

# ADDITION Year 3

## Statutory requirements

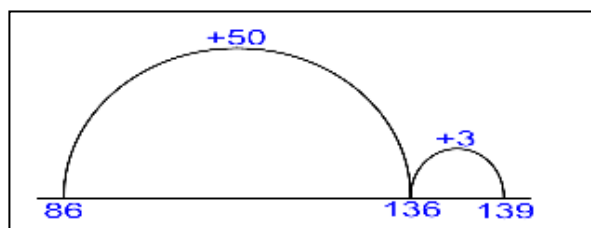
Pupils should be taught to:

- add and subtract numbers mentally, including:
  - a three-digit number and ones
  - a three-digit number and tens
  - a three-digit number and hundreds
- add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction
- estimate the answer to a calculation and use inverse operations to check answers
- solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

## Vocabulary

add addition  
more plus increase sum  
total altogether  
score  
double near double  
how many more to make...?  
how much more/less is...?  
equals sign  
is the same as  
tens boundary  
hundreds boundary  
units boundary

## Mental/jottings



- Use of partitioning to add digits.

## Representations

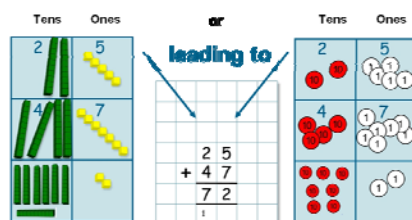


Place value arrow cards

Gattegno Chart

1000	2000	3000	4000	5000	6000	7000	8000	9000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9

Gattegno Chart



After time they will see that if they add ones first it will be more efficient.

What is the same and what is different about these models?

Diennes and place value counters to support the move to column method

## Formal Written

$$\begin{array}{r} 366 \\ + 458 \\ \hline 14 \\ 110 \\ 700 \\ \hline 824 \end{array}$$

$$\begin{array}{r} 366 \\ + 458 \\ \hline 824 \\ \hline 11 \end{array}$$

Use of expanded method to support move to compacted method of addition.

## Subtraction Year 3

### Statutory requirements

Pupils should be taught to:

- subtract numbers mentally, including:
  - a three-digit number and ones
  - a three-digit number and tens
  - a three-digit number and hundreds
- subtract numbers with up to three digits, using formal written methods of columnar subtraction
- estimate the answer to a calculation and use inverse operations to check answers
- solve problems, including missing number problems, using number facts, place value, and more complex subtraction.
- add and subtract fractions with the same denominator within one whole
- find 10 or 100 more or less than a give number

### Representations

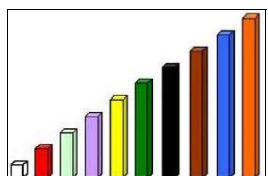
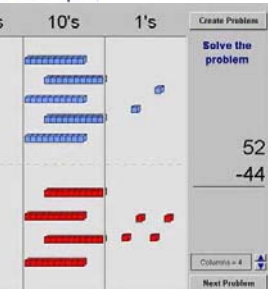
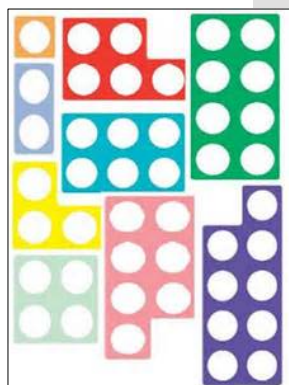
Place value cards.

Numicon

Diennes equipment

Cuisenaire

Use of number lines.



$$\frac{7}{9} - \frac{4}{9} = \frac{3}{9} = \frac{1}{3}$$

$$167 + 30 = 200 \quad 200 - 167 = 33$$

### Vocabulary

-, subtract, subtraction, take (away), minus  
 leave, how many are left/left over?  
 one less, two less... ten less... one hundred less  
 how many fewer is... than...?  
 how much less is...?  
 difference between  
 half, halve  
 =, equals, sign, is the same as  
 tens boundary, hundreds boundary

### MENTAL / Jottings

#### Taking away

Use place value to subtract, e.g.  $348 - 300$  or  $348 - 40$  or  $348 - 8$

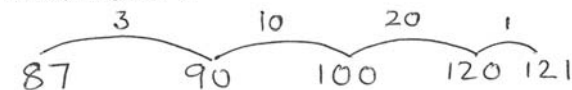
Taking away multiples of 10, 100 and £1, e.g.  $476 - 40 = 436$ ,  $476 - 300 = 176$ ,  $£4.76 - £2 = £2.76$

