

Calculate written method (by saying)

- What do we take next? (Tens)
- How many tens do we have? (0)
- How many tens are we taking away? (8)
- Do we have enough tens to take away 8? (No)
- What will we do? (**Change 1 hundred for 10 tens. Mark off 1 hundred and write the changed figure of 10 tens at the top of the tens column. Write the remaining hundreds at the top of the hundreds column.**)
- What do we have now? (5 hundreds and 10 tens)
- Where did we put the tens? (Tens place)
- How many tens do we have? (10)
- 10 tens take away 8 tens leaves 2 tens.

Visual – written

	hundreds	tens	ones
		10	
	5	0	12
	6	1	2
-	4	8	8
		2	4



SUBTRACTION – WITH REGROUPING – STEP 3

Verbal (Student thinks or says)

STEP 3

Calculate written method (by saying)

- What do we take next? (Hundreds)
- How many hundreds do we have? (5)
- How many hundreds are we taking away? (4)
- 5 hundreds take away 4 hundreds leaves 1 hundred.

Read answer

612 take away 488 leaves 124

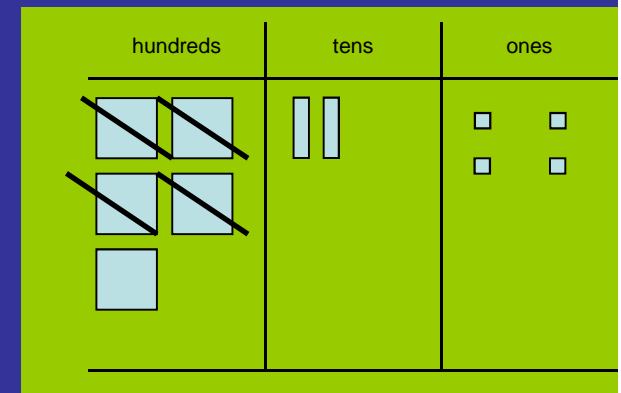
What is 610 take 488? 124

Check (by saying)

612 is close to 600 and 488 is close to 500. 600 take away 500 leaves 100. My answer is close to 100 so it is reasonable.

Visual – written

	hundreds	tens	ones
		10	
	5	0	12
	6	1	2
-	4	8	8
	1	2	4



MULTIPLICATION – without regrouping

Verbal (Student thinks or says)

What operation is it? (Multiplication)

What number are we multiplying? (24)

What number are we multiplying by? (2)

Calculate written method (by saying)

- What do we multiply first? (Ones)
- How many ones are there? (2 lots of 4 ones; 2 by 4 ones)
- How many ones altogether? (8)
- Where will we put the 8 ones? (Ones Place)
- What do we multiply next? (Tens)
- How many tens are there? (2 lots of 2 tens; 2 by 2 tens)
- How many tens altogether? (4 tens)
- Where will we put the 4 tens? (Tens place)

Read answer

What is 24 multiplied by 2? (48)





Check (by saying)

24 is close to 20. 20 multiplied by 2 is 40 so my answer is reasonable.

Visual – written

	hundreds	tens	ones
		2	4
x			2
<hr/>			
		4	8
<hr/>			

Visual – concrete

hundreds	tens	ones
		
		

MULTIPLICATION – with regrouping – STEP 1

Verbal (Student thinks or says)

What operation is it? (Multiplication)

What number are we multiplying? (25)

What number are we multiplying by? (3)

STEP 1

Calculate written method (by saying)

