

# **Kenningtons Primary Academy**

## **Calculation Policy**



**Addition**

**Year 1 - 6**

## Year 1 Addition

Adding one-digit and two-digit numbers to 20, including zero.

### + = signs and missing numbers

Children need to understand the concept of equality before using the '=' sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as 'the answer'.

$$2 = 1 + 1$$

$$2 + 3 = 4 + 1$$

Missing numbers need to be placed in all possible places:

$$3 + 4 = ?$$

$$? = 3 + 4$$

$$3 + ? = 7$$

$$7 = ? + 4$$

### Counting and combining sets of objects

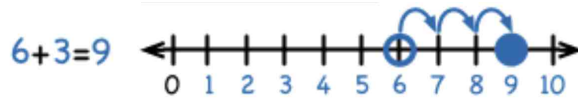
Combining two sets of objects which will progress on to adding on to a set.



Use cubes to add two numbers together as a group or in a bar. Then recount all using one-to-one correspondence.

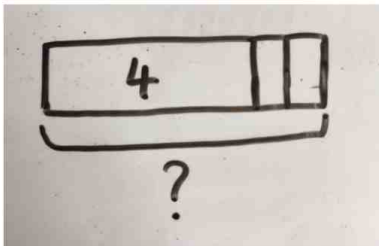


Understanding of counting on with a number line (supported by models and images)



### Extension:

A bar model which encourages the children to count on, rather than count all.



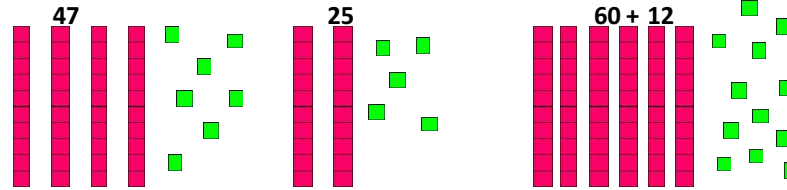
## Year 2 Addition

Adding a 2-digit number and ones, a 2-digit number and tens, two 2-digit numbers and adding three one-digit numbers.

### Working towards a written method: (2d add 2d)

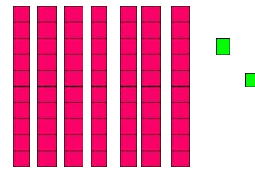
Partitioning in different ways and recombine

$$47 + 25 =$$



Leading to exchanging:

$$72$$



### Formal written method:

$$56 + 25 = ?$$

$$\begin{array}{r} 56 \\ + 25 \\ \hline 11 \quad (6 + 5) \\ 70 \quad (50 + 20) \\ \hline 81 \end{array}$$

The same methods to be used when adding with **money** as amounts are less than £1.

### Moving on to exchanging:

$$\begin{array}{r} 56 \\ + 25 \\ \hline 81 \\ \diagdown \end{array}$$

## Year 3 Addition

Adding numbers with up to three digits, using formal written methods of columnar addition.

### Formal column method: (progressing to 3-digit numbers)

$$\begin{array}{r} 56 \\ + 25 \\ \hline 81 \\ \diagdown \end{array}$$

$$\begin{array}{r} 529 \\ + 346 \\ \hline 875 \\ \diagdown \end{array}$$

$$\begin{array}{r} 639 \\ + 282 \\ \hline 921 \\ \diagdown \end{array}$$

### Adding with money

(NC: They record £ and p separately. The decimal recording of money is introduced formally in year 4.)

$$£3.27 + £2.94$$

### A. Record £ and p separately:

$$£3 + £2 = £5$$

$$\begin{array}{r} 27 \\ + 94 \\ \hline 121 \\ \diagdown \end{array}$$

$$121\text{p} = £1 \text{ and } 21\text{p}$$

$$£5 + £1 \text{ and } 21\text{p} = £6 \text{ and } 21\text{p}$$

### B. Convert to pennies:

$$\begin{array}{r} 327 \\ + 294 \\ \hline 621 \\ \diagdown \end{array}$$

$$621\text{p} = £6 \text{ and } 21\text{p}$$

## Year 4 Addition

Adding numbers with up to 4 digits using the formal written method of columnar addition where appropriate.