Partitioning, e.g.  $68 - 42$  as  $60 - 40$  and  $8 - 2$  or  $£6.84 - £2.40$  as  $£6 - £2$  and  $80p - 40p$

Count back in hundreds, tens then ones, e.g.  $763 - 121$  as  $763 - 100$  (663) then subtract 20 (743) then subtract 1 (742)

Subtract near multiples, e.g.  $648 - 199$  or  $86 - 39$

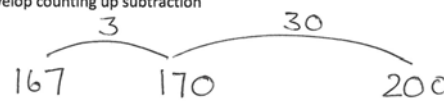
Find a difference between two numbers by counting up from the smaller to the larger, e.g.  $121 - 87$



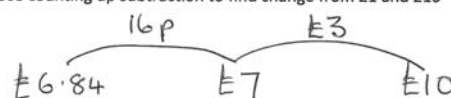
#### Using number facts

Number bonds to 100, e.g.  $100 - 35 = 65$ ,  $100 - 48 = 52$ , etc.

Develop counting up subtraction



Use counting up subtraction to find change from £1 and £10



Recognise complements of any fraction to 1, e.g.  $1 - \frac{1}{4} = \frac{3}{4}$  or  $1 - \frac{2}{3} = \frac{1}{3}$

### Formal Written Methods.

Children could use number line jottings as a written method, but must be working towards the formal column method involving exchange. Children first work with expanded methods possibly 2 digits and formal methods without exchange before moving onto formal methods involving exchange in a 3 digit questions — end of year 3

$$\begin{array}{r} 42 = 30 + 12 \\ - 26 = 20 + 6 \\ \hline 10 + 6 = 16 \end{array}$$

$$\begin{array}{r} 254 \\ - 172 \\ \hline 82 \end{array}$$

ex- 874 - 523 becomes 932 - 457 becomes expectation.

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

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

## MULTIPLICATION: YEAR 3

### Statutory requirements

Pupils should be taught to:

- count from 0 in multiples of 4, 8, 50 and 100
- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
- solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which  $n$  objects are connected to  $m$  objects.

### Representations

Missing number— $224 \div ? = 56$

Arrays



Using squared paper



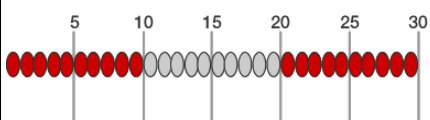
Squared paper for:

$$19 \times 6 = 104$$

$$10 \times 6 = 60$$

$$9 \times 6 = 54$$

Repeated addition



### Vocabulary

lots of, groups of  
, times, multiply, multiplication, multiplied by  
multiple of, product  
once, twice, three times... ten times...  
times as (big, long, wide... and so on)  
repeated addition  
array  
row, column  
double, halve  
share, share equally

### Mental/jottings

Partitioning

$$45 \times 7 = 315$$

$$40 \times 7 = 280$$

$$5 \times 7 = 35$$

Grid Method

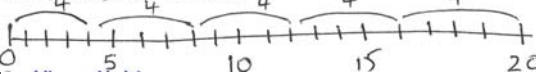
$\times$	20	3
4	80	12

= 92

Clever Counting

Counting in steps ('Clever' counting)

Count in 2s, 3s, 4s, 5s, 8s and 10s, e.g. colour the multiples on a 1-100 grid or use hops along a landmarked line



### Formal Written

Columnar method—expanded

$$56$$

$$\times 4$$

$$24$$

$$200$$

$$224$$

## Division Year 3

### Statutory requirements

- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
- solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which  $n$  objects are connected to  $m$  objects.

### Representations

Pupils solve simple problems in contexts, deciding which of the four operations to use and why. These include measuring and scaling contexts, (for example, four times as high, eight times as long etc.) and correspondence problems in which  $m$  objects are connected to  $n$  objects (for example, 3 hats and 4 coats, how many different outfits?; 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children).

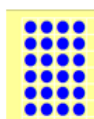
#### Use known facts to derive unknown facts

$$4 \times 6 = 24$$

$$6 \times 4 = 24$$

$$24 \div 4 = 6$$

$$24 \div 6 = 4$$



Use arrays in context to support imagery - wrapping paper, bun tins, ice cube trays, cakes in boxes etc...

Understand division as **grouping**:

We have £12. Tickets cost £4. We can buy 3 tickets.



Solved by putting the coins into groups of 4.

Understand remainders including money and measures- I have £14 to buy presents for 4 people. I want to spend an equal amount on each- how much can I spend?

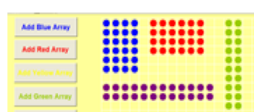
How much is left over?

