Quick tricks

Multiplication by 11

We insert the sum between the 2 original numbers. For example :

$$33 \times 11 = 363$$

If the sum is more than 9, we simply carry over. For example :

$$93 \times 11 = 1023$$

where we had $9 + 3 = 12$. If we want to multiply larger numbers, the same rule carries over. For example :

$$427 \times 11 = 4697$$

where we had $4 + 2 = 6$ and $2 + 7 = 9$.

Multiplying 2 numbers whose first digit is the same and whose second sums to 10

The procedure is to multiply the first digit by the next number and to multiply the second digits together. For example :

$$35 \times 35 = 1225$$

with $3 \times 4 = 12$ and $5 \times 5 = 25$. It is important to have 2 digits for the multiplication of the second digit. For example :

$$31 \times 39 = 1209$$

with $3 \times 4 = 12$ and $1 \times 9 = 09$.

Squaring any number

The algebraic formula is, where A and d are integers, $A^2 = (A+d) \times (A-d) + d^2$. For example :

$$98^2 = 100 \times 96 + 2^2 = 9604$$

with the number 2 being added and substracted and from 98.
We can generalize this to 3 digit numbers. For example :

$$\begin{aligned} 212^2 &= 200 \times 224 + 12^2 \\ &= 44800 + 144 = 44944 \end{aligned}$$

Because we round down to the nearest hundred, we only have to multiply the first digit.

Multiplying numbers between 10 and 20

We add the second digit of the second number to the first and add the multiple of the second digit for both numbers. For example :

$$\begin{aligned} 17 \times 14 &= (17 + 4) \times 10 + 7 \times 4 \\ &= 210 + 28 = 238 \end{aligned}$$

Almost perfect squares

Recall that $x^2 - 1 = (x-1)(x+1)$. In fact, x^2 can be visualized as a square from which we substract one to form a rectangle of lengths $x - 1$ and $x + 1$.

2 Dates and units

Since 1582 (introduction of the Gregorian calendar).

A year is a leap year if :

- The year can be divided by 4 (e.g., 2016, 2020, 2024, etc.).
- The year cannot be divided by 100 (e.g., 2100, 2200, etc.).
- Except if it can be divided by 400 (e.g., 2000, 2400, etc.).

2.1 Find day of the week of any date

We pose :

h Day of the week with $\{0 = \text{Sat.}, 1 = \text{Sun.}, 2 = \text{Mon.}, \dots, 6 = \text{Fri.}\}$.

d_m Day of the month.

m Month with $\{3 = \text{Mar.}, 4 = \text{Apr.}, 2 = \text{Mon.}, \dots, 14 = \text{Feb.}\}$.

- So we'd consider February to be the 14th month of the previous year.

K Year of the century, $Y mod 100$.

J Zero-based century, $\lfloor Y/100 \rfloor$.

So, $h = \left(d_m + \lfloor \frac{13(m+1)}{4} \rfloor + K + \lfloor \frac{K}{4} \rfloor + + \lfloor \frac{J}{4} \rfloor - 2J\right) mod 7$

2.2 Temperature

$\deg C$ **to** $\deg F$ Multiply by 9, divide by 5 and add 32.

$\deg F$ **to** $\deg C$ Deduct 32, multiply by 5 and divide by 9.

Alternatively, we can multiply *(divide)* by 1.8 (i.e., 9/5) to convert from $\deg C$ to $\deg F$ *(or vice-versa)*.