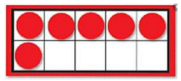
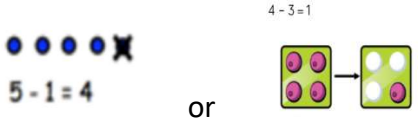
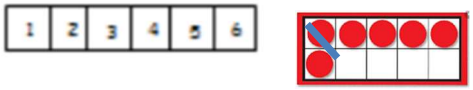
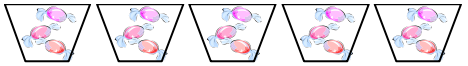
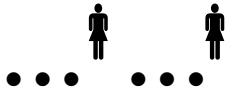
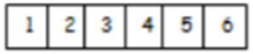
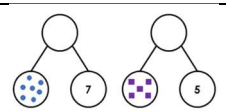
MATHS CALCULATION POLICY

Mount Pleasant Primary School

Foundation Stage- By the end of FS we expect children to:			
Addition	Subtraction	Multiplication	Division
Numicon shapes, 5/10 frames are introduced straight away and can be used to: • Recognise amounts • Identify 1more/less • Combine pieces to add • Find number bonds • Add by counting on Children can record this by printing or drawing around Numicon pieces.   Children begin to combine groups of objects using concrete apparatus. (cubes, counters, numicon, fingers)  Construct number sentences verbally or using cards to go with practical activities. *"There are 2 cars in the carpark and 1 more pulls in. How many altogether?"*  Children are encouraged to read number sentences aloud in different ways. *"3 add 2 equals 5" "5 is equal to 3 add 2"* Children make a record using marks, pictures,	Children begin with mostly pictorial representations.  Concrete apparatus is used to relate subtraction to taking away and counting how many objects are left. Concrete apparatus models the subtraction of 1 object away from 5.  Construct number sentences verbally or using cards to go with practical activities. *"In the fruit bowl there are 4 bananas, I have eaten 1. How many are left?"*  Children make a record in pictures, words or symbols of subtraction activities already carried out. Solve simple problems using fingers.  Number tracks can be introduced to count back and find one less alongside 5/10 frames.  *"What is 1 less than 9? 1 less than 20?"*	The link between addition and multiplication is introduced through doubling. Numicon is used to visualise the repeated adding of the same number. These can then be drawn around or printed as a way of recording.  A range of objects are also used to add equal groups such as fingers, cubes, toys. Children begin with mostly pictorial representations:  *"How many groups of 2 are there?"* Real life contexts and use of practical equipment to **<u>count in repeated groups of the same size:</u>**  "How many wheels are there altogether?"  *"There are 3 sweets in one bag.* *How many sweets are there in 5 bags?"*	The ELG states that children **solve problems, including doubling, halving, and sharing.** Children need to see and hear representations of divisions as both grouping and sharing. Division can be introduced through halving. Children begin with mostly pictorial representations linked to real life context. **<u>Grouping Model</u>** *"12 children get into teams of 4 to play a game. How many teams are there?"*  **<u>Sharing Model</u>** *"I have 6 sweets. I want to share them with my friend. How many will we have each?*  Part-part whole model can be used alongside to use concrete objects or marks.

words, or symbols of addition activities already carried out. Use part-part whole model to add amounts or investigate number bonds.  Solve problems using fingers.  Number tracks will be introduced alongside to count up on and find one more.  "What is 1 more than 4? 1 more than 13?" Number lines are used alongside practical apparatus to solve addition calculations and word problems.  **Children will need opportunities to look at and talk about different models and images as they move between representations.** *Games and songs can be a useful way to begin using vocabulary involved in addition. E.g. Alice the Camel.* **Vocabulary** **More, add, plus, total, addition, altogether, count on, equal to, as many as, is the same as**	Number lines are used alongside number tracks and practical apparatus to solve subtraction calculations and word problems. Children count back under the number line.  **Children will need opportunities to look at and talk about different models and images as they move between representations.** *Games and songs can be a useful way to begin using vocabulary involved in Subtraction e.g. Five little men in a flying saucer.* **Vocabulary** **Less than, count back, takeaway, fewer, subtract, minus, how many have gone/or are left?**	<u>Count aloud and with objects in 1s 2s 5s and 10s</u> Children are **<u>given multiplication problems set in a real life context.</u>** Children are encouraged to vislualise the problem. *"How many fingers on two hands?* *How many sides on three triangles?* *How many legs on four ducks?"* *Children are encourgaed to read number sentences aloud in different ways "5 times two makes 10." "10 is eqaul to five multiplied by two."* **Vocabulary** The same, equal amounts, double, doubling, groups of, sets of, lots of, multiply	 Children are to give verbal division number sentences with a verbal explanation and then have a go at recording the calculation that has been carried out. **Vocabulary** Share, sharing, equally, the same amount, group of, Half, halving, 2 equal groups/parts, how many, same as. Dived into/by, left, left over.