What could we do with £2



Array Creator Spreadsheet

Fractions ITP



Measuring Cylinder ITP showing  $\frac{1}{4}$  of 12 litres

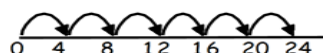
### Vocabulary

array row, column double, halve  
share, share equally one each, two each, three each...group in pairs, threes... tens  
equal groups of  $\div$ , divide, division, divided by, divided into left, left over, remainder

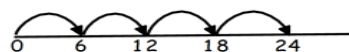
### Mental / Jottings

Pupils develop efficient mental methods multiplication and division facts (for example, using  $3 \times 2 = 6$ ,  $6 \div 3 = 2$  and  $2 = 6 \div 3$ ) to derive related facts (for example,  $30 \times 2 = 60$ ,  $60 \div 3 = 20$  and  $20 = 60 \div 3$ ).

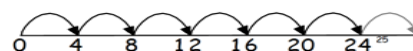
$$24 \div 4 = 6$$



$$24 \div 6 = 4$$



Round up or down depending on the context:



Round up

We have got £25. Tickets cost £4.

$$4 \times 6 = 24$$

We can buy 6 tickets we have not got enough money for 7.

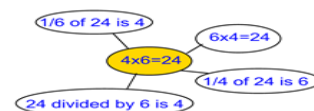
Round down

25 children are going camping. Each tent sleeps 4 children.

$$4 \times 6 = 24$$

We will need 7 tents.

Children may record their understanding of division as the inverse of multiplication in a variety of ways



### Formal Written Methods

Pupils develop reliable written methods for multiplication and division, starting with calculations of two-digit numbers by one-digit numbers and **progressing** to the formal written methods of short multiplication and division.

#### Short division

$98 \div 7$  becomes

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

Answer: 14

$432 \div 5$  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

NB: This example should be applied to the relevant Y3 tables expectations.

**It is expected that 'chunking' will be taught as a method for understanding before the short method is taught. Discuss with maths coordinator for clarification.**

# ADDITION Year 4

## Statutory requirements

Pupils should be taught to:

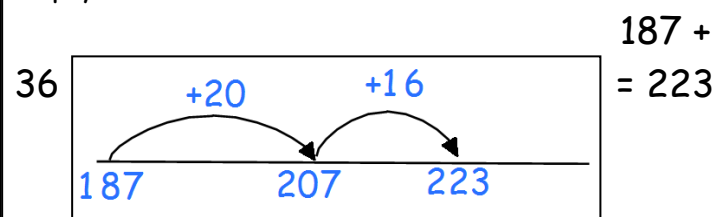
- add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
- estimate and use inverse operations to check answers to a calculation
- solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.
- solve simple measure and money problems involving fractions and decimals to two decimal places

## Vocabulary

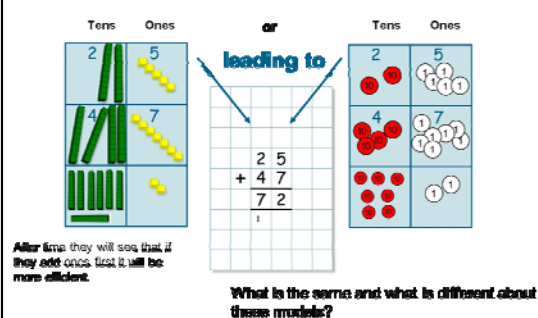
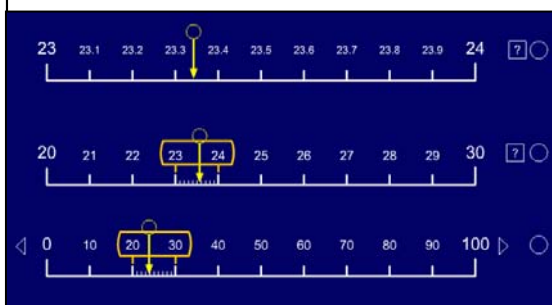
add addition  
more plus increase sum  
total altogether  
score  
double near double  
how many more to make...?  
how much more/less is...?  
equals sign  
is the same as  
tens boundary  
hundreds boundary  
units boundary

## Mental/jottings

Empty number lines



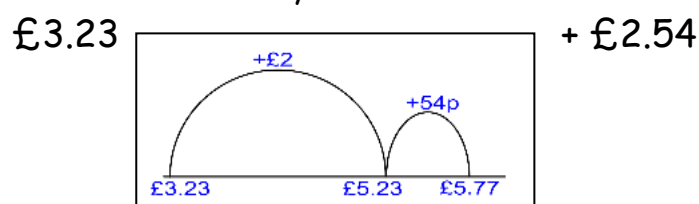
## Representations



Decimal number line ITP



Money and decimals



## Formal Written

$$\begin{array}{r} 366 \\ + 458 \\ \hline 824 \\ \hline 11 \end{array}$$

$$\begin{array}{r} + \quad \pounds 38.76 \\ \pounds 12.15 \\ \hline \pounds 40.91 \\ \hline 1 \quad 1 \end{array}$$



