# Calculation Guidelines for Gifted and Talented Children Working Beyond Primary Level

## MULTIPLICATION

**Mental methods**

**Use partitioning**

Partition either part of the product e.g. 7.3 x 11 = (7.3 x 10) + 7.3 = 80.3

*OR*
Use the grid method of multiplication (as below).

*Pencil and paper procedures (Written methods)*
Use written methods to support, record or explain multiplication of:

- a three-digit number by a two-digit number
- a decimal with one or two decimal places by a single digit

Grid method
6.24 x 8 is approximately 6 x 8 = 48

| x | 6 | 0.2 | 0.04 |
|---|---|---|---|
| 8 | 48 | 1.6 | 0.32 |

= 49.92

Grid lines can become optional

# MULTIPLICATION GUIDELINES

## Year One

Multiplication is related to doubling and counting groups of the same size.



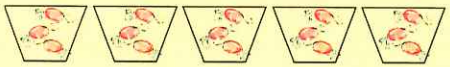
Looking at columns
2 + 2 + 2
3 groups of 2

Looking at rows
3 + 3
2 groups of 3

Counting using a variety of practical resources
Counting in 2s e.g. counting socks, shoes, animal's legs…
Counting in 5s e.g. counting fingers, fingers in gloves, toes…
Counting in 10s e.g. fingers, toes…

**Pictures / marks**

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



## Year Two

**x = signs and missing numbers**

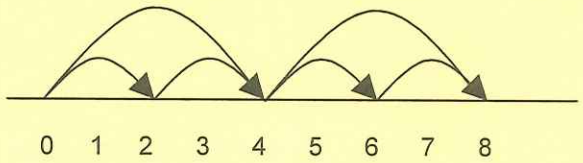
| | |
|---|---|
| 7 x 2 = □ | □ = 2 x 7 |
| 7 x □ = 14 | 14 = □ x 7 |
| □ x 2 = 14 | 14 = 2 x □ |
| □ x ∇ = 14 | 14 = □ x ∇ |

**Arrays and repeated addition**



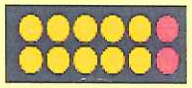
4 x 2 or 4 + 4

2 x 4 or 2 + 2 + 2 + 2




**Doubling multiples of 5 up to 50**
15 x 2 = 30

**Partition**
Children need to be secure with partitioning numbers into 10s and 1s and partitioning in different ways: 6 = 5 + 1 so e.g. Double 6 is the same as double five add double one.



AND double 15
10 + 5
↓ ↓
20 + 10 = 30

OR

| X | 10 | 5 | |
|---|---|---|---|
| 2 | 20 | 10 | = 30 |

## Year Three

**x = signs and missing numbers**
Continue using a range of equations as in Year 2 but with appropriate numbers.

**Arrays and repeated addition**
Continue to understand multiplication as repeated addition and continue to use arrays (as in Year 2).

**Doubling multiples of 5 up to 50**
35 x 2 = 70

Partition

| X | 30 | 5 | |
|---|---|---|---|
| 2 | 60 | 10 | =70 |

Use known facts and place value to carry out simple multiplications

**Use the same method as above (partitioning), e.g.**

**32 x 3 = 96**

| x | 30 | 2 |
|---|---|---|
| 3 | 90 | 6 |

= 96

# MULTIPLICATION GUIDELINES

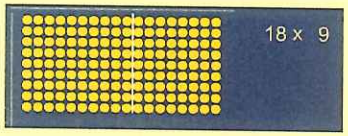
## Year Four

**x = signs and missing numbers**

Continue using a range of equations as in Year 2 but with appropriate numbers

**Partition**

Continue to use arrays:




18 x 9 = 162

18 x 9 = (10 x 9) + (8 x 9) = 162

**OR**

Use the grid method of multiplication (as below)

**Pencil and paper procedures**

Grid method
23 x 7 is approximately 20 x 10 = 200

| x | 20 | 3 | |
|---|---|---|---|
| 7 | 140 | 21 | = 161 |

## Year Five

**Partition**

47 x 6 = 282

47 x 6 = (40 x 6) + (7 x 6) = 282

OR

Use the grid method of multiplication (as below)

**Pencil and paper procedures**

Grid method
72 x 38 is approximately 70 x 40 = 2800

| x | 70 | 2 |
|---|---|---|
| 30 | 2100 | 60 |
| 8 | 560 | 16 |

2100 + 60 = 2160
560 + 16 = 576

2160
560 +
2736

**Expanded Column Multiplication**

Children should describe what they do by referring to the actual values of the digits in the columns. For example, the first step in 38 × 7 is 'thirty multiplied by seven', not 'three times seven', although the relationship 3 × 7 should be stressed.

30 + 8
x 7
56 (8 x 7 = 56)
210 (30 x 7 = 210)
266

38
x 7
56
210
266

## Year Six

**Partition**

87 x 6 = 522

87 x 6 = (80 x 6) + (7 x 6) = 522

**OR**

Use the grid method of multiplication (as below)

**Pencil and paper procedures**

Grid method
372 x 24 is approximately 400 x 20 = 8000

Extend to decimals with up to two decimal places.

