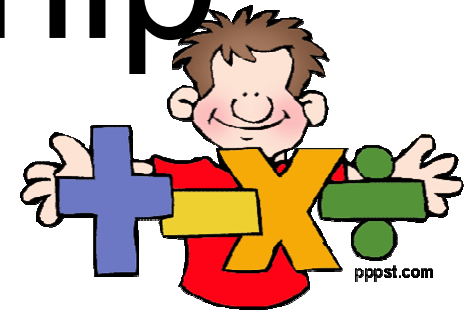


Commutativity

The order doesn't matter

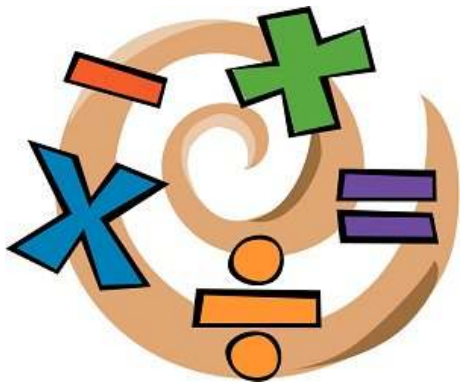
e.g. 24 twos is the same as two 24's, so double 24 is 48.

Inverse Relationship



Thinking of a multiplication
might help solve a division

e.g. $63 \div 9$ can be thought of as 'how many nines make 63?'



Partitioning

Multiply by the tens and
then the ones.

e.g. 6×27 is 6×20 add 6×7 , so 120
add 42, which is 162



Round and Adjust

Round to a multiplication you know, then adjust.

e.g. 9×7 is 7 tens take 7 ones, so $70 - 7$, so 63 or 99×6 is 100 sixes take 6 ones is $600 - 6$, so 594.

Using Factors

Doubling and Halving



Double one number and halve the other.

e.g. 45×14 , 45 can be doubled to make 90 and 14 can be halved to make 7, so 90×7 is 630.

Using Factors

Double, double, double

e.g. 8×14 is double, double, double 14,

so double 14 is 28

double 28 is 56

double 56 is 112



Using Factors

Multiplying by fifty

Multiply by a hundred and halve

e.g. 50×72 ; 50 is half of a hundred, so
 100×72 is 7 200,



so half of this is 3 600.

Using Factors



Multiplying by Twenty Five

Four 25's make one hundred.

e.g. 36×25 ;

I saw 25 and looked for 4 to make 100,

so $9 \times 4 \times 25$ is 900.

Inverse Relationship

Thinking of an addition might help
solve a subtraction.



e.g. $13 - 8$ can be thought of as
'eight add what, is 13?'

Commutativity 

The order doesn't matter.

e.g. $4 + 27$ is the same as $27 + 4$,

so we can count on 28, 29, 30, 31.

Near Doubles



Double one number and add or subtract one.

e.g. $14 + 15 =$

Double $14 + 1 = 14 + 14 + 1$ or

Double $15 - 1 = 15 + 15 - 1$

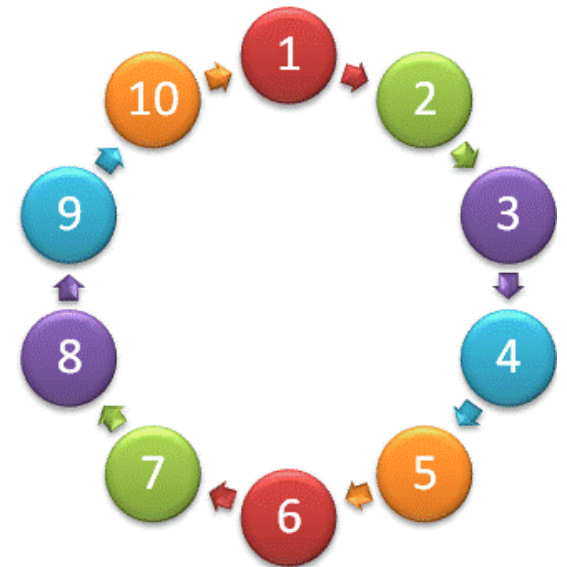
Compensating

Take some from one number and give to the other.

e.g. $8^{+2} + 7^{-2}$ is $10 + 5$

OR

$68^{+2} + 37^{-2}$ is $70 + 35$



Partitioning



Add both the tens and then both
the ones.

e.g. $68 + 37$ is $60 + 30 = 90$
then $8 + 7$ is 15 ,
so $90 + 15$,
which is 100 and 5 more, so 105

Compatible Numbers

Combination to 10 or 100

Rainbow numbers e.g.

