ADDITION

28 + 45

Front end/Splitting both numbers

20 + 40 = 60   20 + 8
 8 + 5 = 13   + 40 + 5
            73   **60 + 13 = 73**   (60 + 10 + 3)
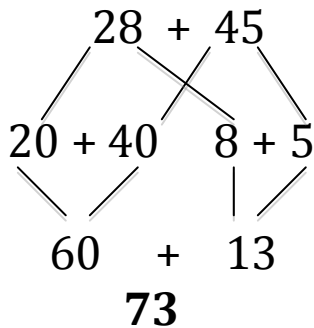
         28 + 45   28
       /   \ /   \   +   45
   20 + 40   8 + 5   13 (add ones)
       \   / | /   60 (add tens)
        60   +   13   **73**
            73

Keeping One Number Whole, Taking Friendly Jumps
(Shown on Open Number Lines)

         + 20   + 5   + 3

   45   65   70   **73**

         + 40   + 2   + 3

   28   68   70   **73**
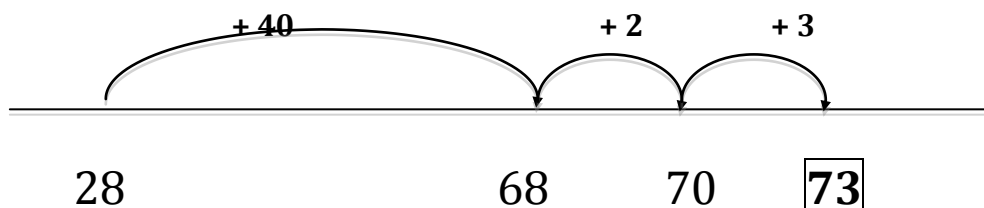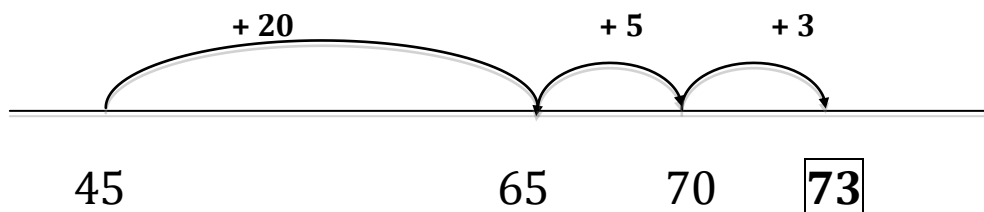
ADDITION continued   **28 + 45**

Or smaller friendly jumps of 10
(Shown on Open Number Lines)

| +10 | +10 | +5 | +3 |
| 45 | 55 | 65 | 70 | **73** |
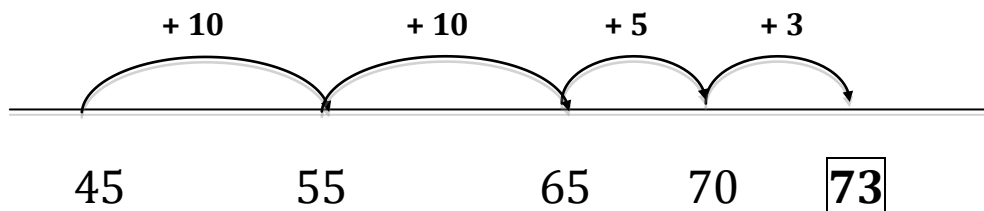
Compensation

For 28 + 45, think "I know **30 + 45 = 75**
I added 2 extra so I need to subtract them":
75 – 2 = 73

Take 2 from 45 and give it to 28 to make a friendly
number (30):

```
        28  +  45
   +2   ↓        ↓  -2
        30  +  43   =   73
```

SUBTRACTION

94 - 49

Keeping One Number Whole, Taking Friendly Jumps
(Shown on Open Number Lines)

- 5   - 4   - 40

45   50   54   94
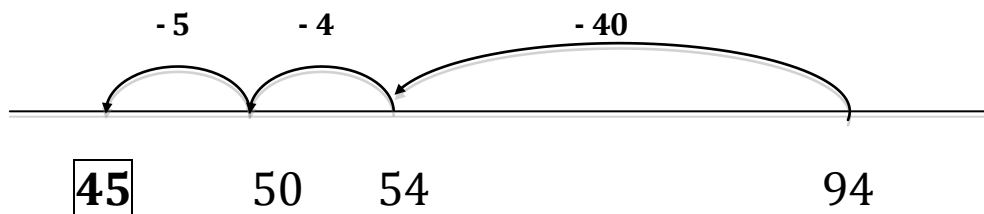
Think addition: 49 + □ = 94