### Formal column method: (progressing to 4-digit numbers)

$$\begin{array}{r} 6327 \\ +3294 \\ \hline 9621 \\ \cancel{\phantom{0000}} \end{array}$$

$$\begin{array}{r} 3965 \\ +8861 \\ \hline 12826 \\ \cancel{\phantom{0000}} \end{array}$$

### Formally introduce addition with decimals in the context of money and measures:

$$£53.97 + £20.76 = ?$$

$$\begin{array}{r} £53.97 \\ +£20.76 \\ \hline £74.73 \\ \cancel{\phantom{0000}} \end{array}$$

$$738.9 \text{ km} + 376.5 \text{ km}$$

$$\begin{array}{r} 738.9 \\ +376.5 \\ \hline 1115.4 = 1115.4 \text{ km} \\ \cancel{\phantom{0000}} \end{array}$$

## Year 5 Addition

Adding whole numbers with more than 4 digits using formal methods.

### Formal column method: (progressing to more than 4-digit numbers)

$$\begin{array}{r} 63975 \\ +30844 \\ \hline 94819 \\ \cancel{\phantom{0000}} \end{array}$$

This method should also be used when adding numbers with **different amounts of digits**:

$$34625 + 109 + 1068 = ?$$

$$\begin{array}{r} 34625 \\ 109 \\ +1068 \\ \hline 35802 \\ \cancel{\phantom{0000}} \end{array}$$

### Formally column method is used when adding money and measures:

(See year 4 addition.)

Moving on to adding money is expressed in £ and pence.

$$£15.45 + £3.23 + 39\text{p} = ?$$

$$\begin{array}{r} £15.45 \\ £3.23 \\ +£0.39 \\ \hline £19.07 \\ \cancel{\phantom{0000}} \end{array}$$

To convert pence to pounds and use the 0 as place holder.

Moving on to adding decimals with different number of digits, e.g.

$$4.5 + 16.72 + 237.4 = ?$$

$$\begin{array}{r} 4.50 \\ 16.72 \\ +237.40 \\ \hline 258.62 \\ \cancel{\phantom{0000}} \end{array}$$

To line numbers up in place value and use the 0 as place holder.

## Year 6 Addition

The National Curriculum does not directly refer to addition in year 6 – only in regards to solving multi-step problems in context. Therefore, the children should be secure in using the formal column method when entering year 6.

(See methods used in year 5.)

Please note that all calculations can include numbers up to 10 000 000.

Calculations can also include:

$$\begin{array}{r} 44\phantom{00}5 \\ +\phantom{00}6\phantom{00} \\ \hline 4690 \end{array}$$

**Subtraction**

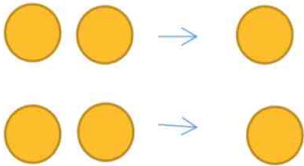
**Year 1 - 6**

## Year 1 Subtraction

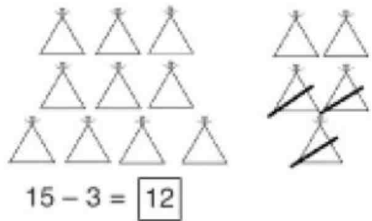
Subtract one-digit and two-digit numbers to 20, including zero.

Use practical objects, counters, cubes etc to show how objects can be taken away.

$$6 - 2 = 4$$

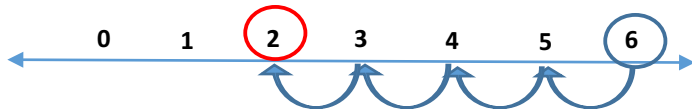


Cross out drawn objects to show what has been taken away.



Use a number line to count backwards:

$$6 - 4 = ?$$



## Year 2 Subtraction

Subtracting a 2-digit number and ones, a 2-digit number and tens, two 2-digit numbers and subtracting three one-digit numbers.

Solve problems with subtraction:

- using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- applying increasing knowledge of mental and written methods

Start with subtraction with partitioning:

$$38 - 29 = ?$$

$$38 - 20 = 18$$

$$18 - 9 = 9$$

Moving on to formal column method:

$$46 - 25 = ?$$

$$\begin{array}{r} 46 \\ - 25 \\ \hline 21 \end{array}$$

$$58 - 39 = ?$$

$$\begin{array}{r} 4\overset{1}{5}8 \\ - 39 \\ \hline 19 \end{array}$$

## Year 3 Subtraction

Subtract numbers with up to three digits, using formal written methods of columnar subtraction.