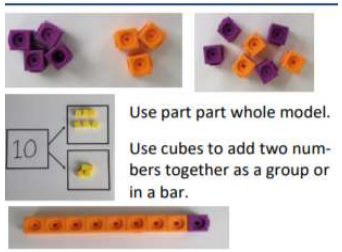
Year 1 – By the end of year 1 we expect children to:

Addition

Number bonds to 10 and 20

Concrete: Use physical objects eg cubes, counters etc. to make 10/20 and bonds within 10/20

Pictorial



Subtraction

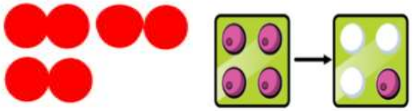
Taking Away

Concrete: Use physical objects, counters, cubes, Numicon etc to show how objects can be taken

away.

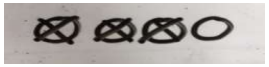
4—2 = 2

4 - 3 = 1

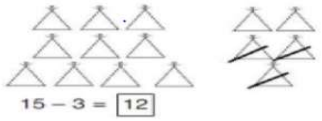


Pictorial

4- 3 =

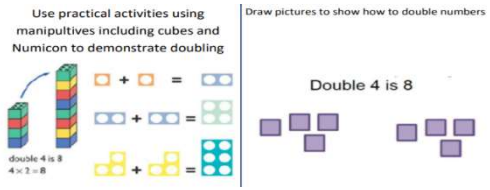


Cross out drawn objects to show what has been taken away.

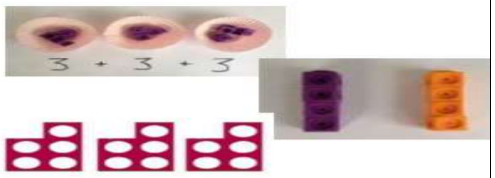


Multiplication

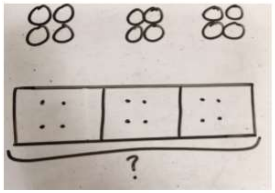
Doubling –



Repeated Addition - Concrete

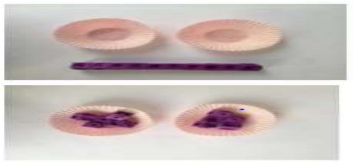


Pictorial

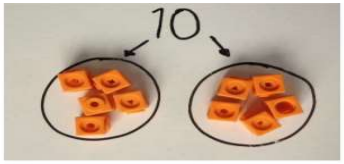


Division

Halving – Use objects to share between 2



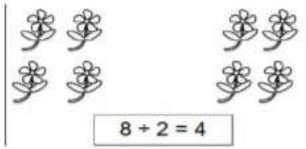
Sharing - Concrete

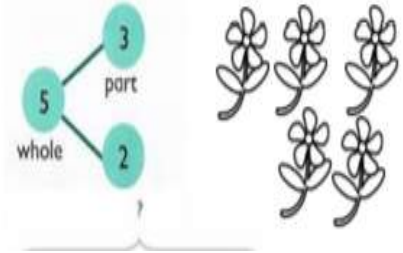


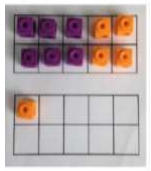
I have 10 cubes, can you share them equally in 2 groups?

