Calcpad

Version 5.4 Readme!

ПРОЕКТСОФТ ®
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How it works?

1. **Enter** text and formulas into the "**Code**" box on the left.
2. Click ▶ to **calculate**. The results will appear in the "**Output**" box on the right as a professionally formatted Html **report**.
3. Click 🖶 to **print** or 📄 to **copy** the output.
   You can also **export** it to Html 💾, PDF 📕 or MS Word 📘 document.

The language

Calcpad language includes the following elements (click an item to insert):

- Real numbers: digits "**0**" - "**9**" and decimal point "**.**";
- Complex numbers: **re** ± **im***i* (e.g. **3** - **2***i*);
- Variables:
  - Latin letters "*a*" - "*z*", "*A*" - "*Z*";
  - Greek letters "*α*" - "*ω*", "*A*" - "*Ω*";
  - digits "**0**" - "**9**";
  - comma ",";
  - "_" for subscript;

  A variable name must start with a letter. Names are case sensitive.
- Operators:
  "**!**" - factorial;
  "**^**" - exponent;
  "**/**" - division;
  "**÷**" - force division bar;
  "****" - division;
  "**%**" - reminder;
  "*****" - multiplication;
  "**-**" - minus;
  "**+**" - plus;
  "**≡**" - equal to;
  "**≠**" - not equal to;
  "**<**" - less than;
  "**>**" - greater than;
  "**≤**" - less or equal;
  "**≥**" - greater or equal;
  "**=**" - assignment;
- Custom functions of type ***f*** (*x*; *y*; *z*; ...);

- Built-in functions:

  abs(*x*) - absolute value/magnitude;

  sin(*x*) - sine;

  cos(*x*) - cosine;

  tan(*x*) - tangent;

  csc(*x*) - cosecant;

  sec(*x*) - secant;

  cot(*x*) - cotangent;

  sinh(*x*) - hyperbolic sine;

  cosh(*x*) - hyperbolic cosine;

  tanh(*x*) - hyperbolic tangent;

  csch(*x*) - hyperbolic cosecant;

  sech(*x*) - hyperbolic secant;

  coth(*x*) - hyperbolic cotangent;

  asin(*x*) - inverse sine;

  acos(*x*) - inverse cosine;

  atan(*x*) - inverse tangent;

  atan2(*x*; *y*) - the angle whose tangent is the quotient of *y* and *x*;

  acsc(*x*) - inverse cosecant;

  asec(*x*) - inverse secant;

  acot(*x*) - inverse cotangent;

  asinh(*x*) inverse hyperbolic sine;

  acosh(*x*) - inverse hyperbolic cosine;

  atanh(*x*) - inverse hyperbolic tangent;

  acsch(*x*) - inverse hyperbolic cosecant;

  asech(*x*) - inverse hyperbolic secant;

  acoth(*x*) - inverse hyperbolic cotangent;

  log(*x*) - decimal logarithm;

  ln(*x*) - natural logarithm;

  log$_2$(*x*) - binary logarithm;

  sqr(*x*) / **sqrt**(*x*) - square root;

  cbrt (*x*) - cubic root;

  root(*x*; *n*) - n-th root;

  round(*x*) - round to the nearest integer;

  floor(*x*) - round to the lower integer;

  ceiling(*x*) - round to the greater integer;

  trunc(*x*) - round to the nearest integer towards zero;

  re(*x*) - the real part of a complex number;

  im(*x*) - the imaginary part of a complex number;

  phase(*x*) - the phase of a complex number;

random(*x*) - random number between 0 and *x*;

min(*x*; *y*) - the minimum of two values;

max(*x*; *y*) - the maximum of two values;

if(<*cond*>; <*value-if-true*>; <*value-if-false*>) - conditional evaluation;

- Comments: **"Title"** or **'text'** in double or single quotes, respectively. **HTML**, **CSS**, **JS** and **SVG** are allowed.
- Graphing and plotting:

  $Plot { $f(x)$ @ $x = a : b$ } - simple plot;

