

$$\begin{aligned} &> 2 + 3; 2 * 7; 4; 2 / 7; 2 / 3 + \frac{5}{7 + \frac{8}{7}}; \\ &\qquad\qquad\qquad \frac{5}{14} \\ &\qquad\qquad\qquad \frac{4}{7} \\ &\qquad\qquad\qquad \frac{2}{7} \\ &\qquad\qquad\qquad \frac{73}{57} \end{aligned} \tag{1}$$

$$\begin{aligned} &> 1 : g := 3 \cdot x + 1 : \\ &> \text{sqrt}(5); \text{Pi}; \text{pi}; \text{evalf}(\text{Pi}); \text{evalf}(\text{pi}); \text{evalf}(E); \text{evalf}(e); \text{evalf}(\exp(1)); \text{I}^2; 1 + 2 \cdot I; \text{Digits} := \\ &\qquad\qquad\qquad 20; \text{evalf}(\exp(1)) \\ &\qquad\qquad\qquad \sqrt{5} \\ &\qquad\qquad\qquad \pi \\ &\qquad\qquad\qquad \pi \\ &\qquad\qquad\qquad 3.141592654 \\ &\qquad\qquad\qquad \pi \\ &\qquad\qquad\qquad E \\ &\qquad\qquad\qquad e \\ &\qquad\qquad\qquad 2.718281828 \\ &\qquad\qquad\qquad -1 \\ &\qquad\qquad\qquad 1 + 2 I \\ &\qquad\qquad\qquad \text{Digits} := 20 \\ &\qquad\qquad\qquad 2.7182818284590452354 \end{aligned} \tag{2}$$

$$\begin{aligned} &> ?\text{evalf} \\ &> z := 1 + x + \frac{x^2 \cdot (x^2 + x + 1)}{1 - x} \\ &\qquad\qquad\qquad z := 1 + x + \frac{x^2 (x^2 + x + 1)}{1 - x} \end{aligned} \tag{3}$$

$$\begin{aligned} &> \text{simplify}(\%) \\ &\qquad\qquad\qquad \frac{-x^4 - x^3 - 1}{-1 + x} \end{aligned} \tag{4}$$

$$\begin{aligned} &> \text{subs}(x=0, \%) \\ &\qquad\qquad\qquad 1 \end{aligned} \tag{5}$$

$$\begin{aligned} &> z; \\ &\qquad\qquad\qquad 1 + x + \frac{x^2 (x^2 + x + 1)}{1 - x} \end{aligned} \tag{6}$$

```
> z := 'z'; z
z := z
z
```

(7)

```
> #Exercice 1
> Digits := 30
Digits := 30
```

(8)

```
> evalf(5/7), evalf(sqrt(5)), evalf(Pi), evalf(exp(1)), evalf(ln(5)), evalf(sin(Pi/7)),
evalf(cos(Pi/9)), evalf(1/(1+sqrt(3)))
0.714285714285714285714285714286, 2.23606797749978969640917366873,
3.14159265358979323846264338328, 2.71828182845904523536028747135,
1.60943791243410037460075933323, 0.433883739117558120475768332848,
0.939692620785908384054109277325, 0.366025403784438646763723170752
```

(9)

```
> #Exercice 2
> ?simplify
> ?expand
> ?rationalize
> ?factor
> ?combine
> ?solve
> #Exercice 3
> simplify(1/(1-x) + 1/(1-x)^2 + 1/(1-x-x^2)^2)
-x^5 + 5x^3 + x^2 - 7x + 3
(-1+x)^2 (x^2+x-1)^2
```

(10)

```
> #Exercice 4
> expand((1+x) * (1-x-x^3) * (1+y))
-x^4y - x^4 - x^3y - x^3 - x^2y - x^2 + y + 1
```

(11)

```
> #Exercice 5
> factor(1+x^2-2*x)
(-1+x)^2
```

(12)

```
> factor(x^2-4)
(x-2) (x+2)
```

(13)

```
> factor(x^2-2); factor(x^2-2, sqrt(2))
x^2-2
-(-x+sqrt(2)) (x+sqrt(2))
```

(14)

```
> factor(x^2+4); factor(x^2+4, complex)
```


$$\frac{(-1 - x + \sqrt{x})(-1 + x)}{x^2 + x + 1} \quad (20)$$

> #Exercice 7

> expand(cos(2·x))

$$2 \cos(x)^2 - 1 \quad (21)$$

> #Exercice 8

> combine(4·sin(x)³)

$$-\sin(3x) + 3 \sin(x) \quad (22)$$

> A := 2·x + t·(y + 4); whattype(A); nops(A); op(2, A); op(A);

$$A := 2x + t(y + 4)$$

‘+’

2

$$t(y + 4)$$

$$2x, t(y + 4)$$

(23)

> #Exercice 9

> B := $\frac{(3 + x)}{1 - 2 \cdot x + \cos(x)}$; whattype(B); op(B)

$$B := \frac{3 + x}{1 - 2x + \cos(x)}$$

‘*’

$$3 + x, \frac{1}{1 - 2x + \cos(x)}$$

(24)

> whattype($\frac{1}{1 - 2x + \cos(x)}$); op($\frac{1}{1 - 2x + \cos(x)}$)

$$1 - 2x + \cos(x), -1$$

(25)

> whattype(1 - 2x + cos(x)); op(1 - 2x + cos(x)); whattype(-1)

‘+’

$$1, -2x, \cos(x)$$

integer

(26)