+ 1   + 40   + 4   → **45**

49   50   90   **94**
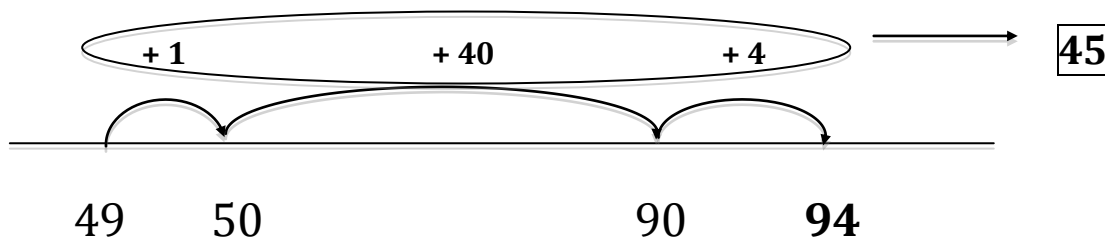
Splitting both numbers

94 – 49 : There won't be enough ones, so I'll split 94 this way:

```
  94  =   80  +  14
- 49  =   40  +   9    Now I can subtract
          40  +   5   =  45
```

SUBTRACTION   **94 - 49**
cont'd

Compensation

For 94 - 49, think "I know **94 - 50 = 44**
I subtracted 1 extra so I need to add it back":
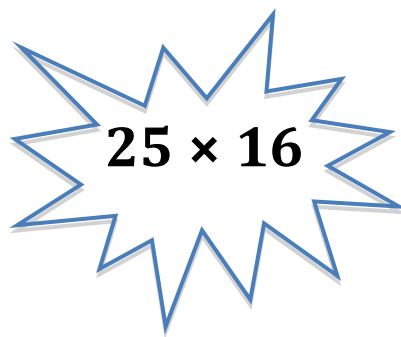**44 + 1 = 45**

Constant Difference

Add 1 to both numbers to make a friendly number (50):

```
        94  -   49
   +1   ↓        ↓   +1
        95  -   50      =   45
```

MULTIPLICATION 25×16

Halve and Double

$$25 \times 16$$

$\times 2 \downarrow \qquad \downarrow \div 2$

$$50 \times 8$$

$\times 2 \downarrow \qquad \downarrow \div 2$

$$100 \times 4 = \mathbf{400}$$

Think of Money

$25¢ \times 16$ There are $4 \times 25¢$ in \$1
so $16 \times 25¢ = \$4$ or **400**¢

Partial Products

Break up 16 into $10 + 4 + 2$

$25 \times 10 = 250$
$25 \times 4 = 100$
$25 \times 2 = \underline{\ 50}$
$\qquad \quad \mathbf{400}$

MULTIPLICATION cont'd

25×16

Partial Products

```
      25
    × 16
      30   (6 × 5)
     120   (6 × 20)
      50   (10 × 5)
     200   (10 × 20)
     400
```

Area Model (Open Array)

$25 = 20 + 5$
$16 = 10 + 6$

	20	5
10	**200**	**50**
6	**120**	**30**

320 + 80 = 400

DIVISION

$$397 \div 6$$
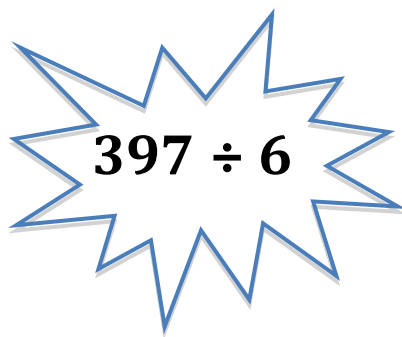
Equal Sharing

1. Give each group 50.
   6 × 50 = 300
   97 left to share

50 10 6	50 10 6
50 10 6	**50 10 6**
50 10 6	**50 10 6**

2. Give each group 10.
   6 × 10 = 60
   37 left to share

3. Give each group 6.
   6 × 6 = 36
   <u>1 left over</u>

Each group gets **66**, one left over

Using Multiplication

6 × □ = 397

$$6 \times 60 = 360$$
$$6 \times 6 = \underline{\ \ 36}$$
$$396$$

6 × 66 = 396
397 ÷ 6 = **66** with a remainder of 1 (**R1**)

DIVISION cont'd $397 \div 6$

Repeated Subtraction

```
6 | 397
  | -360    60     Think  "I can subtract 6 groups of 60 = 360"
  |   37
  |  -36     6     Think  "I can subtract 6 groups of 6 = 36"
  |    1           I have 1 left over

       66 R1
```

Splitting the Dividend into Friendly Numbers

$$50 + 10 + 6 \quad R1 \quad = 66\ R1$$

$$6 \mid 300 + 60 + 36 + 1$$