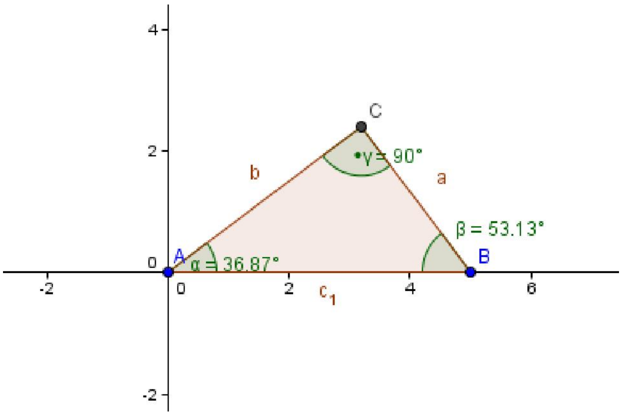
Winkelfunktionen am rechtwinkeligen Dreieck

1 Geogebra-Konstruktion

Figure 1:



1.1 Gegebene Katheten

```
(%i1) a:3;b:4;
(%o1) 3
(%o2) 4
```

1.2 Pythagoras

```
(%i3) c:sqrt(a**2+b**2);
(%o3) 5
```

1.3 Lösung für Alpha

```
(%i4) g:sin(%alpha)=a/c;
```

(%o4) $\sin(\%alpha)=\frac{3}{5}$

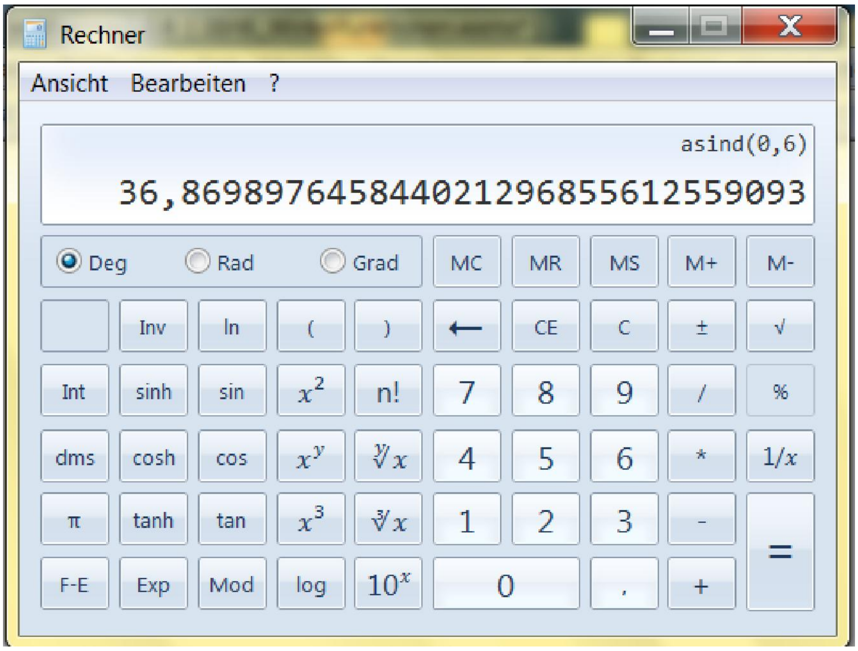
```
(%i5) l:solve(g,%alpha),numer;
rat: replaced -0.6 by -3/5 = -0.6
rat: replaced -0.6 by -3/5 = -0.6
rat: replaced 0.2 by 1/5 = 0.2
solve: using arc-trig functions to get a solution.
Some solutions will be lost.
rat: replaced 0.64350110879328 by 12491/19411 = 0.64350110761939
rat: replaced 0.64350110761939 by 10778/16749 = 0.64350110454355
rat: replaced -5.970505701832946E-5 by -1/16749 = -5.970505701832946E-5
rat: replaced -0.6435011045436 by -10778/16749 = -0.6435011045436
(%o5) [%alpha=0.64350110454355]
```

```
(%i6) %alpha:ev(%alpha,l);
(%o6) 0.64350110454355
```

```
(%i7) %alpha:%alpha*180/%pi,numer;
(%o7) 36.86989740235245
```

1.4 mit Taschenrechner

Figure 2:



1.5 Lösung für Beta

```
(%i8) g:sin(%beta)=b/c;
```

(%o8) $\sin(\%beta)=\frac{4}{5}$

```
(%i9) l:solve(g,%beta),numer;
rat: replaced -0.8 by -4/5 = -0.8
rat: replaced -0.8 by -4/5 = -0.8
rat: replaced 0.2 by 1/5 = 0.2
solve: using arc-trig functions to get a solution.
Some solutions will be lost.
rat: replaced 0.92729521800161 by 6747/7276 = 0.92729521715228
rat: replaced 0.92729521715228 by 6747/7276 = 0.92729521715228
rat: replaced -1.37438152831226E-4 by -1/7276 = -1.37438152831226E-4
rat: replaced -0.9272952171523 by -6747/7276 = -0.9272952171523
(%o9) [%beta=0.92729521715228]
```

```
(%i10) %beta:ev(%beta,l);
(%o10) 0.92729521715228
```

