

Regelmäßige Vielecke

Dokumentnummer: DX1705

Fachgebiet: Geometrie, Planimetrie,
Trigonometrie

Einsatz: 3HAK (zweites Lernjahr)

Quelle: <http://www.matheass.de> (um die Aufgaben zu erstellen).



1 Aufgabe

1.1 Was gegeben ist

Figure 1: Ein Sechseck

Eckenzahl n =	<input type="text" value="6"/>	
Seite a =	<input type="text" value="5"/>	
Umkreisradius ru =	<input type="text"/>	
Inkreisradius ri =	<input type="text"/>	
Umfang u =	<input type="text"/>	
Fläche A =	<input type="text"/>	

```
(%i1) kill(all);
```

```
(%o0) done
```

1.2 Lösung

```
(%i1) a:5;
```

```
      n:6;
```

```
(%o1) 5
```

```
(%o2) 6
```

```
(%i3) GK:a/2;
```

```
(%o3) 5/2
```

```
(%i4) alpha:360/(2*n)*%pi/180;
```

```
(%o4) pi/6
```

```
(%i5) g:GK/ru=sin(alpha);
```

```
(%o5) 5/2 = 1/2
```

```
(%i6) l:solve(g,ru);
```

```
(%o6) [ru=5]
```

```
(%i7) H:ru,l;
```

```
(%o7) 5
```

```

(%i8) g:ri/H=cos(alpha);
(%o8)  $\frac{ri}{5} = \frac{\sqrt{3}}{2}$ 

(%i9) l:solve(g,ri);
(%o9) [ri= $\frac{5\sqrt{3}}{2}$ ]

(%i10) AK:ri,l;
AK:floor(AK*1000+0.5)/1000.0;
(%o10)  $\frac{5\sqrt{3}}{2}$ 
(%o11) 4.33

(%i12) u:n*a;
(%o12) 30

(%i13) A:GK*AK*n;
A:floor(A*1000+0.5)/1000.0;
(%o13) 64.94999999999999
(%o14) 64.95

```

2 Aufgabe

2.1 Was gegeben ist

Figure 2: Ein Fünfeck

```

(%i15) kill(all);
(%o0) done

```

2.2 Lösung

```

(%i1) n:5;ru:5;
(%o1) 5
(%o2) 5

(%i3) alpha:360/(2*n)*%pi/180;
(%o3)  $\frac{\pi}{5}$ 

(%i4) H:ru;
(%o4) 5

```

```

(%i5) g:sin(alpha)=GK/H;
(%o5)  $\sin\left(\frac{\pi}{5}\right)=\frac{GK}{5}$ 

(%i6) l:solve(g,GK);
(%o6) [ GK = 5  $\sin\left(\frac{\pi}{5}\right)$  ]

(%i7) GK:ev(GK,l);
(%o7) 5  $\sin\left(\frac{\pi}{5}\right)$ 

(%i8) a:2*GK,l;
(%o8) 10  $\sin\left(\frac{\pi}{5}\right)$ 

(%i9) a:floor(a*1000+0.5)/1000.0;
(%o9) 5.878

(%i10) g:cos(alpha)=AK/H;
(%o10)  $\cos\left(\frac{\pi}{5}\right)=\frac{AK}{5}$ 

(%i11) l:solve(g,AK);
(%o11) [ AK = 5  $\cos\left(\frac{\pi}{5}\right)$  ]

(%i12) ri:AK,l;
(%o12) 5  $\cos\left(\frac{\pi}{5}\right)$ 

(%i13) ri:floor(ri*1000+0.5)/1000.0;
(%o13) 4.045

(%i14) u:a*n;
(%o14) 29.39

(%i15) GK;ri;n;
(%o15) 5  $\sin\left(\frac{\pi}{5}\right)$ 
(%o16) 4.045
(%o17) 5

(%i18) A:GK*ri*n;
          A:floor(A*1000+0.5)/1000.0;
(%o18) 101.125  $\sin\left(\frac{\pi}{5}\right)$ 
(%o19) 59.44

```

□ **3 Aufgabe**

3.1 Was gegeben ist

Figure 3: Ein weiteres Fünfeck

```
(%i20) kill(all);
(%o0) done
```

3.2 Lösung

```
(%i1) n:5$ri:5$
```

```
(%i3) winkel:360/(2*n);
      winkel:winkel*%pi/180;
```

```
(%o3) 36
```

```
(%o4)  $\frac{\pi}{5}$ 
```

```
(%i5) g:ri/ru=cos(winkel);
```

```
(%o5)  $\frac{5}{ru} = \cos\left(\frac{\pi}{5}\right)$ 
```

```
(%i6) l:solve(g,ru);
```

```
(%o6) [ ru =  $\frac{5}{\cos\left(\frac{\pi}{5}\right)}$  ]
```

```
(%i7) ru:ev(ru,l)$
      ru:floor(ru*100+0.5)/100.0;
```

```
(%o8) 6.18
```

```
(%i9) g:a/ri=tan(winkel);
```

```
(%o9)  $\frac{a}{5} = \tan\left(\frac{\pi}{5}\right)$ 
```

```
(%i10) l:solve(g,a);
```

```
(%o10) [ a =  $5 \tan\left(\frac{\pi}{5}\right)$  ]
```

```
(%i11) a:ev(a,l)$
      a:floor(a*100+0.5)/100.0$
      a:2*a;
```

```
(%o13) 7.26
```

```
[ (%i14) U:n*a;  
  (%o14) 36.3
```