P1

PRACTICE 1: FIRST STEPS WITH "MATHEMATICA"

▼ Proposed Exercise P-1.1

Make the following calculations:
a) cos 60° , sen 30°, tg 120°, cotg 0°, tg 45°.
b) arcsin (1/2), arctg 1, arccos 0, arctg(-1).
c) e^{100}, Log 10, |-5|, $\sqrt{8}$, $\sqrt{0.04}$.

▼ Resolution P-1.1

★ a)

```
Clear["Global`*"]
Cos[60 * 2 * Pi / 360]
```

$$\frac{1}{2}$$

```
Sin[30 * 2 * Pi / 360]
```

$$\frac{1}{2}$$

$$\frac{1}{2}$$

```
Tan[120 Degree]
```

$$-\sqrt{3}$$

$$-\sqrt{3}$$

```
Cot[0]
ComplexInfinity
```

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```
Tan[45 Degree]
```

1

1

★ b)

```
ArcSin[1 / 2] * 180 / Pi
```

30

30

```
ArcTan[1] * 180 / Pi
```

45

45

```
ArcCos[0]
```

$\frac{\pi}{2}$

$\frac{\pi}{2}$

```
ArcTan[-1] * 180 / Pi
```

-45

-45

★ c)

```
E^100 // N
```

2.68812×10^{43}

2.68812×10^{43}

```
Log[10.]
```

2.30259

```
√8
```

$2\sqrt{2}$

$2\sqrt{2}$

```
Abs[-5]
```

5

```
√0.04
```

0.2

0.2

▼ Proposed Exercise P-1.2

Define the following functions:

$$f(x)=\begin{cases} \ln(x+5) & \text{si } x > -5 \\ e^x & \text{si } x \le -5 \end{cases}$$

$$g(x)=\begin{cases} \sqrt{x} & \text{si } x > 0 \\ \text{sen}^2(x*\pi) & \text{si } x \le 0 \end{cases}$$

and evaluate f(x), f(x)*g(x) and g(f(x)) in the points {-5,-3,-1,1,3,5}

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▼ Resolution P-1.2

★ Function definition

```
f[x_] = If[x ≤ -5, E^x, Log[x + 5]]
```

```
If[x ≤ -5, ℯ^x, Log[x + 5]]
```

```
g[x_] = If[x ≤ 0, (Sin[x * Pi])^2, √x]
```

```
If[x ≤ 0, Sin[x π]^2, √x]
```

★ Function evaluation

```
a = {None, {"x", "f[x]", "f[x]*g[x]", "g[f[x]]"}}
```

```
{None, {x, f[x], f[x]*g[x], g[f[x]]}}
```

```
b = Table[{x, f[x], f[x] * g[x], g[f[x]]}, {x, -5, 5, 2}]
```

$$\left\{\left\{-5, \frac{1}{e^5}, 0, \frac{1}{e^{5/2}}\right\}, \left\{-3, \text{Log}[2], 0, \sqrt{\text{Log}[2]}\right\},\right.$$
$$\left\{-1, \text{Log}[4], 0, \sqrt{\text{Log}[4]}\right\}, \left\{1, \text{Log}[6], \text{Log}[6], \sqrt{\text{Log}[6]}\right\},$$
$$\left.\left\{3, \text{Log}[8], \sqrt{3}\ \text{Log}[8], \sqrt{\text{Log}[8]}\right\}, \left\{5, \text{Log}[10], \sqrt{5}\ \text{Log}[10], \sqrt{\text{Log}[10]}\right\}\right\}$$

```
c = TableForm[b, TableHeadings → a]
```

x	f[x]	f[x]*g[x]	g[f[x]]
-5	$\frac{1}{e^5}$	0	$\frac{1}{e^{5/2}}$
-3	Log[2]	0	$\sqrt{\text{Log}[2]}$
-1	Log[4]	0	$\sqrt{\text{Log}[4]}$
1	Log[6]	Log[6]	$\sqrt{\text{Log}[6]}$
3	Log[8]	$\sqrt{3}$ Log[8]	$\sqrt{\text{Log}[8]}$
5	Log[10]	$\sqrt{5}$ Log[10]	$\sqrt{\text{Log}[10]}$

```
c // N
```

x	f[x]	f[x]*g[x]	g[f[x]]
-5.	0.00673795	0.	0.082085
-3.	0.693147	0.	0.832555
-1.	1.38629	0.	1.17741
1.	1.79176	1.79176	1.33857
3.	2.07944	3.6017	1.44203
5.	2.30259	5.14874	1.51743

▼ Proposed Exercise P-1.3

Define the following functions:

f(x)=sin2x + cosx

g(x) = $\begin{cases} \sin^2 x & \text{si } -2\pi \le x \le 2\pi \\ tgx + sen(x+\pi) & \text{si } x > 2\pi \end{cases}$, and g(x)=3 in the rest of the cases.

And evaluate (f+g)(x), and f(x)*g(x) in the points x=k*π, where k∈{-3,-2,-1,0,1,2,3}.

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▼ Resolution P-1.3

★ Function definition

```
f[x_] = Sin[2 * x] + Cos[x]
```

```
Cos[x] + Sin[2 x]
```

```
g[x_] = Which[x < -2 * Pi, 3, x > 2 * Pi, Tan[x] + Sin[x + Pi], True, (Sin[x])^2]
```

```
Which[x < -2 π, 3, x > 2 π, Tan[x] + Sin[x + π], True, Sin[x]^2]
```

★ Function evaluation

```
f /@ Table[x, {x, -3, 3, 1}]
```

```
{Cos[3] - Sin[6], Cos[2] - Sin[4], Cos[1] - Sin[2],
 1, Cos[1] + Sin[2], Cos[2] + Sin[4], Cos[3] + Sin[6]}
```

```
g /@ Table[x, {x, -3, 3, 1}]
```

```
{Sin[3]^2, Sin[2]^2, Sin[1]^2, 0, Sin[1]^2, Sin[2]^2, Sin[3]^2}
```

```
a = {None, {"x", "f[x]+g[x]", "f[x]*g[x]"}}
```

```
{None, {x, f[x]+g[x], f[x]*g[x]}}
```

```
b = Table[{k * π, f[k * π] + g[k * π], f[k * π] * g[k * π]}, {k, -3, 3, 1}]
```

```
{{-3 π, 2, -3}, {-2 π, 1, 0}, {-π, -1, 0}, {0, 1, 0}, {π, -1, 0}, {2 π, 1, 0}, {3 π, -1, 0}}
```

```
c = TableForm[b, TableHeadings → a]
```

x	f[x]+g[x]	f[x]*g[x]
-3 π	2	-3
-2 π	1	0
-π	-1	0
0	1	0
π	-1	0
2 π	1	0
3 π	-1	0

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