## Statutory requirements

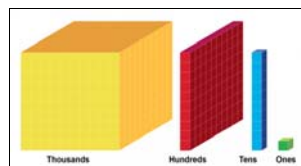
Pupils should be taught to:

- recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones)
- add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
- estimate and use inverse operations to check answers to a calculation
- solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.
- find 1000 more or less than a given number
- count backwards through zero to include negative numbers
- subtract fractions with the same denominator

## Representations



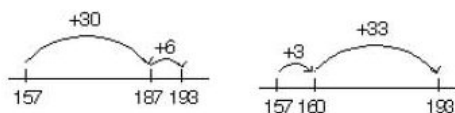
Place value cards



Dienes equipment.



Numicon– to reinforce concept of difference



$$193 - 157 = 36$$

Empty number line to solve subtraction counting on as in above example but also counting back. Children to be flexible in choosing most efficient methods depending on size of numbers and question.

## Vocabulary

### ADDITION AND SUBTRACTION

subtract, subtraction, take (away), minus, decrease  
leave, how many are left/left over?  
difference between  
half, halve  
how many fewer is... than...?  
how much less is...?  
equals, sign, is the same as  
tens boundary, hundreds boundary

## Mental / jottings

### Taking away

Use place value to subtract, e.g.  $4748 - 4000$  or  $4748 - 8$ , etc.  
Take away multiples of 10, 100, 1000, £1, 10p or 0.1, e.g.  $8392 - 50$  or  $6723 - 3000$  or  $£3.74 - 30p$  or  $5.6 - 0.2$   
Partitioning, e.g.  $£5.87 - £3.04$  as  $£5 - £3$  and  $7p - 4p$  or  $7493 - 2020$  as  $7000 - 2000$  and  $90 - 20$   
Count back, e.g.  $6482 - 1301$  as  $6482 - 1000$  then  $- 300$  then  $- 1$  (5181)  
Subtract near multiples, e.g.  $3522 - 1999$  or  $£34.86 - £19.99$

### Counting up

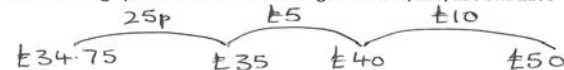
Find a difference between two numbers by counting up from the smaller to the larger, e.g.  $506 - 387$



### Using number facts

Number bonds to 10, 100 and derived facts, e.g.  $100 - 76 = 24$ ,  $1.0 - 0.6 = 0.4$   
Number bonds to £1 and £10, e.g.  $£1.00 - 86p = 14p$  or  $£10 - £3.40 = £6.60$

Use counting up subtraction to find change from £10, £20, £50 and £100



Subtract like fractions, e.g.  $\frac{3}{8} - \frac{1}{8} = \frac{2}{8}$

## Formal Written methods

$$\begin{array}{r} 89^13 \\ 904^10 \\ - 8161 \\ \hline 879 \end{array}$$

Children can still use number line jottings as a written method but must lead towards formal column methods

$$\begin{array}{r} £75.28 \\ - £16.32 \\ \hline £ \quad . \end{array}$$

Develop expanded methods from Y3 to lead into this

## MULTIPLICATION: YEAR 4

### Statutory requirements

Pupils should be taught to:

- count in multiples of 6, 7, 9, 25 and 1000
- Pupils should be taught to: recall multiplication and division facts for multiplication tables up to  $12 \times 12$
- use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers
- recognise and use factor pairs and commutativity in mental calculations
- multiply two-digit and three-digit numbers by a one-digit number using formal written layout
- solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

### Vocabulary

lots of, groups of  
times, multiply, multiplication, multiplied by  
multiple of, product  
once, twice, three times... ten times...  
times as (big, long, wide... and so on)  
repeated addition  
array  
row, column  
double, halve

### What pupils record– mental

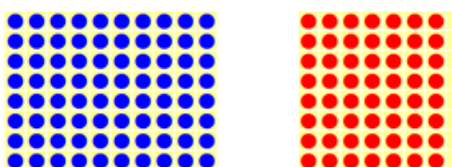
Pupils practise mental methods and extend this to three-digit numbers to derive facts, (for example  $600 \div 3 = 200$  can be derived from  $2 \times 3 = 6$ ).