Formal column method: (progressing to 3-digit numbers)

$$646 - 25 = ?$$

$$\begin{array}{r} 646 \\ - 25 \\ \hline 621 \end{array}$$

$$529 - 346 = ?$$

$$\begin{array}{r} 4\overset{1}{5}29 \\ - 346 \\ \hline 183 \end{array}$$

$$852 - 289 = ?$$

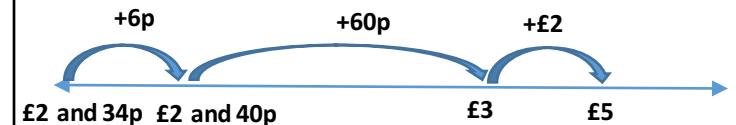
$$\begin{array}{r} 7\overset{14}{8}52 \\ - 289 \\ \hline 563 \end{array}$$

Subtracting with money

(NC: They record £ and p separately. The decimal recording of money is introduced formally in year 4.)

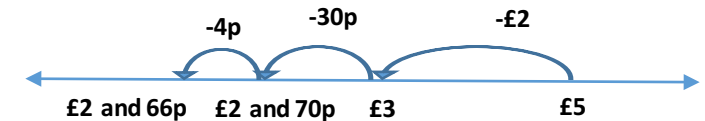
$$£5 - £2.34 = ? \text{ (working out the change)}$$

A. Adding on using a number line:



$$6p + 60p + £2 = £2 \text{ and } 66p \text{ change}$$

B. Taking away using a number line:



## Year 4 Subtraction

Subtract numbers with up to 4 digits using the formal written methods of columnar subtraction where appropriate.

$$5975 - 4894 = ?$$

$$\begin{array}{r} 8 \\ 5 \cancel{9} 7 5 \\ - 4 8 9 4 \\ \hline 1 0 8 1 \end{array}$$

$$2002 - 1236 = ?$$

$$\begin{array}{r} 1 \ 9 \ 9 \\ 2 \ 0 \ 0 \ 2 \\ - 1 2 3 6 \\ \hline 7 6 6 \end{array}$$

## Year 5 Subtraction

Subtract whole numbers with more than 4 digits, including using formal written methods (columnar subtraction).

$$\begin{array}{r} 5 \quad 8 \\ 6 \ 3 \ 9 \ 7 5 \\ - 3 4 8 9 4 \\ \hline 2 9 0 8 1 \end{array}$$

This method should also be used when subtracting numbers with **different amounts of digits**:

$$34\ 625 - 709 = ?$$

$$\begin{array}{r} 3 \ 1 \ 1 \\ 3 \ 4 \ 6 \ 2 5 \\ - 7 0 9 \\ \hline 3 3 9 1 6 \end{array}$$

Formally column method is used when subtracting money and measures:

(See year 4 subtraction.)

Moving on to subtracting money where £ and p are used:

$$£15.45 - 97p = ?$$

$$\begin{array}{r} 4 \ 131 \\ £ 1 5 . 4 5 \\ - £ 0 . 9 7 \\ \hline £ 1 4 . 4 8 \end{array}$$

To convert pence to pounds and use the 0 as place holder.

Moving on to subtracting decimals with different number of digits, e.g.

$$3.4 - 1.97 = ?$$

$$\begin{array}{r} 2 \ 131 \\ 3 . 4 0 \\ - 1 . 9 7 \\ \hline 1 . 4 3 \end{array}$$

Use the 0 as place holder.

## Year 6 Subtraction

The National Curriculum does not directly refer to subtraction in year 6 – only in regards to solving multi-step problems in context. Therefore, the children should be secure in using the formal column method when entering year 6.

(See methods used in year 5.)

Please note that all calculations can include numbers up to 10 000 000.

Calculations can also include:

$$\begin{array}{r} 4 \ 7 \ \square \ 2 \ \square \ 1 \\ - \ \square \ 6 \ \square \ 8 \ \square \\ \hline 3 \ 9 \ 0 \ 0 \ 4 \ 1 \end{array}$$

**Multiplication**

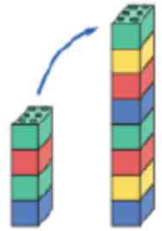
**Year 1 - 6**



## Year 1 Multiplication

Solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Use practical activities to show how to double a number.



double 4 is 8  
 $4 \times 2 = 8$

It is not expected from year 1 children to use the 'x' symbol. Instead, we use the language of 'lots of' or 'groups of'.