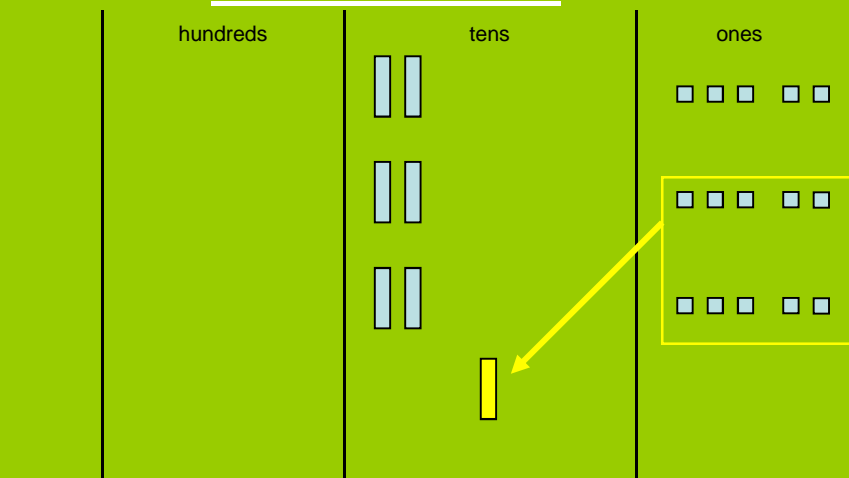
- What do we multiply first? (Ones)
- How many ones are there? (3 lots of 5 ones; 3 by 5 ones; 15 ones)
- How many ones altogether? (15)
- Have we enough ones to make a ten? (Yes)
- What will do? (**Change** ten ones for 1 ten)
- How many ones are left in the ones place? (5)
- Where will we put the 5 ones? (Ones Place)
- Where will we put the 1 ten? (**Tens place. The carry figure should be normal size and placed at the top of the Tens place.**)

Visual – written

	hundreds	tens	ones
		1	
		2	5
	x		3
<hr/>			
			5
<hr/>			

15

Visual – concrete



MULTIPLICATION – with regrouping – STEP 2

Verbal (Student thinks or says)

STEP 2

Calculate written method (by saying)

- What do we multiply next? (Tens)
- How many tens are there? (3 lots of 2 tens and 1 ten; 3 by 2 tens and 1 ten)
- How many tens altogether? (7 tens)
- Where will we put the 7 tens? (Tens place)

Read answer

What is 25 multiplied by 3? (75)

Check (by saying)

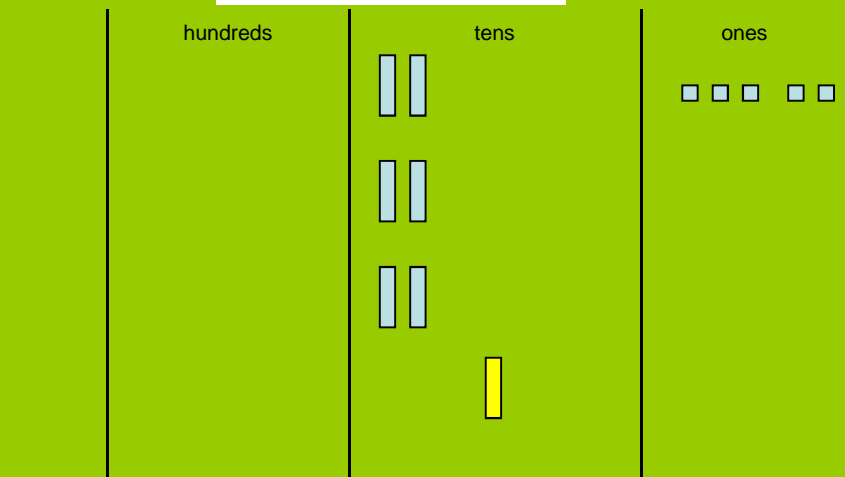
25 is between 20 and 30. 20 by 3 is 60 and 30 multiplied by 3 is 90. My answer is between 60 and 90 so my answer is reasonable.

Visual – written

	hundreds	tens	ones
		1	
		2	5
x			3
<hr/>			
		7	5
<hr/>			

15

Visual – concrete



MULTIPLICATION – Double digits – STEP 1

Verbal (Student thinks or says)

What operation is it? (Multiplication)

What number are we multiplying? (25)

What number are we multiplying by? (23)

STEP 1

















































































Calculate written method (by saying)

- What do we multiply first? (25 by 3; 3 lots of 25)
- How many ones are there? (3 lots of 5 ones; 15 ones)
- How many ones altogether? (15)
- Have we enough ones to make a ten? (Yes)
- What will do? (**Change** ten ones for 1 ten)
- How many ones are left in the ones place? (5)
- Where will we put the 5 ones? (Ones Place)
- Where will we put the 1 ten? (**Tens place. The carry figure should be normal size and placed at the top of the Tens place.**)

Visual – written

	hundreds	tens	ones
		1	
		2	5
	x	2	3
			5
			15

Visual – concrete

hundreds	tens	ones
	    	    
	    	    
	    	    
	    	    
		    