$1 + 9$, $2 + 8$, $3 + 7$,

$4 + 6$, $5 + 5$ etc





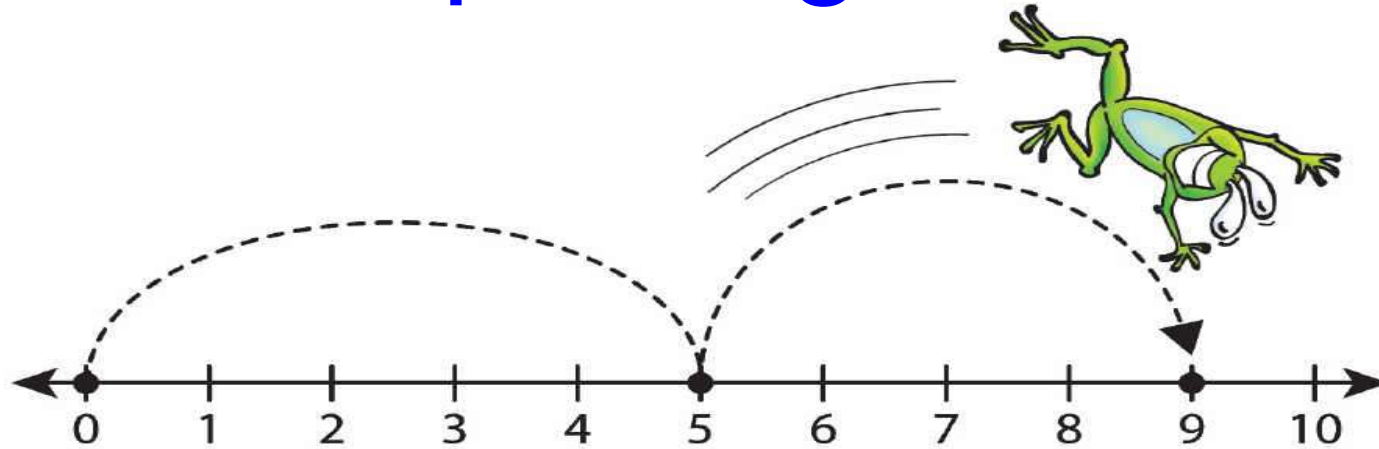
Front Loading

Bring on the tens and then
the ones.

e.g. $28 + 37$ is 38, 48, 58, and 7
more, so 60, 65

Imagine a Number Line

Jump along or back



e.g. $364 - 198$:

Starting at 198, it takes 2 to get to 200 and another 164 to get to 364, so 166.

Moving Mentally

Up and back through the number system

- Count backwards and forwards in ones from any starting point

5, 6, 7, 8, 9 ...

23, 22, 21, 20, 19 ...

- Count backwards and forwards in tens

10, 20, 30, 40 ...

120, 110, 100, 90 ...

- Count backwards and forwards in tens from any starting point



14, 24, 34 ...

53, 43, 33 ...

Moving Mentally

Up and back through the number system

- Add in tens, twenties, thirties, hundreds etc from any starting point

23, 43, 63, 83 ...

30, 60, 90 ...

125, 225, 325 ...

- Generalise basic facts

8 + 7 is 15,
and 28 + 7 is 35

so 18 + 7 is 25

6 x 7 = 42

so 60 x 7 = 420 and 600 x 7 = 4 200



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Compensate

Partition and rearrange

Addition:

Take some from one number and give it to another

$38 + 27$ is the same as

$38 + (2 + 25)$ is the same as

$(38 + 2) + 25$ is the same as

$40 + 25$ is the same as

65

Compensate

Partition and rearrange

Subtraction:

Change the numbers by adding or subtracting the same amount

62 - 37 is the same as
65 - 40 is the same as
25

62 - 37 is the same as
60 - 35 is the same as
25

Compensate

Partition and rearrange

Multiplication:

Take out a factor from one and give it to the other

5×8 is the same as
 $5 \times (2 \times 4)$ is the same as
 10×4 is the same as
40

15×6 is the same as
 $15 \times (2 \times 3)$ is the same as
 30×3 is the same as
90

Compensate

Partition and rearrange

Division:

Change the numbers by multiplying or dividing by the same amount

$40 \div 5$ is the same as
 $80 \div 10$ is the same as
8

$60 \div 20$ is the same as
 $6 \div 2$ is the same as
3

Use Relationships! Commutativity

Adding:

The order doesn't matter

$$4 + 27$$

Is the same as

$$27 + 4$$

Multiplying:

The order doesn't matter

$$24 \times 2$$

Is the same as

$$2 \times 24$$

Use Relationships! Inverse

Subtracting:

Thinking of an addition might help

$$27 - 19 =$$

Is the same as

$$19 + \underline{\quad} = 27$$

Dividing:

Thinking of a multiplication might help

$$24 \div 2$$

Is the same as

$$2 \times \underline{\quad} = 24$$