Draw pictures to show how to double a number.

Double 4 is 8



**What is 3 groups of 4?**

Draw circles to represent 3 groups. Draw 4 dots in each circle. Count the number of dots.

3 groups of 4 = 12

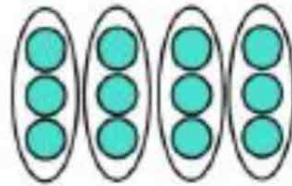


## Year 2 Multiplication

Recall and use multiplication facts for the 2, 5 and 10 multiplication tables.

Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (x) and equals (=) signs.

Show that multiplication of two numbers can be done in any order (commutative).



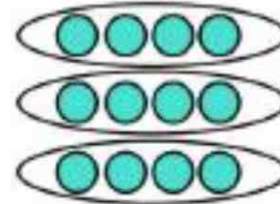
$$12 = 3 \times 4$$



$$2 \times 4 = 8$$

$$2 \times 4 = 8$$

$$4 \times 2 = 8$$

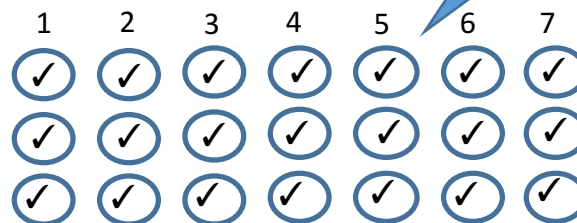


$$12 = 4 \times 3$$

Calculate:

$$7 \times 3 = ?$$

(Refer to 7 lots of 3 OR 3 lots of 7)



$$= 21$$

Draw the 3 lots of 7 or 7 lots of 3. Then count all the circles.

## Year 3 Multiplication

Recall and use multiplication facts for the 3, 4 and 8 multiplication tables.

$$6 \times 4 = 24$$

$$60 \times 4 = 240$$

$$6 \times 40 = 240$$

Write and calculate mathematical statements for multiplication using the multiplication tables that I know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.

$$87 \times 5 = ?$$

$$\begin{array}{r} 87 \\ \times \quad 5 \\ \hline 35 \quad (7 \times 5) \\ 400 \quad (80 \times 5) \\ \hline 435 \end{array}$$

Progressing to short multiplication:

$$\begin{array}{r} 87 \\ \times \quad 5 \\ \hline 435 \end{array}$$

## Year 4 Multiplication

Multiply two-digit numbers by a one-digit number using formal written layout.

$87 \times 5 = ?$

$$\begin{array}{r} 87 \\ \times 5 \\ \hline 435 \end{array}$$

Multiply three-digit numbers by a one-digit number using formal written layout.

Starting with expanded method:

$342 \times 6 = ?$

$$\begin{array}{r} 342 \\ \times 6 \\ \hline 12 \quad (6 \times 2) \\ 240 \quad (6 \times 40) \\ \underline{1800} \quad (6 \times 300) \\ 2052 \end{array}$$

Moving on to short multiplication method:

$$\begin{array}{r} 342 \\ \times 6 \\ \hline 2052 \end{array}$$

## Year 5 Multiplication

Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers.

$837 \times 5 = ?$

$$\begin{array}{r} 837 \\ \times 5 \\ \hline 4185 \end{array}$$

$2837 \times 35 = ?$

$$\begin{array}{r} 2837 \\ \times 35 \\ \hline 14185 \\ \underline{85110} \\ 99295 \end{array}$$

Write the 0 as place holder when multiplying with the tens.

## Year 6 Multiplication

Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.

$2837 \times 35 = ?$

$$\begin{array}{r} 2837 \\ \times 35 \\ \hline 14185 \\ \underline{85110} \\ 99295 \end{array}$$

Write the 0 as place holder when multiplying with the tens.

Multiply one-digit numbers with up to two decimal places by whole numbers.