		    
		    
		    
		    
		    
		    
		    

MULTIPLICATION – Double Digit – STEP 2

Verbal (Student thinks or says)

STEP 2

Calculate written method
(by saying)

- What do we multiply next? (Tens)
- How many tens are there? (3 lots of 2 tens and 1 ten)
- How many tens altogether? (7)
- Where will we put the 7 tens? (Tens place)

Visual – written

	hundreds	tens	ones
		1	
		2	5
x		2	3
<hr/>			
		7	5
			0
<hr/>			
<hr/>			

15

Visual – concrete

hundreds	tens	ones
	○○ ■■ ■■ ■■ ■■	○○○○ ○○○○
		■■■■■

MULTIPLICATION – Double Digit – STEP 3

Verbal (Student thinks or says)

STEP 3

Calculate written method (by saying)

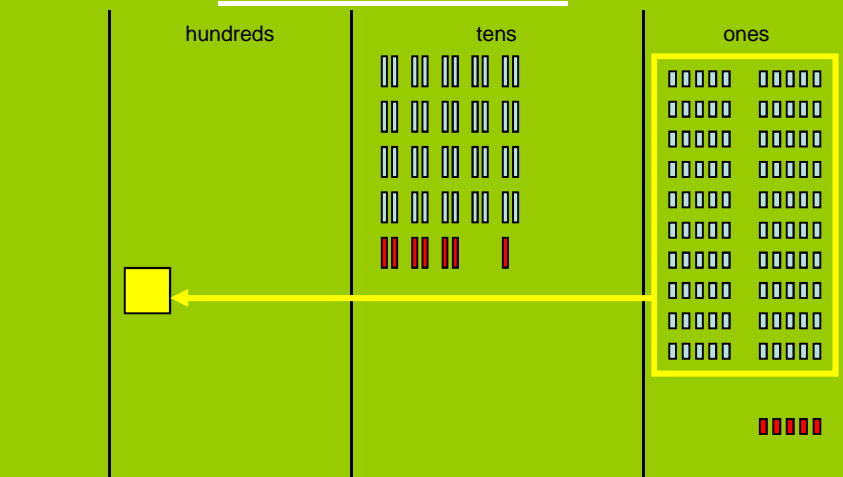
- What do we multiply next? (20 lots of 25)
- **Record a zero in the ones place to show we are multiplying by 10.**
- How many ones are there? (20 lots of 5 ones)
- How many ones altogether? (100)
- Have we enough ones to make a ten or hundred? (Yes)
- What will do? (**Change** one hundred ones for 1 hundred)
- Where will we put the 1 hundred? (**Hundreds place. The carry figure should be normal size and placed at the top of the Tens place. Record the remaining tens in the tens place.**)

Visual – written

	hundreds	tens	ones
	1	1	
		2	5
	x	2	3
		7	5
100		0	0

(15)

Visual – concrete



MULTIPLICATION – Double Digit – STEP 4

Verbal (Student thinks or says)

STEP 4

Calculate written method (by saying)

- What do we multiply next? (20 lots of 2 tens)
- How many tens are there? (20 lots of 2 tens is 400)
- How many hundreds altogether? (4 hundred and 1 hundred is 5 hundred)
- Where will we put the 5 hundred? (Hundreds place)
- How do we find the answer? (Add 75 and 500)
- (75 add 500 is 575)

Read answer

What is 25 multiplied by 23? (575)

Check (by saying)

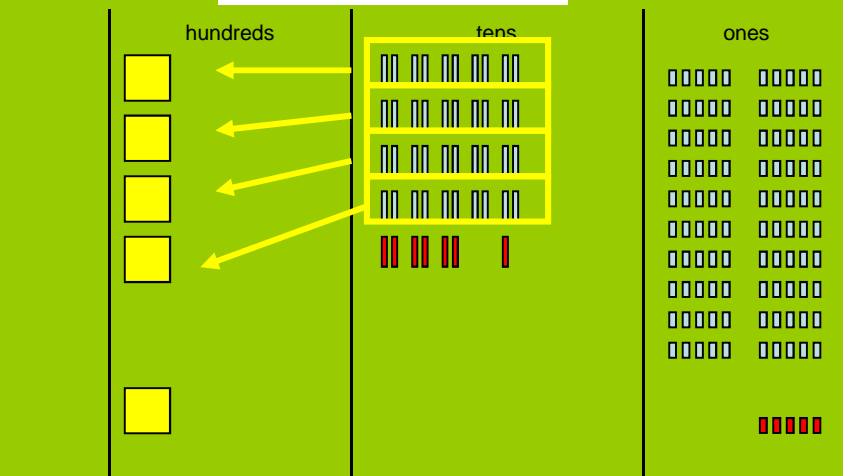
25 and 23 can both be rounded to 20. 20 lots of 20 is 400. My answer is reasonable.