**Short Column Multiplication**

The recording is reduced further, with carry digits recorded below the line.

38
x 7
266
5

Children who are already secure with multiplication for TU × U and TU × TU should have little difficulty in using the same method for HTU × TU or applying decimals.

286
x 29
2574 (9 x 286 = 2574)
5720 (20 x 286 = 5720)
8294
1

Calculation Guidelines for Gifted and Talented Children Working Beyond Primary Level

DIVISION

**Pencil and paper procedures (Written methods)**

Use written methods to support, record or explain division of:

- a three-digit number by a two-digit number
- a decimal with one or two decimal places by a single digit.

Refine methods to improve efficiency while maintaining accuracy and understanding.
109.6 ÷ 8 is approximately 110 ÷ 10 = 11.

```
  109.6
- 80      (10 groups of 8)
  29.6
- 24      ( 3 )
   5.6
-  5.6    ( 0.7 )
   0.0
```

Answer: 13.7

**Pencil and paper procedures (Written methods)**

Continue to use the same method as in Year 7 and Year 8. Adjust the dividend and divisor by a common factor before the division so that no further adjustment is needed after the calculation

e.g. 361.6 ÷ 0.8 is equivalent to 3616 ÷ 8

Use the inverse rule to divide fractions, first converting mixed numbers to improper fractions.

Look at one half of a shape.

**How many sixths of the shape can** you see? (six)
So, how many sixths in one half? (three)

So $\frac{1}{2} \div \frac{1}{6} = \frac{1}{2} \times \frac{6}{1}$
$= \frac{6}{2}$
$= 3$

# DIVISION GUIDELINES

## Year One

Sharing
Requires secure counting skills
-see counting and understanding number strand
Develops importance of one-to-one correspondence
See appendix for additional information on x and ÷ and aspects of number

Sharing – 6 sweets are shared between 2 people. How many do they have each?



Practical activities involving sharing, distributing cards when playing a game, putting objects onto plates, into cups, hoops etc.

**Grouping**
Sorting objects into 2s / 3s/ 4s etc
How many pairs of socks are there?



There are 12 crocus bulbs. Plant 3 in each pot. How many pots are there?
Jo has 12 Lego wheels. How many cars can she make?

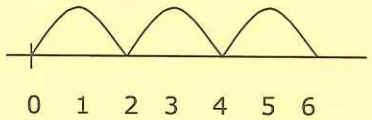
## Year Two

**÷ = signs and missing numbers**

| | |
|---|---|
| 6 ÷ 2 = □ | □ = 6 ÷ 2 |
| 6 ÷ □ = 3 | 3 = 6 ÷ □ |
| □ ÷ 2 = 3 | 3 = □ ÷ 2 |
| □ ÷ ∇ = 3 | 3 = □ ÷ ∇ |

**Grouping**
Link to counting and understanding number strand
Count up to 100 objects by grouping them and counting in tens, fives or twos;…
Find one half, one quarter and three quarters of shapes and sets of objects
6 ÷ 2 can be modelled as:
There are 6 strawberries.
How many people can have 2 each? How many 2s make 6?

6 ÷ 2 can be modelled as:




In the context of money count forwards and backwards using 2p, 5p and 10p coins

Practical grouping e.g. in PE

12 children get into teams of 4 to play a game. How many teams are there?

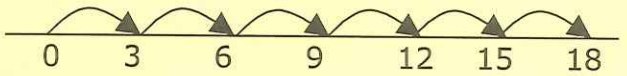


## Year Three

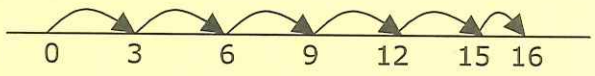
**÷ = signs and missing numbers**
Continue using a range of equations as in Year 2 but with appropriate numbers.

Understand division as sharing and grouping
18 ÷ 3 can be modelled as:
Sharing – 18 shared between 3 (see Year 1 diagram)

OR
Grouping - How many 3's make 18?




**Remainders**
16 ÷ 3 = 5 r1
Sharing - 16 shared between 3, how many left over?
Grouping – How many 3's make 16, how many left over?
e.g.

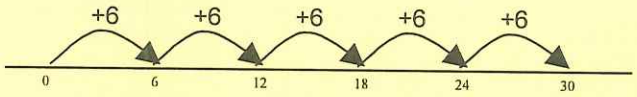


# DIVISION GUIDELINES

## Year Four

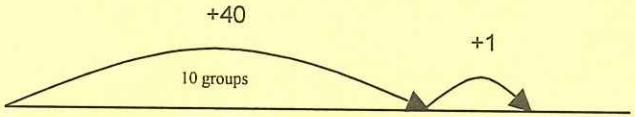
**÷ = signs and missing numbers**
Continue using a range of equations as in Year 2 but with appropriate numbers.