  $Plot { $x(t)$ | $y(t)$ @ $t = a : b$ } - parametric;

  $Plot { $f_1(x)$ & $f_2(x)$ & ... @ $x = a : b$ } - multiple;

  $Plot { $x_1(t)$ | $y_1(t)$ & $x_2(t)$ | $y_2(t)$ & ... @ $x = a : b$ } - multiple parametric;

  $Map { $f(x; y)$ @ $x = a : b$ & $y = c : d$ } - 2D color map of a 3D surface;

  PlotHeight - height of plot area in pixels;

  PlotWidth - width of plot area in pixels;
- Iterative and numerical methods:

  $Root { $f(x)$ = const @ $x = a : b$ } - root finding for $f(x)$ = const;

  $Root { $f(x)$ @ $x = a : b$ } - root finding for $f(x)$ = 0;

  $Find { $f(x)$ @ $x = a : b$ } similar to above, but x is not required to be a precise solution;

  $Sup { $f(x)$ @ $x = a : b$ } - local maximum of a function;

  $Inf { $f(x)$ @ $x = a : b$ } - local minimum of a function;

  $Area { $f(x)$ @ $x = a : b$ } - numerical integration;

  $Slope { $f(x)$ @ $x = a$ } - numerical differentiation;

  $Sum { $f(k)$ @ $k = a : b$ } - iterative sum;

  $Product { $f(k)$ @ $k = a : b$ } - iterative product;

  $Repeat { $f(k)$ @ $k = a : b$ } - general inline iterative procedure;

  Precision - relative precision for numerical methods [10^{-2}; 10^{-16}] (default is 10^{-12})
- Program flow control:

  Simple:

  ```
  #if <condition>
    <Your code goes here>
  #end if
  ```

  Alternative:

  ```
  #if <condition>
    <Your code goes here>
  #else
    <Some other code>
  #end if
  ```

  Complete:

  ```
  #if <condition1>
    <Your code goes here>
  ```

#else if <*condition2*>
<*Your code goes here*>
#else
<*Some other code*>
#end if

You can add or omit as many "#else if's" as needed. Only one "#else" is allowed. You can omit this too.

- Iteration blocks:
  Simple:
  #repeat <*number of repetitions*>
  <*Your code goes here*>
  #loop
  With conditional break:
  #repeat <*number of repetitions*>
  <*Your code goes here*>
  #if <*condition*>
  #break
  #end if
  <*Some more code*>
  #loop
- Output control:
  #hide - hide the report contents;
  #show - always show the contents (default);
  #pre - show the next contents only before calculations;
  #post - show the next contents only after calculations;
  #val - show only the final result, without the equation;
  #equ - show complete equations and results (default);
  Each of the above commands is effective after the current line until the end of the report or another command that overwrites it.
- Units for trigonometric functions: #deg - degrees, #rad - radians;
- Separator for target units: |;
- Metric units (SI and compatible):
  Mass: *g*, *hg*, *kg*, *t*, *kt*, *Mt*, *Gt*, *dg*, *cg*, *mg*, *µg*, *Da*, *u*;
  Length: *m*, *km*, *dm*, *cm*, *mm*, *µm*, *nm*, *pm*, *AU*, *ly*;
  Time: *s*, *ms*, *µs*, *ns*, *ps*, *min*, *h*, *d*;
  Frequency: *Hz*, *kHz*, *MHz*, *GHz*, *THz*, *mHz*, *µHz*, *nHz*, *pHz*, *rpm*;
  Velocity: *kmh*;
  Electric current: *A*, *kA*, *MA*, *GA*, *TA*, *mA*, *µA*, *nA*, *pA*;
  Temperature: *°C*, *Δ°C*, *K*;
  Amount of substance: *mol*;
  Luminous intensity: *cd*;
  Area: *a*, *daa*, *ha*;

Volume: *L*, *mL*, *cL*, *dL*, *hL*;

Force: *dyn N*, *daN*, *hN*, *kN*, *MN*, *GN*, *TN*, *kgf*, *tf*;