#### Deriving facts from known facts

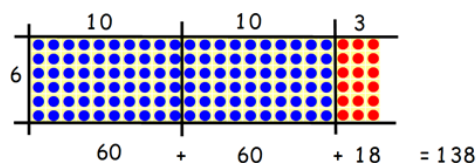
$$\begin{aligned} 6 \times 8 &= 48 \\ 6 \times 80 &= 480 \\ 6 \times 800 &= 4800 \end{aligned}$$

$$\begin{array}{r} x \quad 300 \quad 40 \quad 6 \\ 6 \overline{) 1800 \quad 240 \quad 36} \quad 2076 \end{array}$$

### Representations

$$17 \times 8 = 10 \times 8 + 7 \times 8$$


Use known number facts:  
 $6 \times 23 = 6 \times 20 + 6 \times 3$



$$\begin{array}{r} 10 \quad 10 \quad 3 \\ 6 \overline{) 60 \quad 60 \quad 18} \quad 138 \end{array}$$

### What pupils record– written

multiply two-digit and three-digit numbers by a one-digit number using formal written layout

$$\begin{array}{r} 3 \quad 4 \quad 6 \\ x \quad 6 \\ \hline 18 \quad 24 \quad 36 \\ \hline 2076 \end{array}$$

Expanded method leading to more compact method

$$\begin{array}{r} 3 \quad 4 \quad 6 \\ x \quad 6 \\ \hline 18 \quad 24 \quad 36 \\ \hline 2076 \end{array}$$

## Division Year 4

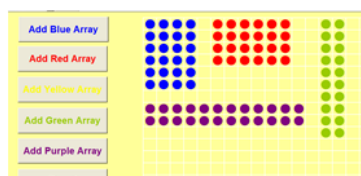
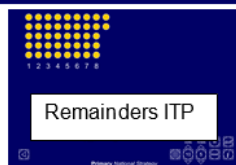
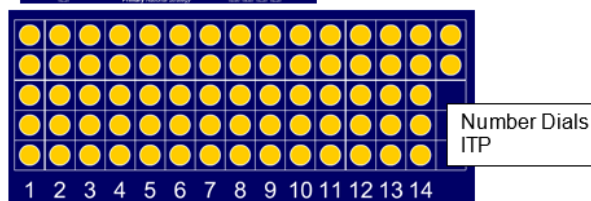
### Statutory requirements

- Recall multiplication and division facts for multiplication tables up to  $12 \times 12$
- Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers
- Recognise and use factor pairs and commutativity in mental calculations

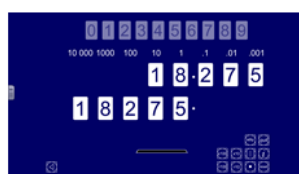
### Representations



$72 \div 5 = 14$  groups of 5 and 2 remaining



Model the connections between division and fractions



Array Creator Spreadsheet

### Vocabulary

Array row, column double, halve  
share, share equally  
one each, two each, three each...  
group in pairs, threes... tens  
equal groups of divide, division, divided by, divided into remainder  
factor, quotient, divisible by  
inverse

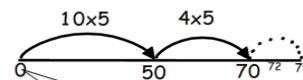
### Mental / Jottings

Pupils continue to practise recalling and using multiplication tables and related division facts to aid fluency.

Pupils practise mental methods and extend this to three-digit numbers to derive facts, (for example  $600 \div 3 = 200$  can be derived from  $2 \times 3 = 6$ ).

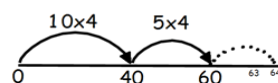
Division with remainders

$$72 \div 5 = 14 \text{ r } 2$$



The answer is 14r2, because I can make 14 whole jumps of 5 and I have 2 left over.

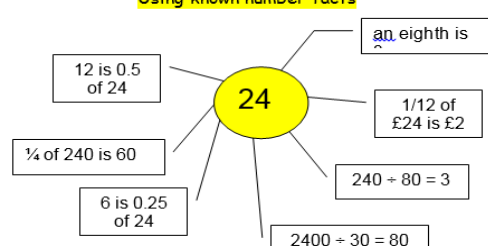
63 children are going camping. Each tent sleeps 4 children. How many tents are needed?



Number Dials ITP

The answer is 16 tents. 15 tents would have 4 children in each and the last tent would have 3 children in it.

Using known number facts



### Formal Written Methods

Pupils practise to become fluent in the formal written method of short multiplication and short division with exact answers.

$98 \div 7$  becomes

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

Answer: 14

$432 \div 5$  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

$496 \div 11$  becomes

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

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