> whattype(-2x); op(-2x); whattype(cos(x)); op(cos(x))

‘*’

$$-2, x$$

function

x

(27)

> #Exercice 10

> C := (1 + 2·x + 3·x²)⁴; whattype(C); op(C); whattype(3x² + 2x + 1); op(3x² + 2x + 1);
whattype(3x²); op(3x²)

$$C := (3x^2 + 2x + 1)^4$$

$$3x^2 + 2x + 1, 4$$

$$3x^2, 2x, 1$$

$$3, x^2$$
(28)

```
> L := 1, 2, a, x + y, 1/x; LL := [L]; op(3, LL)
```

$$L := 1, 2, a, x + y, \frac{1}{x}$$

$$LL := \left[1, 2, a, x + y, \frac{1}{x} \right]$$

$$a$$
(29)

```
> for j from 1 to 5 do op(j, LL) od;
```

$$1$$

$$2$$

$$a$$

$$x + y$$

$$\frac{1}{x}$$
(30)

```
> S := seq(k^2, k=1..20); LLL := [S];
```

$$S := 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, 256, 289, 324, 361, 400$$

$$LLL := [1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, 256, 289, 324, 361, 400]$$
(31)

```
> #Exercice 11
```

```
> T := seq(12! / (p! * (12 - p)!), p = 0..12)
```

$$T := 1, 12, 66, 220, 495, 792, 924, 792, 495, 220, 66, 12, 1$$
(32)

```
> #Exercice 12
```

```
> seq(convert([seq(12 - j + 1 / j, j = 1..p)], ' '), p = 0..12)
```

$$1, 12, 66, 220, 495, 792, 924, 792, 495, 220, 66, 12, 1$$
(33)

```
> convert([%], '+')
```

$$4096$$
(34)

```
> for n from 1 to 12 do convert([seq(convert([seq(n - j + 1 / j, j = 1..p)], ' '), p = 0..n)], '+') od;
```

$$2$$

$$4$$

8
16
32
64
128
256
512
1024
2048
4096 (35)

> seq(convert([seq(convert([seq($\frac{n-j+1}{j}$, j=1..p)], `.`), p=0..n)], `+`), n=1..12)
2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096 (36)

> #Exercice 13

> subs(x=1, convert(expand((1+x)¹²), list)); [coeffs(expand((1+x)¹²))]
[1, 12, 66, 220, 495, 792, 924, 792, 495, 220, 66, 12, 1]
[1, 12, 66, 220, 495, 792, 924, 792, 495, 220, 66, 12, 1] (37)

> #Exercice 14

> L := []:
for p from 0 to 12 do
L := [op(L), $\frac{12!}{p! \cdot (12-p)!}$]
od:
L;
[1, 12, 66, 220, 495, 792, 924, 792, 495, 220, 66, 12, 1] (38)

> #Exercice 15

> L := [seq(k, k=1..100)] : L[1] := 0 :
for p from 2 to 100 do
j := (p+p);
while (j ≤ 100) do
L[j] := 0;
j := (j+p);
od:
od:
L
[0, 2, 3, 0, 5, 0, 7, 0, 0, 0, 11, 0, 13, 0, 0, 0, 17, 0, 19, 0, 0, 0, 23, 0, 0, 0, 0, 0, 29, 0, 31, 0, 0, 0, 0, 37, 0, 0, 0, 41, 0, 43, 0, 0, 0, 47, 0, 0, 0, 0, 0, 53, 0, 0, 0, 0, 0, 59, 0, 61, 0, 0, 0, 0, 0, 67, 0, 0, 0, 71, 0, 73, 0, 0, 0, 0, 0, 79, 0, 0, 0, 83, 0, 0, 0, 0, 0, 89, 0, 0, 0, 0, 0, 0, 97, 0, 0, 0] (39)

> premiers := []:
for i from 1 to 100 do
if L[i] ≠ 0 then
premiers := [op(premiers), i]

```

    fi;
od:
premiers
[2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97] (40)

```

```

> #Exercice 16

```

```

> est_premier := proc(n)
    local k;
    for k from 2 to n - 1 do
    if irem(n, k) = 0 then
    return false fi; od;
    return true end:

```

```

> jumeaux := [ ]:
    for x from 2 to 1000 do
    if est_premier(x) and est_premier(x + 2) then
    jumeaux := [op(jumeaux), x] fi; od:
jumeaux

```

```

[3, 5, 11, 17, 29, 41, 59, 71, 101, 107, 137, 149, 179, 191, 197, 227, 239, 269, 281, 311, 347, 419, (41)
431, 461, 521, 569, 599, 617, 641, 659, 809, 821, 827, 857, 881]

```

```

> jumeaux2 := [ ]:
    for x from 3 to 1000 do
    drapeau := true;
    for k from 2 to x - 1 do

```

Si x ou x+2 admet un diviseur non trivial, alors on met le drapeau à false: (x,x+2) ne sont pas premiers jumeaux

```

    if irem(x, k) = 0 or irem(x + 2, k) = 0 then
    drapeau := false fi; od;
    if drapeau then jumeaux2 := [op(jumeaux2), x] fi; od:
jumeaux2

```

```

[3, 5, 11, 17, 29, 41, 59, 71, 101, 107, 137, 149, 179, 191, 197, 227, 239, 269, 281, 311, 347, 419, (42)
431, 461, 521, 569, 599, 617, 641, 659, 809, 821, 827, 857, 881]

```

```

>

```