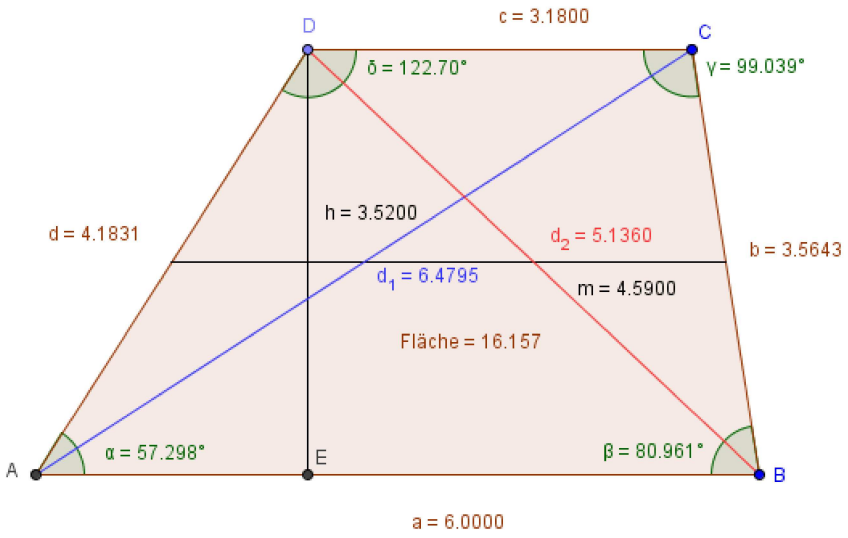
Trapez

Dokumentnummer: DX1321
Fachgebiet: Geometrie, Trigonometrie,
Sinussatz, Cosinussatz
Einsatz: 3HAK (zweites Lernjahr)

1 Angabe Musterbeispiel

Figure 1: Von einem Trapez kennt man die Seiten
a, b, c und d - alle anderen Größen sind gesucht!



2 Lösung

```
(%o0) done
```

2.1 Eingabe der Seiten

```
(%o1) 6
(%o2) 3.5643
(%o3) 3.18
(%o4) 4.1831
```

2.2 Berechnung der Mittellinie

```
(%o5) 4.59
```

2.3 Berechnung der Höhe

Die Formel für die Berechnung der Höhe habe ich in der deutschen Wikipedia gefunden. Sie war mir vorher nicht bekannt.

```
(%i6) s:1/2*(a+b+d-c);
(%o6) 5.2837
```

```
(%i7) h:2/(a-c)*sqrt(s*(s+c-a)*(s-b)*(s-d));
      h:floor(h*100+0.5)/100.0;
(%o7) 3.520035878295952
(%o8) 3.52
```

2.4 Berechnung der Fläche

```
(%i9) A:(a+c)/2*h;
      A:m*h;
      A:floor(A*100+0.5)/100.0;
(%o9) 16.1568
(%o10) 16.1568
(%o11) 16.16
```

2.5 Berechnung von Alpha

```
(%i12) g:sin(alpha)=h/d;
(%o12) sin(alpha)=0.84148119815448
```

```
(%i13) l:solve(g,alpha),numer;
rat: replaced -0.8414811981545 by -4613/5482 = -0.8414812112368
rat: replaced -0.8414812112368 by -4613/5482 = -0.8414812112368
rat: replaced 1.8241517694272163E-4 by 1/5482 = 1.8241517694272163E-4
solve: using arc-trig functions to get a solution.
Some solutions will be lost.
rat: replaced 1.000018927514276 by 52834/52833 = 1.000018927564212
rat: replaced 1.000018927564212 by 52834/52833 = 1.000018927564212
rat: replaced -1.892756421176159E-5 by -1/52833 = -1.892756421176159E-5
rat: replaced -1.00001892756421 by -52834/52833 = -1.00001892756421
(%o13) [alpha=1.000018927564212]
```

```
(%i14) alpha:ev(alpha,l);
       alphag:alpha*180/%pi,numer;
       alphag:floor(alphag*100+0.5)/100.0;
(%o14) 1.000018927564212
(%o15) 57.29686398262812
(%o16) 57.3
```

2.6 Berechnung von Beta

```
(%i17) g:sin(beta)=h/b;
(%o17) sin(beta)=0.98757119209943
```

```
(%i17) -->  l:solve(g,beta),numer;
rat: replaced -0.9875711920994 by -1907/1931 = -0.9875712066287
rat: replaced -0.9875712066287 by -1907/1931 = -0.9875712066287
rat: replaced 5.1786639047125837E-4 by 1/1931 = 5.1786639047125837E-4
solve: using arc-trig functions to get a solution.
Some solutions will be lost.
rat: replaced 1.412969682265655 by 12071/8543 = 1.412969682781224
rat: replaced 1.412969682781224 by 12071/8543 = 1.412969682781224
rat: replaced -1.170548987475126E-4 by -1/8543 = -1.170548987475126E-4
rat: replaced -1.41296968278122 by -12071/8543 = -1.41296968278122
(%o18) [beta=1.412969682781224]
```

```
(%i19) -->  beta:ev(beta,l);
            betag:beta*180/%pi;
            betag:floor(betag*100+0.5)/100.0;
(%o19) 1.412969682781224
                                  254.3345429006204
(%o20)                            ------------------
                                          %pi
(%o21) 80.95999999999999
```

2.7 Berechnung von Gamma und Delta

```
(%i22) -->  gammag:180-betag;
            deltag:180-alphag;
(%o22) 99.04000000000001
(%o23) 122.7
```

2.8 Berechnung der Diagonalen

```
(%i24) -->  g:d1**2=a**2+b**2-2*a*b*cos(beta);
                      2
(%o24)               d1 =41.9817264931304
```

```
(%i25) -->  d1:sqrt(rhs(g));
            d1:floor(d1*100+0.5)/100.0;
(%o25) 6.479330713363101
(%o26) 6.48
```

```
(%i27) -->  g:d2**2=a**2+d**2-2*a*d*cos(alpha);
                      2
(%o27)               d2 =26.37746219734247
```

```
(%i28) -->  d2:sqrt(rhs(g));
            d2:floor(d2*100+0.5)/100.0;
(%o28) 5.135899356231825
(%o29) 5.14
```