$34.72 \times 24 = ?$

$$\begin{array}{r} 34.72 \\ \times 24 \\ \hline 13888 \\ \underline{69440} \\ 833.28 \end{array}$$

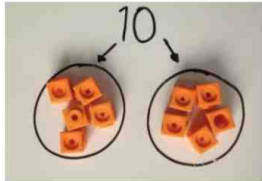
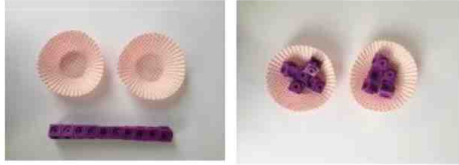
Write the 0 as place holder when multiplying with the tens.

**Division**  
**Year 1 - 6**

## Year 1 Division

Solve one-step problems involving division by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

### Concrete



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

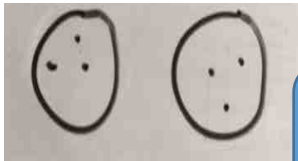
Children must be able to count in multiples of 2's, 5's and 10s to support grouping.

### Pictorial

Share 8 flowers between 2 people  
OR  $\frac{1}{2}$  of 8.



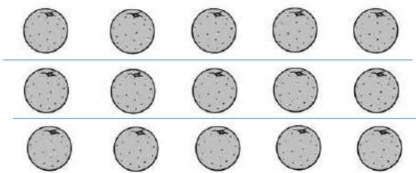
Share 6 pencils between 2 people.  
OR  $\frac{1}{2}$  of 6.



Children should be able to find  $\frac{1}{2}$  and  $\frac{1}{4}$  of objects or quantities.

### Arrays

Draw an array and use lines to split the array into groups to make multiplication and division sentences.



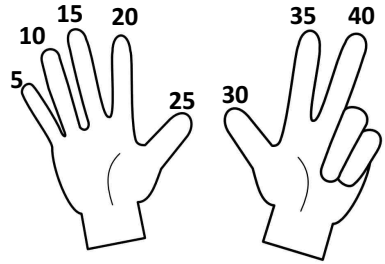
There are 3 groups of 5.  
There are 5 groups of 3.

## Year 2 Division

Recall and use the multiplication and division facts for the 2, 5 and 10 multiplication tables.

Calculate mathematical statements for multiplication and division with in the multiplication tables and write them using the (x), ( $\div$ ) and (=) signs.

### Using fingers to count in multiples when $\div 2$ , $\div 5$ and $\div 10$



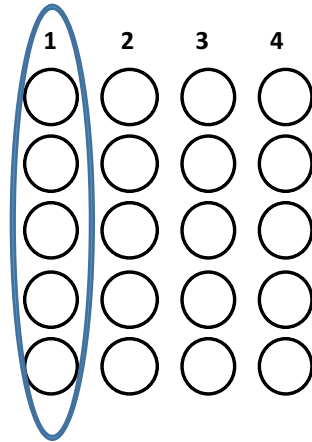
$$40 \div 5 = ?$$

(How many groups of 5 are there in 40?)

$$40 \div 5 = 8$$

Solving problems involving division using materials, **arrays**, repeated addition, mental methods and multiplication and division facts.

$$20 \div 4 = ? \text{ OR } \frac{1}{4} \text{ of } 20 =$$



$$20 \div 4 = 5 \text{ OR } \frac{1}{4} \text{ of } 20 = 5$$

## Year 3 Division

Recall and use the multiplication and division facts for the 3, 4 and 8 multiplication tables.

Solving problems, including missing number problems.

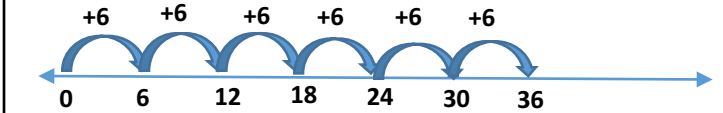
$$? \div 3 = 7$$

$$4 = 16 \div ?$$

$$? \div 8 = 11$$

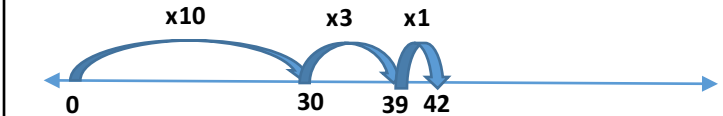
### Grouping

$$36 \div 6 = ? \text{ (How many 6's are there in 36?) } \quad 36 \div 6 = 6$$



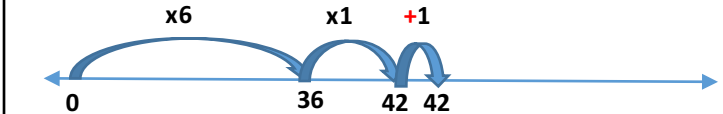
### Becoming more efficient using a numberline