Pictorial

Children use pictures or shapes to share quantities.







Start with the bigger number and use the smaller number to make 10.

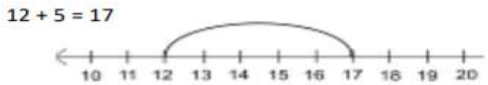
Use ten frames.

Abstract Solve number statements:

7 + 4 = 11 If I am at 7, how many more do I need to make 10? How many more do I add on now?

5 + 12 = 17 Place the larger number in your head and count on the smaller number to find your answer.

Number lines



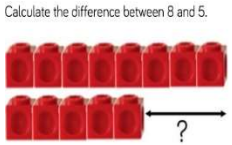
Start at the larger number on the number line and count on in ones or in one jump to find the answer.

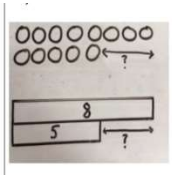
+ = signs and missing numbers

Sam has 10 buns and eats 4. How many does he have left?

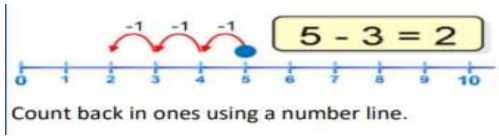
Abstract 10 – 3 = 17-9 = 20-5=

Difference- However, children need a good understanding of removing objects before teaching this concept.

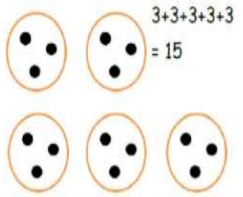




Number lines (numbered) - (Counting back)



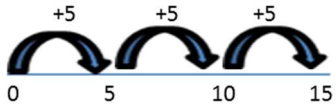
Count back in ones using a number line.



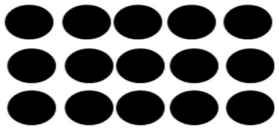
There are 3 sweets in one bag.
How many sweets are there in 5 bags?

Abstract

e.g. 3 x 5



Arrays e.g. 5 x 3



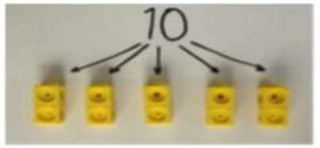
3 + 3 + 3 + 3 + 3

Abstract - 12 ÷ 3 = 4

Division as Grouping

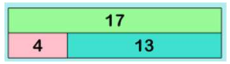
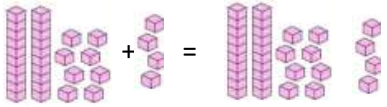
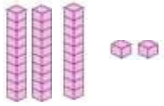
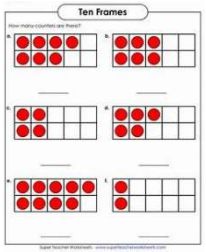
Divide quantities into equal groups.

Use cubes, counters, objects or place value counters to aid understanding.



There are 10 sweets. How many people can have 2 each? (How many 2's make 10?)

3 + 4 = □ □ = 3 + 4 3 + □ = 7 7 = □ + 4	**- = signs and missing numbers** 7 - 3 = □ □ = 7 - 3 7 - □ = 4 4 = □ - 3		

