Introduction to calculation sheets

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Calculations Sheets

- MS Office – Excel
- Libre Office – Calc
- Google – Sheets

Numerical models

The aim: how to investigate such numerical models using calculation sheet!

Newton's law of cooling

$$T(t) = T_0 + (T_p - T_0)e^{-kt} \quad (1)$$

where T_0 is the ambient temperature, T_p is the initial temperature, k is the constant, t is the time.

Rumor spread in social network

$$n(t) = N(1 - e^{-kt}) \quad (2)$$

where N is the population, k is the constant, t is the time

Operators

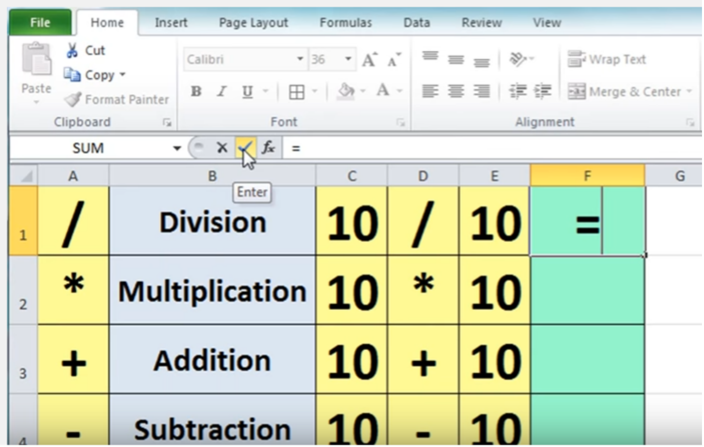
Arithmetic operators

$+$ (plus sign), – (minus sign), $*$ (asterisk), / (forward slash), % (percent sign), $\wedge$ (caret)

Comparison operators

$=$ (equal sign), $>$ (greater than sign), $<$ (less than sign), $>=$ (greater than or equal to sign), $<=$ (less than or equal to sign), $<>$ (not equal to sign)

Formulas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G
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Division
10
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10
=
2
*
Multiplication
10
*
10
3
+
Addition
10
+
10
4
-
Subtraction
10
-
10

Reference operators

Combine ranges of cells for calculations with the following operators.

Reference operator	Meaning	Example
: (colon)	Range operator	B5:B15
, (comma)	Union operator	SUM(B5:B15,D5:D15)
(space)	Intersection operator	B7:D7 C6:C8

Functions examples

To investigate the numerical models (1) and (2) the functions are required!!!

- =SLOPE()
  Calculates the slope of the line resulting from linear regression of a dataset.
- =INTERCEPT()
  Calculates the y-value at which the line resulting from linear regression of a dataset will intersect the y-axis (x=0).
- =LINEST()
  Given partial data about a linear trend, calculates various parameters about the ideal linear trend using the least-squares method.

In practice – linear model

i) how to build a dataset automatically, ii) how to use the relative and the absolute address of the cell

Ex. 1

The data in the Table present the velocity of an object in different periods of time. Calculate the acceleration (a) of the object and its initial velocity V_0. Hint: $V = V_0 + at$

Table: The velocity of an object in different periods of time

time (sec.)	2	4	6	8	10
velocity (m/s)	22	42	62	80	100

In practice – "squared" model

Ex. 2

The data in the Table present the results of an experiment of a ball falling down in the oil. Calculate the acceleration - a. Hint: $s = \frac{1}{2}at^2$.

time (sec)	distance (cm)
0	0
0.05	0.3
0.1	1.25
0.15	1.4
0.2	4.6
0.25	7.1
0.3	10
0.35	13.7
0.4	18.1
0.45	22.6
0.5	28

In practice – "exponential" model

Ex. 3

How to consider "exponential" model?

$$N = C\exp(Bt) \tag{3}$$

Calculate C and B parameters for the following data:

Time t(sec.)	2.0	4.0	6.0	8.0	10.0
Population N	2500	6000	15000	35000	90000