$$42 \div 3 = ? \text{ (How many 3's are there in 42?) } \quad 42 \div 3 = 14$$



### Remainders

$$43 \div 6 = ? \text{ (How many 6's are there in 43?) } \quad 43 \div 6 = 7 \text{ r } 1$$



## Year 4 Division

Recall all the division facts for multiplication tables up to 12 x 12.

To divide numbers with up to 4-digit numbers by 1-digit numbers using the expanded method for division:

$728 \div 5 = ?$

$$\begin{array}{r}
 145 \text{ r } 3 \\
 \leftarrow \\
 5 \overline{) 728} \\
 \underline{- 500} \quad (5 \times 100) \\
 228 \\
 \underline{- 200} \quad (5 \times 40) \\
 28 \\
 \underline{- 25} \quad (5 \times 5) \\
 3
 \end{array}$$

## Year 5 Division

Quick recall all the division facts for multiplication tables up to 12 x 12.

Divide numbers mentally drawing upon known facts, e.g.

$400 \div 8 = 50 \quad (40 \div 8 = 5)$

$360 \div 6 = 60 \quad (36 \div 6 = 6)$

Divide numbers up to 4-digits by a 1-digit number using short division.

Begin with divisions that divide equally.

$$\begin{array}{r}
 218 \\
 3 \overline{) 654} \\
 \underline{6} \phantom{00} \\
 0 \phantom{00} \\
 \underline{0} \phantom{0} \\
 0
 \end{array}$$

Move onto divisions with a remainder.

$$\begin{array}{r}
 86 \text{ r } 2 \\
 3 \overline{) 258} \\
 \underline{24} \phantom{0} \\
 18 \\
 \underline{15} \\
 3
 \end{array}$$

## Year 6 Division

Divide numbers up to 4 digits by a two-digit whole number using the formal written method of **long division**, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.

432 ÷ 15 becomes

$$\begin{array}{r}
 28.8 \\
 15 \overline{) 432.0} \\
 \underline{30} \phantom{0} \\
 132 \\
 \underline{15} \phantom{0} \\
 120 \\
 \underline{120} \\
 0
 \end{array}$$

432 ÷ 15 becomes

$$\begin{array}{r}
 28 \\
 15 \overline{) 432} \\
 \underline{30} \phantom{0} \\
 132 \\
 \underline{15} \phantom{0} \\
 120 \\
 \underline{120} \\
 0
 \end{array}$$

$\frac{12}{15} = \frac{4}{5}$

Divide numbers up to 4 digits by a two-digit number using the formal written method of **short division** where appropriate, interpreting remainders according to the context.

432 ÷ 5 becomes

$$\begin{array}{r}
 86 \text{ r } 2 \\
 5 \overline{) 432} \\
 \underline{40} \phantom{0} \\
 32 \\
 \underline{30} \\
 2
 \end{array}$$

Answer: 86 remainder 2

$£432 \div 5 = £86.40$

$$\begin{array}{r}
 86.4 \\
 5 \overline{) 432.0} \\
 \underline{40} \phantom{0} \\
 32 \\
 \underline{30} \\
 20 \\
 \underline{20} \\
 0
 \end{array}$$

496 ÷ 11 becomes

$$\begin{array}{r}
 45 \text{ r } 1 \\
 11 \overline{) 496} \\
 \underline{44} \phantom{0} \\
 56 \\
 \underline{55} \\
 1
 \end{array}$$

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

$728 \div 6 = 121.33$

$$\begin{array}{r}
 121.33 \\
 6 \overline{) 728.00} \\
 \underline{6} \phantom{00} \\
 12 \phantom{00} \\
 \underline{12} \phantom{00} \\
 80 \\
 \underline{78} \\
 20 \\
 \underline{18} \\
 20 \\
 \underline{18} \\
 20
 \end{array}$$

Use written division methods in cases where the answer has up to two decimal places.