Year 2- By the end of year 2 we expect children to:			
Addition	Subtraction	Multiplication	Division
Autumn **Numbers to 50** Use bar models  Use Dienes   28 + 4 =  =  Concrete – Use Numicon for doubles 8+8=16 	Autumn Numbers to 50  Use tens frame and bar models to derive subtract facts to 20 To derive bonds to 100 label the counters with 10. And count in 10s 					
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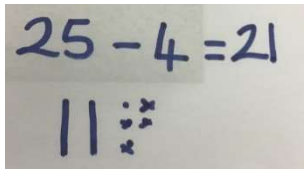
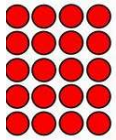
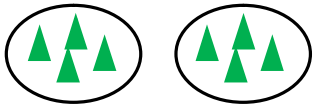
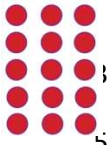
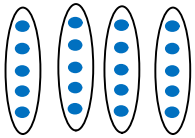
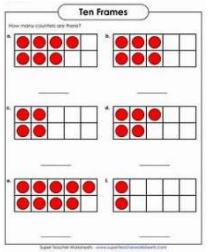
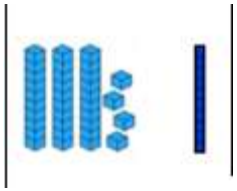
10	10	10		
				| 30 + 70 = 100  Use Dienes to subtract tens and ones. Not crossing ten. Move to drawing Dienes.  Use Dienes to subtract a 1 digit, tens and 2 digit from a 2 digit number, extend to drawing Dienes	**Autumn** • Use concrete apparatus- cubes Eg. 3 x 2=  **Spring**: Draw arrays to calculate.  This is 4 x 5 = 20 Draw arrays on a whiteboard then rotate the white board to demonstrate commutativity.	**Autumn** • Do the concept of division as sharing. Eg. Share 8 into 2 groups  **Arrays**  columns of 5 counters 5 + 5 + 5 = 15 3 lots of 5 equals 15 Division to be shown by grouping. Use counters to support. 10 ÷ 5 = 2  Then move on to show 20 ÷4= 5 

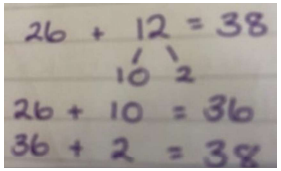
Spring:



Use the 10s frame.



Begin to use partitioning:



Then use Dienes in a column frame.

Tens	ones
	

Spring:

Teach subtraction by partitioning:

26 – 12 = 14

/\

10 2

26 – 10 = 16

16 – 2 = 14

Begin to demonstrate the concept of subtracting in columns by placing Dienes in a column subtraction frame.

Tens	Ones

Extend to drawing the diennes and crossing out, then replace pictures with numbers.

Use bar models to create fact families and recognise inverse.

20	
15	5

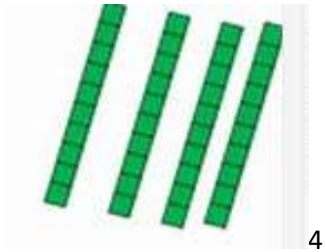
15 + 5 = 20

5+15 =20

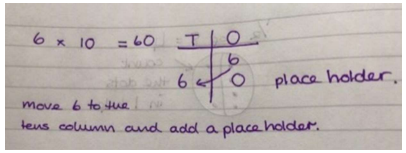
20-5=15

20-15=5

Find a small difference by counting on



4 x 10

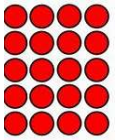


Summer:

Spring

Understand division as grouping

20 ÷ 5 can be modelled as:



20-5-5-5-5 = 0

Then show as repeated subtraction below.

Grouping – There are 6 sweets. How many people can have 2 each? (How many 2's make 6?)

5	9

Extend to drawing Dienes in the column frame followed by:

T O
3 6
+2 3
9
+5 0
5 9

Summer:

T O
3 6
+2 3
9
+5 0
5 9

Begin to work beyond 100.

12 + □ = 18

18	
12	?

Create a bar model then use the inverse to calculate.

Number Line (partially numbered) number lines to include- thermometer, weighing scales, metre sticks

using a numbered number line.

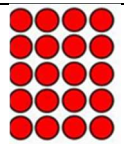
Summer:

Expanded column subtraction - (not carrying tens)

76 – 45 =

70 6
– 40 5
1
+ 3 0
3 1

Explain that we are putting our tens and ones back together.