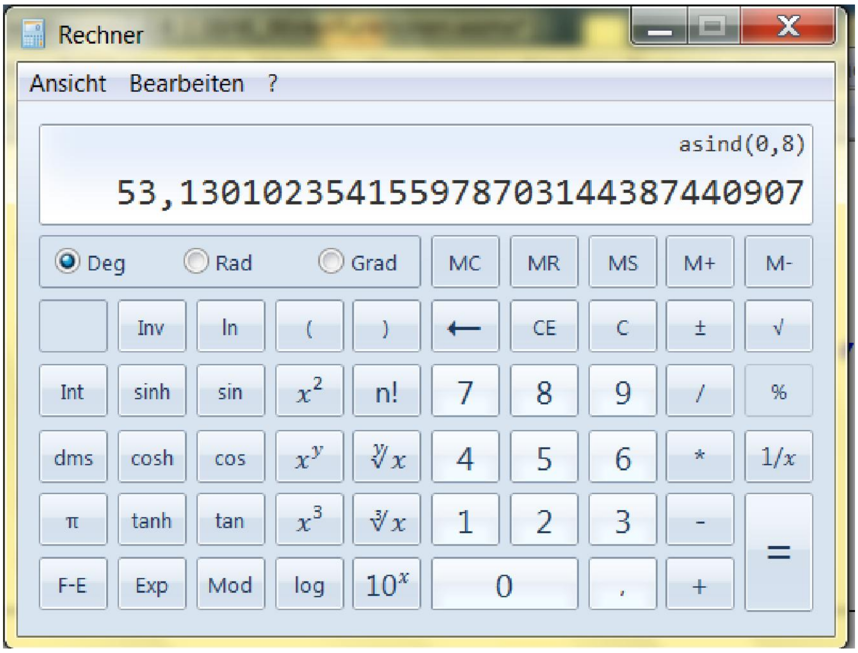
```
(%i11) %beta:%beta*180/%pi,numer;
(%o11) 53.13010230549291
```

Kontrolle

```
(%i12) %alpha+%beta;
(%o12) 89.99999970784536
```

1.6 mit Taschenrechner

Figure 3:



2 Definitionen

```
Sinus eines Winkels = GK/H
Cosinus eines Winkels = AK/H
Tangens eines Winkels = GK/AK
```

(%i13) kill(all);

(%o0) *done*

3 Übungsaufgabe

3.1 Gegebene Katheten

(%i1) a:7;b:10;

(%o1) 7

(%o2) 10

3.2 Hypothenuse

(%i3) c:sqrt(a**2+b**2);

(%o3) $\sqrt{149}$

3.3 Lösung für Alpha

(%i4) g:sin(%alpha)=a/c;

(%o4) $\sin(\%alpha)=\frac{7}{\sqrt{149}}$

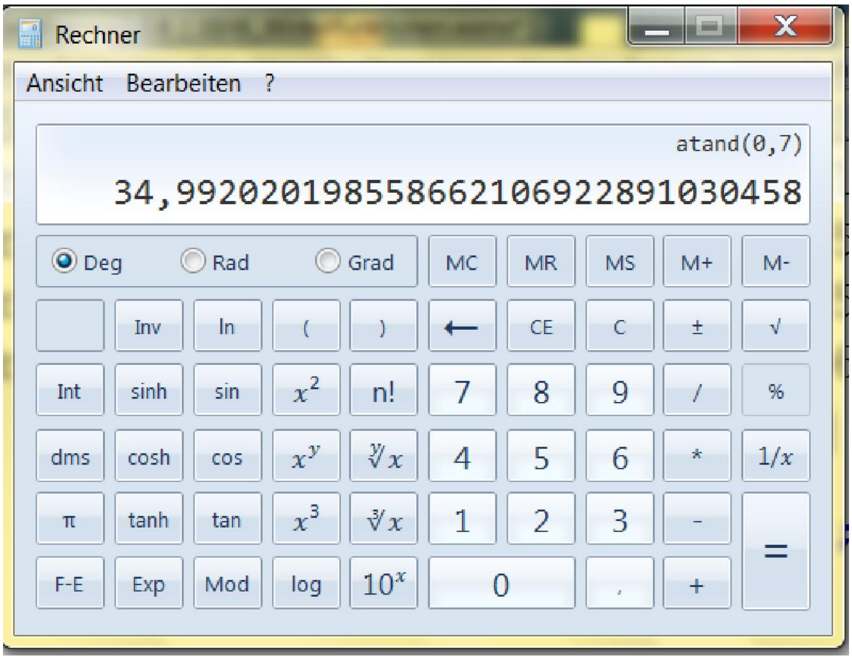
```
(%i5) l:solve(g,%alpha),numer;
rat: replaced -0.5734623443633 by -4149/7235 = -0.5734623358673
rat: replaced -0.5734623358673 by -4149/7235 = -0.5734623358673
rat: replaced 1.3821700069108501E-4 by 1/7235 = 1.3821700069108501E-4
solve: using arc-trig functions to get a solution.
Some solutions will be lost.
rat: replaced 0.6107259540185 by 7664/12549 = 0.6107259542593
rat: replaced 0.6107259542593 by 4669/7645 = 0.6107259646828
rat: replaced -1.3080444735120 99E-4 by -1/7645 = -1.308044473512099E-4
rat: replaced -0.6107259646828 by -4669/7645 = -0.6107259646828
(%o5) [%alpha=0.6107259646828]
```

```
(%i6) %alpha:ev(%alpha,l);
(%o6) 0.6107259646828
```

```
(%i7) %alpha:%alpha*180/%pi,numer;
(%o7) 34.99202021538017
```

3.4 Taschenrechner mit Tangens

Figure 4:



HÜ: Buch Trigonometrie - die ersten 4 Seiten