Moment: *Nm*, *kNm*;

Pressure: *Pa*, *daPa*, *hPa*, *kPa*, *MPa*, *GPa*, *TPa*, *dPa*, *cPa*, *mPa*, *µPa*, *nPa*, *pPa*, *bar*, *mbar*, *µbar*, *atm*, *at*, *Torr*, *mmHg*;

Energy work: *J*, *kJ*, *MJ*, *GJ*, *TJ*, *mJ*, *µJ*, *nJ*, *pJ*, *Wh*, *kWh*, *MWh*, *GWh*, *TWh*, *cal*, *kcal*, *erg*, *eV*, *keV*, *MeV*, *GeV*, *TeV*, *PeV*, *EeV*;

Power: *W*, *kW*, *MW*, *GW*, *TW*, *mW*, *µW*, *nW*, *pW*, *hpM*, *ks*;

Electric charge: *C*, *kC*, *MC*, *GC*, *TC*, *mC*, *µC*, *nC*, *pC*, *Ah*, *mAh*;

Potential: *V*, *kV*, *MV*, *GV*, *TV*, *mV*, *µV*, *nV*, *pV*;

Capacitance: *F*, *kF*, *MF*, *GF*, *TF*, *mF*, *µF*, *nF*, *pF*;

Resistance: *Ω*, *kΩ*, *MΩ*, *GΩ*, *TΩ*, *mΩ*, *µΩ*, *nΩ*, *pΩ*;

Conductance: *S*, *kS*, *MS*, *GS*, *TS*, *mS*, *µS*, *nS*, *pS*;

Magnetic flux: *Wb* , *kWb*, *MWb*, *GWb*, *TWb*, *mWb*, *µWb*, *nWb*, *pWb*;

Magnetic flux density: *T*, *kT*, *MT*, *GT*, *TT*, *mT*, *µT*, *nT*, *pT*;

Inductance: *H*, *kH*, *MH*, *GH*, *TH*, *mH*, *µH*, *nH*, *pH*;

Luminous flux: *lm*;

Illuminance: *lx*;

Radioactivity: *Bq*, *kBq*, *MBq*, *GBq*, *TBq*, *mBq*, *µBq*, *nBq*, *pBq*, *Ci*, *Rd*;

Absorbed dose: *Gy*, *kGy*, *MGy*, *GGy*, *TGy*, *mGy*, *µGy*, *nGy*, *pGy*;

Equivalent dose: *Sv*, *kSv*, *MSv*, *GSv*, *TSv*, *mSv*, *µSv*, *nSv*, *pSv*;

Catalytic activity: *kat*;

- Non-metric units (Imperial/US):

  Mass: *gr*, *dr*, *oz*, *lb*, *kip* , *st*, *qr*, *cwt*, *cwt_UK*, *cwt_US*, *ton*, *ton_UK*, *ton_US*, *slug*;

  Length: *th*, *in*, *ft*, *yd*, *ch*, *fur*, *mi*, *ftm*, *cable*, *nmi*, *li*, *rod*, *pole*, *perch*, *lea*;

  Speed: *mph*;

  Temperature: *°F*, *Δ°F*, *°R*;

  Area: *rood*, *ac*;

  Volume (fluid): *fl_oz*, *gi*, *pt*, *qt*, *gal*, *bbl*, (dry) *bu*;
  fl_oz_UK, *gi_UK*, *pt_UK*, *qt_UK*, *gal_UK*, *bbl_UK*, (dry) *bu_UK*;
  fl_oz_US, *gi_US*, *pt_US*, *qt_US*, *gal_US*, *bbl_US*, (dry) *bu_US*;

  Force: *ozf*, *lbf*, *kipf*, *tonf*, *pdl*;

  Pressure: *osi*, *osf psi*, *psf*, *ksi*, *ksf*, *tsi*, *tsf*, *inHg*;

  Energy/work: *BTU*, *therm*, *therm_UK*, *therm_US*, *quad*;

  Power: *hp*, *hpE*, *hpS*.