5+5+5+5=20

4 x 5=20

Spring and summer

Spring term- start with tens and multiply by a single digit

(Grid Method)

TU x U

x	30	5
2	60	10

Missing numbers

□ x 2 = 14 14 = 2 x □

□ x ∇ = 14 14 = □ x ∇

Problem solving - (Applying the grid method)

Summer –

÷ = signs and missing numbers

16 ÷ 2 = □ □ = 16 ÷ 2

16 ÷ □ = 8 8 = 16 ÷ □

Using known number facts

8 ÷ 2= 4 8 ÷ 4=2

80÷2=40 80 ÷ 4=20

Compensation method- 35 + 9= Adjusting (may not be shown on a number line) Add 9 or 11 by adding 10 and adjusting by 1 35 + 9 = 44 (teaching- Bar model, arrows cards and dienes equipment		How many stamps would you have if you bought four books of stamps, with each having 10 stamps in it? **<u>Partition-</u>** 23 x 3= 20 x 3 3 x 3	

Year 3 - By the end of year 3 we expect children to:

Addition

<u>Add a near multiple of 10 to a two-digit number-</u> mentally

e.g. 35 + 19 is the same as 35 + 20 – 1.

<u>Compact method -</u>

<u>Autumn -</u> Not crossing the tens boundary then move to crossing the tens boundary. Start with the least significant digit first.

$$\begin{array}{r} 46 \\ +\ 23 \\ \hline 69 \end{array}$$

$$\begin{array}{r} 46 \\ +\ 25 \\ \hline 71 \\ 1 \end{array}$$

<u>Spring -</u> not crossing the tens boundary. Start with the least significant digit first. 3 digits and 2 then move to crossing the tens boundary.

$$\begin{array}{r} 246 \\ +\ 23 \\ \hline 269 \end{array}$$

$$\begin{array}{r} 246 \\ +\ 25 \\ \hline 271 \end{array}$$

Subtraction

<u>Subtract mentally a 'near multiple of 10' to or from a two-digit number</u>

78 – 49 is the same as 78 – 50 + 1

<u>Compact method- (carrying tens)</u>

<u>Autumn-</u> start with not carrying then move to carrying tens crossing the tens. Start with the least significant digit first.

$$\begin{array}{r} 67 \\ -\ 34 \\ \hline 33 \\ \hline \end{array}$$

$$\begin{array}{r} {}^{5}\ {}^{1} \\ \not{6}7 \\ -\ 38 \\ \hline 29 \\ \hline \end{array}$$

<u>Spring-</u> not carrying. Start with the least significant digit first. 3 digits and 2

$$\begin{array}{r} 487 \\ -\ 64 \\ \hline 423 \\ \hline \end{array}$$

$$\begin{array}{r} {}^{5}\quad \\ 3\ \not{6}\,{}_{1}7 \end{array}$$

Multiplication

<u>Autumn</u>

2 digits x 1 digit

<u>Partition (Grid Method)</u>

TU x U

45 x 5

X	40	5
5	200	25

$$\begin{array}{r} 200 \\ +\ 25 \\ \hline 225 \end{array}$$

<u>Spring</u>

$$\begin{array}{rl} 23 & \\ \times\ 7 & \\ \hline 21 & (7 \times 3) \\ 140 & (7 \times 20) \\ \hline 161 & \\ \hline \end{array}$$