Visual – written

	hundreds	tens	ones
	1	1	
		2	5
	x	2	3
		7	5
100	5	0	0
	5	7	5

15

Visual – concrete



DIVISION – without remainder

Verbal (Student thinks or says)

What operation is it? (Division)

How many are to be shared? (675)

How many are sharing? (5)

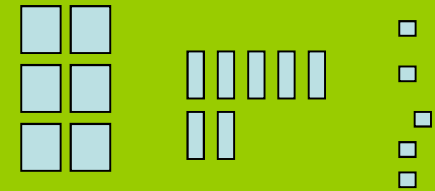
Calculate written method (by saying)

- What will be shared first? (Hundreds)
- How many hundreds are to be shared? (6 hundreds; 6 hundreds shared among 5)
- What is the greatest number of hundreds each would get? (1 hundred)
- Where will we record the 1 hundred? (Hundreds place)
- How many hundreds are left to be shared? (1 hundred)
- Can we share the 1 hundred left? (Yes. **If we change it for 10 tens. The exchanged figure is written in the tens place in front of the existing digit in small font.**)
- How many tens are to be shared now? (17 tens)

Visual – written

	hu ndr ed s	ten s	on es
5	6	7	5

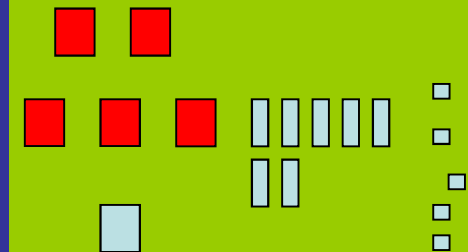
Visual – concrete



Visual – written

	hu ndr ed s	ten s	on es
5	1	6	7

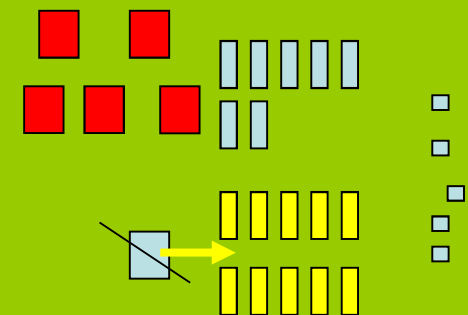
Visual – concrete



Visual – written

	hu ndr ed s	ten s	on es
5	1	17	5

Visual – concrete



DIVISION – without remainder continued

Verbal (Student thinks or says)

Continue.....

Calculate written method (by saying)

- How many tens are to be shared now? (17 tens)
- What is the greatest number of tens each gets? (3 tens)
- Where will we record the 3 tens? (Tens place)
- How many tens are left to be shared? (2 tens)
- Can we share the 2 tens left? (Yes. If we change 2 tens for 20 ones. The exchanged figure is written in the ones place in front of the existing digit in small font.)
- How many ones are to be shared now? (25 ones)
- What is the greatest number of ones each would get? (5)
- How many ones are left/remain? (0)
- Is there anything else to share? (No)

Read answer

675 divided by 5 is 135

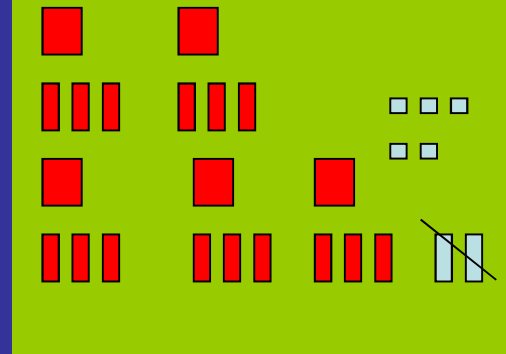
What is 675 divided by 5? 135

Each group of 5 has 135.