**Sharing and grouping**
30 ÷ 6 can be modelled as:
grouping – groups of 6 placed on no. line and the number of groups counted e.g.




sharing – sharing among 6, the number given to each person

Remainders
41 ÷ 4 = 10 r1




$41 = (10 \times 4) + 1$

**Pencil and paper procedures- Chunking.**

72 ÷ 5 lies between 50 ÷ 5 = 10 and 100 ÷ 5 = 20

* Partition the dividend into multiples of the divisor:

e.g 72 = 50 + 22
50 ÷ 5 = 10
22 ÷ 5 = 4r2 → 10 + 4r2 = 14 r 2
OR

| | | |
|---|---|---|
| | 72 | |
| - | 50 | (10 groups) |
| | 22 | |
| - | 20 | (4 groups) |
| | 2 | |

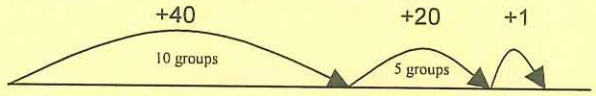
Answer : 14 remainder 2

## Year Five

**Sharing and grouping**
Continue to understand division as both sharing and grouping (repeated subtraction).

Remainders

Quotients expressed as fractions or decimal fractions
61 ÷ 4 = 15 ¼ or 15.25




**Pencil and paper procedures- Chunking**
256 ÷ 7 lies between 210 ÷ 7 = 30 and 280 ÷ 7 = 40

* Partition the dividend into multiples of the divisor:

e.g. 256 = 210 + 46
210 ÷ 7 = 30
46 ÷ 7 = 6r4 → 30 + 6r4 = 36r4

OR

| | | |
|---|---|---|
| | 256 | |
| - | 210 | (30 groups) |
| | 46 | |
| - | 42 | (6 groups) |
| | 4 | |

Answer: 36 remainder 4

**Also, Short Division for More Able Children**

$$5 \overline{)\,8^{3}47} \quad 16$$

Considering each column starting from the left. See Year Six for full explanation.

## Year Six

**Sharing, grouping and remainders as Year Five**

**Pencil and paper procedures- Chunking**
977 ÷ 36 is approximately 1000 ÷ 40 = 25

* Partition the dividend into multiples of the divisor:

e.g. 977 = 720 + 180 + 77
720 ÷ 36 = 20
180 ÷ 36 = 5
77 ÷ 36 = 2r5 → 20 + 5 + 2r5 = 27r5
OR

| | | |
|---|---|---|
| | 977 | |
| - | 720 | (20 groups) |
| | 257 | |
| - | 180 | (5 groups) |
| | 77 | |
| - | 72 | (2 groups) |
| | 5 | |

Answer: $27\ ^{5}/_{36}$

**Pencil and Paper procedures- Short Division Method**

quotient
divisor 5 | 847 dividend

**Write down how many times your divisor goes into the first number of the dividend. If there is a remainder, that's okay. Write down your remainder to the left of the next digit in the dividend.**
**Continue. Repeat steps 1-3 until you are done.**

$$5 \overline{)\,8^{3}4^{4}7} \quad 169\text{r}\,2$$

Both methods above are necessary at this stage, to deal with the wide range of problems experienced at Year Six.

# Calculation Guidelines for Foundation Stage

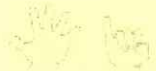
## Children begin to record in the context of play or practical activities and problems.

### ADDITION

Begin to relate addition to combining two groups of objects

- Make a record in pictures, words or symbols of addition activities already carried out.
- Construct number sentences to go with practical activities
- Use of games, songs and practical activities t o begin using vocabulary

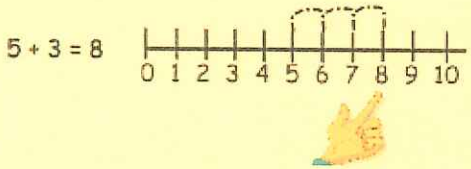
Solve simple word problems using their fingers



5 + 1 = 6

Can find one more to ten.

Higher Ability/ Gifted and Talented children progress to using a number line. They jump forwards along the number line using finger.




### SUBTRACTION

Begin to relate subtraction to 'taking away'

- Make a record in pictures, words or symbols of subtraction activities already carried out
- Use of games, songs and practical activities to begin using vocabulary
- Construct number sentences to go with practical activities
- Relate subtraction to taking away and counting how many objects are left.






5 - 1 = 4

Can find one less to ten.

Higher Ability/ Gifted and Talented Progression:



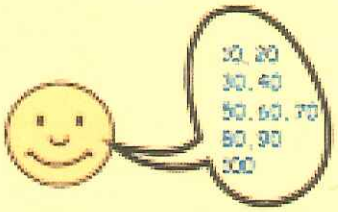

Counting backwards along a number line using finger.

### MULTIPLICATION

Real life contexts and use of practical equipment to count in repeated groups of the same size:

- Count in twos; fives; tens

Also chanting in 2s, 5s and 10s.



### DIVISION

Share objects into equal groups
Use related vocabulary
Activities might include:

- Sharing of milk at break time
- Sharing sweets on a child's birthday
- Sharing activities in the home corner
- Count in tens/twos
- Separate a given number of objects into two groups (addition and subtraction objective in reception being preliminary to multiplication and division)

Count in twos, tens
How many times?
How many are left/left over?
Group
Answer
Right, wrong
What could we try next?
How did you work it out?
Share out
Half, halve