Division

<u>Autumn – Short Division (no remainders)</u>

$$\begin{array}{r|l} & 1\ \ 6 \\ \hline 4 & 6\ {}^{2}4 \end{array}$$

<u>Spring – Short Division (remainders)</u>

$$\begin{array}{r|l} & 1\ \ 5\ \ r2 \\ \hline 4 & 6\ {}^{2}2 \end{array}$$

1 **Summer-** Not crossing the tens boundary. Start with the least significant digit first. (3 digits). Then move to crossing the tens boundary. + 346 223 569 + 346 225 571 1 **Adding Fractions** Add fractions with the same denominator: $^3/_8 + {}^1/_8 = {}^4/_8$ Add fractions to make 1 ¼ + ☐ = 1 Note- For time calculations and time problems (Use the number line method-counting on) **School starts at 8.55. We work for 1h 45m.** **What time is break?** +0.05h +0.40h + 1.00h 8.55 9.00 9.40 10.40 Counting on method for adding time	- 4 8 3 1 9 **Summer-** Carrying. Start with the least significant digit first. 3 digits and 2 digits 5 3 ~~6~~ 17 - 4 8 3 1 9 **Subtract Fractions** $^3/_8 - {}^1/_8 = {}^2/$ Note- For time calculations and time problems (Use the number line method – counting back) **The school fair starts at 11 o'clock. It takes me 1 hour and 45 minutes to walk to school. What time do I need to set off?** 9.15 9.30 10.00 11.00 - 0.15h - 0.30h - 1.00h Counting back method for subtracting time	**Summer - (compact method)** 36 x 4 144 2 **Problem solving in context** I need 32g butter to make one cake. How much butter will I need to make 4 cakes for the school fair?	**Summer – Short Division (in the context of problem solving). Rounding up and down** **Example -** Tamara needed 76 plastic cups for her party. They came in packs of 6. How many packs did she need? 12 r4 6 ⟌ 7 16 Round up to 13

Year 4 - By the end of year 4 we expect children to:

Addition

Add the nearest multiple of 10, then adjust

Continue as in Year 3 but with appropriate numbers e.g. 163 + 29 is the same as163 + 30 - 1

Column Addition

Compact method- up to four digits
The carried digit is in the correct column.
Decimal numbers in the context of money and
metric units.

Carry in the ones column first, then extend to tens column.

```
  346
+ 225
  571
   1
```

```
  3587
+  675
  4262
  111
```

```
  3587
+ 2675
  6262
  111
```

Extend to decimals in the context of money (vertically)

£ 2.50 + £ 1.75 = £ 4.25

```
  £ 2.50
```

Subtraction

Subtract the nearest multiple of 10, then adjust.

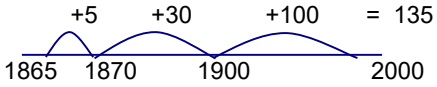
Continue as Year 3 but with appropriate numbers.
178 – 69 is the same as 178 – 70 + 1

Complementary addition

Find a small difference by counting up
e.g. 5003 – 4996 = 7

Use complementary addition to subtract amounts of money, and for subtractions where the larger number is a multiple of 1000 or 100

E.g. 2000 – 1865



Compact Column Subtraction – 3 digits and 3 digits.
structured progression- carrying from 10, then 100s

```
  4 8 7
-   2 6 4
    2 2 3
```

```
    5
  3 6 17
- 1 4 8
  2 1 9
```

Multiplication

Autumn
Short multiplication

Multiplying a number with up to 2 digits by a single digit.

Spring
Short multiplication

Multiplying a number with up to 3 digits by a single digit.

```
  136
x   4
  544
  12
```

Summer

Multiplying a decimal to one decimal place.

```
 12.5
x   2
 25.0
  1
```

Division

Autumn – Short Division (no remainders- 3 digits divided by a single digit)

252 ÷ 7

```
    0 3 6
  ┌──────
7 │ 2 ²5 ⁴2
```

Spring – Short Division (remainders - 3 digits divided by a single digit)

256 ÷ 7

```
    0 3 6 r 4
  ┌──────────
7 │ 2 ²5 ⁴6
```

Summer – Short Division (remainders expressed as a fraction - 3 digits divided by a single digit)

256 ÷ 7 = 36 4/7

```
    0 3 6 r 4
  ┌──────────
7 │ 2 ²5 ⁴6
```

+ £ 1.75 £ 4.25 1 Ensure that the carried digit is in the correct column. **Add like fractions** e.g. $^{3}/_{5} + {}^{4}/_{5} = {}^{7}/_{5} = 1\ {}^{2}/_{5}$. Be confident with fractions that add to 1 and fraction complements to 1 e.g. $^{2}/_{3} + ? = 1$ Note- For time calculations and time problems (Use the number line method – counting on) **School starts at 8.55. We work for 1h 45m.** **What time is break?** +0.05h +0.40h + 1.00h 8.55 9.00 9.40 10.40 Counting on method for adding time	**Subtracting Fractions** Subtract like fractions, e.g. ¼ + $^{1}/_{8} = {}^{3}/_{8}$ Use fractions that add to 1 to find fraction complements to 1, e.g. $1 - {}^{2}/_{3} = {}^{1}/_{3}$ Note- For time calculations and time problems (Use the number line method – counting back) **The school fair starts at 11 o'clock. It takes me 1 hour and 45 minutes to walk to school. What time do I need to set off?** 9.15 9.30 10.00 11.00 - 0.15h - 0.30h - 1.00h Counting back method for subtracting time		

