

MENTAL CALCULATIONS

Addition

Number bonds

Knowing (not working out) pairs of numbers which total to 10, 20 and 100

$3 + 7$, $13 + 7$, $30 + 70$...

Counting on and back

Counting in steps of 1, 10, 100, 1000...

$86 + 52 = 138$ by counting on in 10s then in 1s

Rounding and adjusting

Add the nearest multiple of 10, 100, 1000 and adjust

$24 + 19 \Rightarrow 24 + 20 - 1 = 43$

Relationships

Addition and subtraction are inverse operations so you can 'work backwards'

$23 - 17 = 6$ so we know $17 + 6 = 23$

Doubles and near doubles

$6 + 6 = 12$, $6 + 7 =$ double 6 and 1 more = 13

Partitioning

Splitting a number up and then recombining it

$34 + 45 \Rightarrow (30 + 40) + (4 + 5) = 70 + 9 = 79$

Bridging

Using number bonds to split numbers

$17 + 7 \Rightarrow 17 + (3 + 4) = 20 + 4 = 24$

Using related facts

$4 + 9 = 13$ so we know $40 + 90 = 130$

Equivalent calculations

Use knowledge of structure: increase one number and decrease the other by the same amount

$49 + 6 = 50 + 5$

Multiplication

Times tables

Knowing (not working out) facts

Y2 \rightarrow $\times 2$, $\times 5$ $\times 10$ Y3 \rightarrow $\times 3$, $\times 4$, $\times 8$

Y4 \rightarrow all facts up to 12×12 quickly

Knowing the effect of $\times 0$ and $\times 1$

Doubling... and doubling again

$13 \times 2 = 26$, so $13 \times 4 = 52$ and $13 \times 8 = 104$

Using related facts

8×6 is double 4×6

$24 \times 5 = (24 \times 10)$ then half it = 120

$12 \times 15 = 12 \times 5 \times 3 = 60 \times 3 = 180$

Multiplying by 10, 100, 1000...

$63 \times 10 = 630$ (and $6.3 \times 10 = 63$ etc)

Partitioning

$23 \times 6 \Rightarrow (20 \times 6) + (3 \times 6) = 120 + 18 = 138$

$13 \times 12 \Rightarrow (13 \times 10) + (13 \times 2) = 130 + 26 = 156$

Relationships

Multiplication is repeated addition

$14 \times 3 = 14 + 14 + 14 = 42$

Multiplication and division are inverse operations so you can 'work backwards'

Rounding and adjusting

$99 \times 5 \Rightarrow 100 \times 5 - 5 = 495$

Equivalent calculations

Use knowledge of structure: apply a multiplicative increase to one factor and a corresponding decrease the other

$18 \times 6 = 9 \times 12$

Subtraction

Number bonds

Using number facts we know

$20 - 17 = 3$, $100 - 70 = 30$

Counting on and back

Counting on and back in repeated steps of 1, 10, 100...

$86 - 32 = 54$ by counting back in 10s and in 1s

Find a small difference by counting up

$101 - 98 \Rightarrow$ from 98, jump to 99, 100, 101...three jumps

Rounding and adjusting

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

$74 - 19 = 74 - 20$ and then add the 1 back on = 55

Relationships

Addition and subtraction are inverse operations so you can 'work backwards'

$17 + 6 = 23$ so we know $23 - 6 = 17$

Partitioning

Splitting a number up then recombining it

$89 - 36 \Rightarrow (80 - 30) + (9 - 6) = 50 + 3 = 53$

Bridging

Using number bonds to split numbers up

$14 - 6 \Rightarrow 14 - 4 - 2 = 10 - 2 = 8$

Equivalent calculations

Use knowledge of structure: increase or decrease both numbers by the same amount

$601 - 278 = 599 - 276$

Division

Times tables

Multiplication and division are inverse operations so you can 'work backwards'

$8 \times 7 = 56$ so we know $56 \div 8 = 7$

Halving

Halving is $\div 2$

Halving and halving again is $\div 4$ (and finding $\frac{1}{4}$ or 25%)

$64 \div 4 = 64$ halved (32) and then halved again = 16

Dividing by 10, 100, 1000...

$750 \div 10 = 75$ (and $750 \div 100 = 7.5$)

Relationships

Division can be seen as repeated subtraction

$24 \div 6 \Rightarrow$ starting at 24, we take off 6s $\Rightarrow 18, 12, 6, 0 = 4$ groups

Division can be worked out by repeatedly adding, too

$24 \div 6 \Rightarrow$ from 0, we jump to 6, 12, 18, 24...

4 jumps = 4

If I know $3 \times 7 = 21$, what else do I know?

$30 \times 7 = 210$,

$0.3 \times 7 = 2.1$ etc

Equivalent calculations

Use knowledge of structure: apply a multiplicative increase or decrease to both numbers

$600 \div 50 = 60 \div 5$