Visual – written

	hu ndr ed s	ten s	on es
	1	3	
5	6	17	5

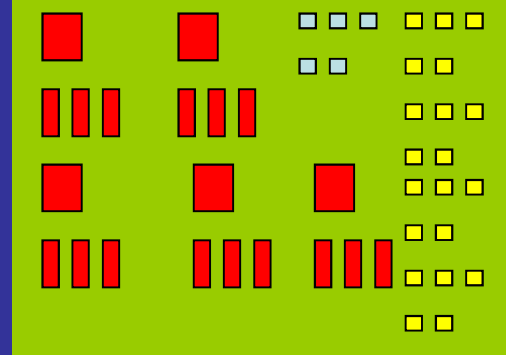
Visual – concrete



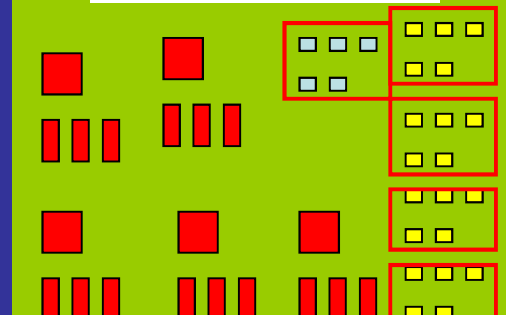
Visual – written

	hu ndr ed s	ten s	on es
	1	3	5
5	6	17	25

Visual – concrete



Visual – concrete



DIVISION – with remainder

Verbal (Student thinks or says)

What operation is it? (Division)

How many are to be shared? (78)

How many are sharing? (5)

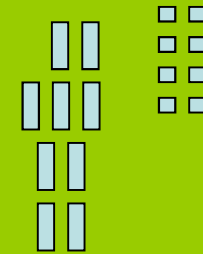
Calculate written method (by saying)

- What will be shared first? (Tens)
- How many tens are to be shared? (7 tens; 7 tens shared among 5)
- What is the greatest number of tens each would get? (1 ten)
- Where will we record the 1 ten? (Tens place)
- How many tens are left to be shared? (2 tens)
- Can we share the 2 tens left? (Yes. If we change them for 20 ones. The exchanged figure is written in the ones place in front of the existing digit in small font.)

Visual – written

	ten s	on es
5	7	8

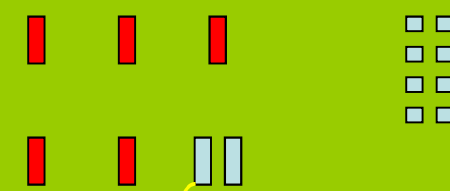
Visual – concrete



Visual – written

	ten s	on es
5	1	7

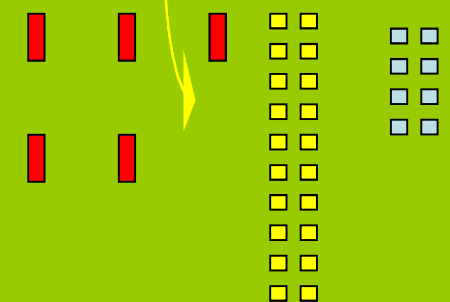
Visual – concrete



Visual – written

	Te ns	on es
5	1	28

Visual – concrete



DIVISION – with remainder continued

Verbal (Student thinks or says)

Continue.....

Calculate written method (by saying)

- How many ones are to be shared now? (28 ones)
- What is the greatest number of ones each would get? (5)
- How many ones are left/remain? (3)

Read answer

78 divided by 5 is 15 remainder 3.

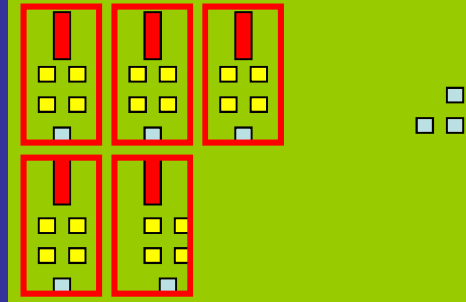
What is 78 divided by 5? 15 remainder 3

Each group of 5 has 15 with 3 remaining/left.

Visual – written

	Tens	ones
	1	5
5	7	8

Visual – concrete



Visual – written

	Tens	ones
	1	5 r3
5	7	8

Visual – concrete