Year 5 - By the end of year 5 we expect children to:

Addition

Add or subtract the nearest multiple of 10 or 100, then adjust mentally

Continue as in Year 4 but with appropriate numbers e.g. 458 + 79 = is the same as 458 + 80 - 1

Column Addition

Compact methods up to 5 digits, decimals and metric

Carry in the units column first, then tens after this extend to hundreds and thousands column

23587
+ 2675
26262
1 1 1

23587
+ 12675
36262

Subtraction

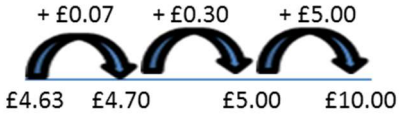
Subtract the nearest multiple of 10 or 100, and then adjust.

Continue as in Year 4 but with appropriate numbers. 458-67=

458 – 70 + 3 =

Complementary addition

Use complementary addition for subtractions where the larger number is a multiple of 1000 and for subtractions of decimals with up to two places incl. amounts of money, e.g. £10.00 - £4.63



Compact Column Subtraction – up to 4 digits and 4 digits, decimals, metric

structured progression- carrying from 10, then 100s

Continue using compact column subtraction method. Extend to decimals (same number of decimal places)

Multiplication

Autumn

Short multiplication

Multiplying number up to 4 digits by a one or two-digit number.

Spring

Long Multiplication

Multiply up to 4 digits by a 2-digit whole number

Division

Autumn

Short division

Dividing a 3-digit number by a 1-digit

256 ÷ 7

0 3 6 r 4
7) 2 25 46

Spring

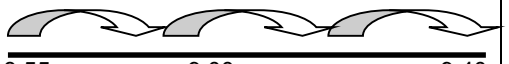
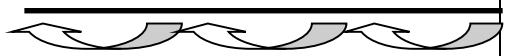
Dividing up to a 4-digit number by a 1-digit number.

Express the remainder as a fraction moving to a decimal (2dp).

0 6 4 r 1
4) 2 25 17

Answer: 64 ¼ or 64.25

1 1 1 Extend to decimals (same number of decimals places) and adding several numbers (with different numbers of digits). Know that decimal points should line up under each other, particularly when adding and subtracting mixed amounts. Eg, 3.2m + 280cm **Adding Fractions** Begin to add related fractions using equivalences, e.g. ½ + $^1/_6$ = $^3/_6$ + $^1/_6$	Introduce taking from the hundreds column. 2 9 / / 2 3 10 15 - 1 1 5 7 1 1 4 8 4 49.5 16 -27.2 8 22.2 8 **Subtracting Fractions** Begin to subtract related fractions using equivalences, e.g. ½ − $^1/_6$ = $^2/_6$	**Problem solving/Reasoning** Two step problems -Alysha eats 8 biscuits a day for the whole of September and October. How many biscuits does she eat altogether? **Summer** **Multiplying Fractions** Begin to multiply fractions and mixed numbers by whole numbers ≤ 10, e.g. 4 × $^2/_3$ = $^8/_3$ = 2$^2/_3$.	

Note- For time calculations and time problems (Use the number line method – counting on) **School starts at 8.55. We work for 1h 45m.** **What time is break?** +0.05h +0.40h + 1.00h  8.55 9.00 9.40 10.40 Counting on method for adding time	Note- For time calculations and time problems (Use the number line method – counting back) **The school fair starts at 11 o'clock. It takes me 1 hour and 45 minutes to walk to school. What time do I need to set off?** 9.15 9.30 10.00 11.00  - 0.15h - 0.30h - 1.00h Counting back method for subtracting time		

Year 6 - By the end of year 6 we expect children to:

Addition

Add the nearest multiple of 10, 100 or 1000, then adjust - mentally

Continue as in Year 2, 3, 4 and 5 but with appropriate numbers including extending to adding 0.9, 1.9, 2.9 etc

Column Addition

Add numbers with up to 6 digits or add several numbers together including metric.

```
 32376
+14397
 46773
  1 1
```

```
   42
+ 6432
  786
 7260
 1 11
```

Subtraction

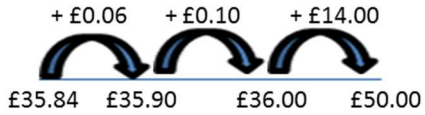
Subtract the nearest multiple of 10, 100 or 1000, then adjust

Continue as in Year 2, 3, 4 and 5 but with appropriate numbers.

Complementary addition

Use complementary addition for subtractions where the larger number is a multiple or near multiple of 1000 or 10,000 and for subtractions of decimal numbers, including money,

e.g. £50.00 - £35.84



Multiplication

Autumn

Short Multiplication

```
  3245
x    3
  9735
  1 1
```

Multiplying decimals with 2 decimal places

Spring and summer

Multiplying number with 4 digits by 1 digit.

Multiplying number with 3 digits by 2 digit.

Long Multiplication

```
   11
  ⅀⅀
  265
x  24
 1060
+5300
 6360
```

Division

Give remainders as fractions and decimals

Short Division

538 ÷ 8

```
    0  6  7 r2
  ┌──────
8 | 5 ⁵3 ⁵8
```

Answer: 67 ¼ OR 67.25

126.52 ÷ 4

```
    0  3  1. 6  3
  ┌──────────
4 | 1 ¹2  6. ²5 ¹2
```

Extend to numbers with any number of digits and decimals with up to 3 decimal places. 124.9 + 117.25 = 242.15 124.90 + 117.25 242.15 11	**Compact Column Subtraction –** up to 5 digits , 3 decimal places and metric structured progression- carrying from 10, then 100s 3 12 4 5 4 3¹0 - 1 2 6 5 4 4 1 6 5 3 12 65 4 3¹0 - 31 2 6 5 3 4 1 6 5 3 14 12 3 . 1 78 143.78- 26.8= - 2 6 . 80 116 . 98 Subtraction of any number, including with a mixed number of decimal places – any number, including 0's in any column.		**Long Division** 8684 ÷ 23 3 7 7 r13 23 7 8 1 6 8 4 - 6 9 1 7 8 - 1 6 1 1 7 4 - 1 6 1 1 3

Adding Fractions

$4\frac{2}{3} + 1\frac{2}{12} = 4\frac{8}{12} + 1\frac{2}{12} = 5\frac{10}{12} = 5\frac{5}{6}$

Note- For time calculations and time problems (Use the number line method – counting on)

School starts at 8.55. We work for 1h 45m.

What time is break?

+0.05h +0.40h + 1.00h

8.55 9.00 9.40
10.40

Counting on method for adding time

Subtraction of any number, including with a mixed number of decimal places – any number, including 0's in any column.

Subtracting Fractions

$4\frac{2}{3} - 1\frac{2}{12} = 4\frac{8}{12} - 1\frac{2}{12} = 3\frac{6}{12} = 3\frac{1}{2}$

Note- For time calculations and time problems

(Use the number line method – counting back)

The school fair starts at 11 o'clock. It takes me 1 hour and 45 minutes to walk to school. What time do I need to set off?

9.15 9.30 10.00
11.00

- 0.15h - 0.30h - 1.00h

Counting back method for subtracting time

Multiply Fractions

Multiply fractions and mixed numbers by whole numbers:

$\frac{3}{4} \times 6 = \frac{18}{4} = 4\frac{2}{4} = 4\frac{1}{2}$

Multiply fractions by proper fractions:

$\frac{2}{7} \times \frac{3}{5} = \frac{6}{35}$

Dividing Fractions

¾ ÷ 2

Put the whole number over 1

$\frac{¾}{2}$

Keep it, change it, flip it.

¾ x ½

Multiply out

¾ x ½ = 3/8