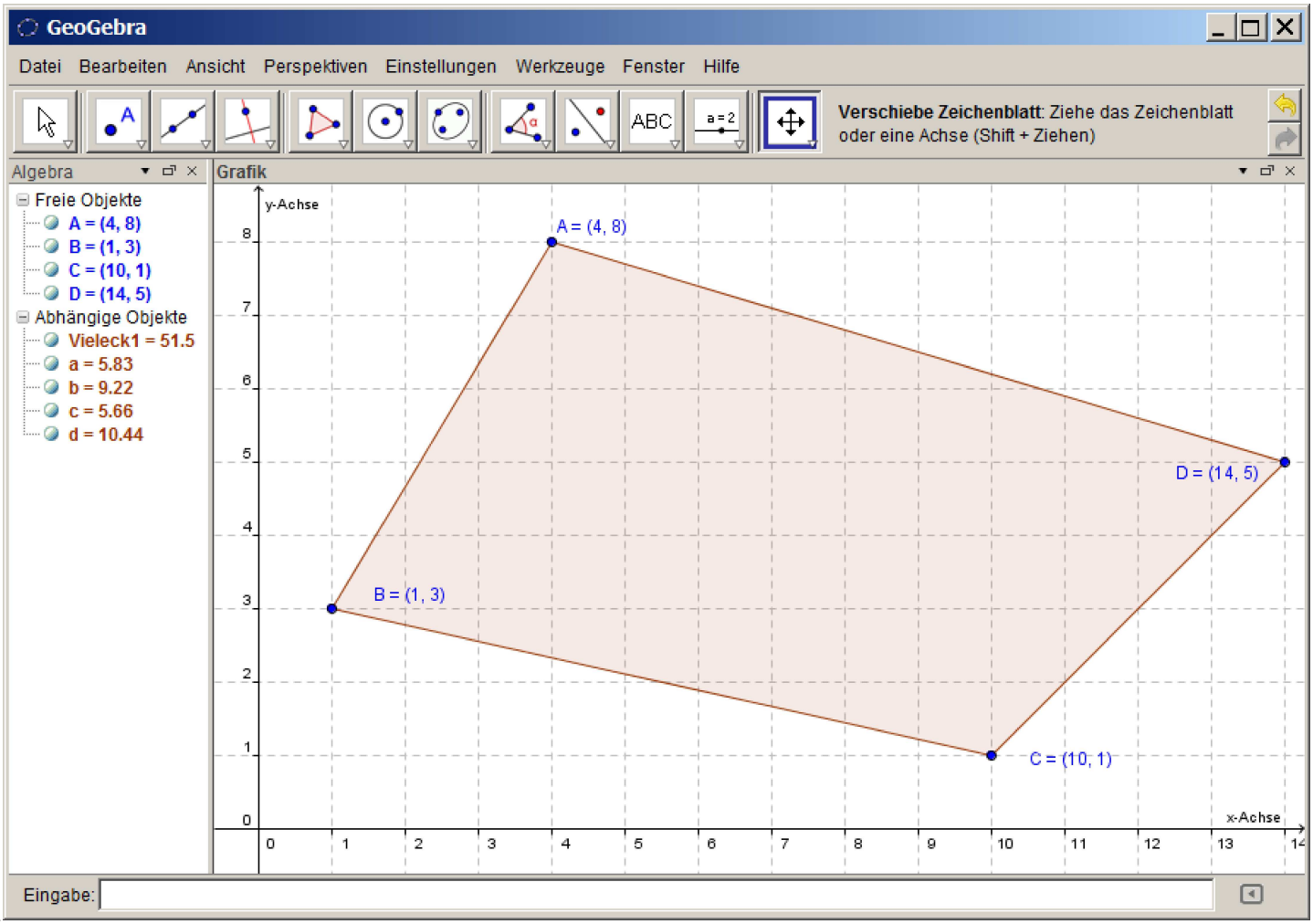
Fläche eines Vierecks

Dokumentnummer: DX1774
Fachgebiet: Geometrie, Planimetrie,
Dreieck, Distanzformel, Funktionen (von Listen),
Listenverarbeitung, Informatik
Einsatz: 3HAK (zweites Lernjahr)

1 Aufgabe

Figure 1:



2 Lösung

```
(%i30) kill(all);
(%o0) done
```

2.1 Eingabe

```
(%i1) A:[4,8];B:[1,3];C:[10,1];D:[14,5];
(%o1) [4,8]
(%o2) [1,3]
(%o3) [10,1]
(%o4) [14,5]
```

2.2 Verarbeitung

```
(%i5) d(X,Y):=sqrt((X[1]-Y[1])**2+(X[2]-Y[2])**2);
```

$$(\%o5)\quad d(X,Y):=\sqrt{(X_1-Y_1)^2+(X_2-Y_2)^2}$$

```
(%i6) AB:d(A,B);
      a:AB;
```

$$(\%o6)\quad \sqrt{34}$$

$$(\%o7)\quad \sqrt{34}$$

```
(%i8) BC:d(B,C);
      b:BC;
```

$$(\%o8)\quad \sqrt{85}$$

$$(\%o9)\quad \sqrt{85}$$

```
(%i10) CD:d(C,D);
       c:CD;
```

$$(\%o10)\quad 2^{5/2}$$

$$(\%o11)\quad 2^{5/2}$$

```
(%i12) DA:d(D,A);
       d:DA;
```

$$(\%o12)\quad \sqrt{109}$$

$$(\%o13)\quad \sqrt{109}$$

```
(%i14) AC:d(A,C);
       e:AC;
```

$$(\%o14)\quad \sqrt{85}$$

$$(\%o15)\quad \sqrt{85}$$

```
(%i16) BD:d(B,D);
       f:BD;
```

$$(\%o16)\quad \sqrt{173}$$

$$(\%o17)\quad \sqrt{173}$$

Dreieck a,b,e

```
(%i18) U:a+b+e;
```

$$(\%o18)\quad 2\sqrt{85}+\sqrt{34}$$

```
(%i19) s:U/2;
```

$$(\%o19)\quad \frac{2\sqrt{85}+\sqrt{34}}{2}$$

```
(%i20) A1:sqrt(s*(s-a)*(s-b)*(s-e));
```

$$(\%o20)\quad \frac{\sqrt{2\sqrt{85}+\sqrt{34}}\sqrt{\frac{2\sqrt{85}+\sqrt{34}}{2}-\sqrt{34}}\left(\frac{2\sqrt{85}+\sqrt{34}}{2}-\sqrt{85}\right)}{\sqrt{2}}$$

Dreieck e,c,d

```
(%i21) U:e+c+d;
```
$$(\%o21)\ \sqrt{109}+\sqrt{85}+2^{5/2}$$

```
(%i22) s:U/2;
```
$$(\%o22)\ \frac{\sqrt{109}+\sqrt{85}+2^{5/2}}{2}$$

```
(%i23) A2:sqrt(s*(s-e)*(s-c)*(s-d));
```
$$(\%o23)\ \frac{\sqrt{\sqrt{109}+\sqrt{85}+2^{5/2}}\sqrt{\frac{\sqrt{109}+\sqrt{85}+2^{5/2}}{2}-2^{5/2}}\sqrt{\frac{\sqrt{109}+\sqrt{85}+2^{5/2}}{2}-\sqrt{85}}\sqrt{\frac{\sqrt{109}+\sqrt{85}+2^{5/2}}{2}-\sqrt{109}}}{\sqrt{2}}$$

3 Ausgabe

```
(%i24) F:A1+A2$
       F:floor(F*1000+0.5)/1000.0;
(%o25) 51.5
```

4 Flächenberechner

```
(%i26) flaeche(A,B,C,D):=
              block(
                    d(X,Y):=sqrt((X[1]-Y[1])**2+(X[2]-Y[2])**2),
                    AB:d(A,B),
                    a:AB,
                    BC:d(B,C),
                    b:BC,
                    CD:d(C,D),
                    c:CD,
                    DA:d(D,A),
                    d:DA,
                    AC:d(A,C),
                    e:AC,
                    BD:d(B,D),
                    f:BD,
                    U:a+b+e,
                    s:U/2,
                    A1:sqrt(s*(s-a)*(s-b)*(s-e)),
                    U:e+c+d,
                    s:U/2,
                    A2:sqrt(s*(s-e)*(s-c)*(s-d)),
                    F:A1+A2,
                    F:floor(F*100+0.5)/100.0
              );
```
$$(\%o26)\ \mathrm{flaeche}(A,B,C,D):=\mathrm{block}\left(\mathrm{d}(X,Y):=\sqrt{(X_1-Y_1)^2+(X_2-Y_2)^2},\ AB:\mathrm{d}(A,B),\ a:AB,\ BC:\mathrm{d}(B,C),\ b:BC,\ CD:\mathrm{d}(C,D),\ c:CD,\ DA:\mathrm{d}(D,A),\ d:DA,\ AC:\mathrm{d}(A,C),\ e:AC,\ BD:\mathrm{d}(B,D),\ f:BD,\ U:a+b+e,\ s:\frac{U}{2},\ A1:\sqrt{s(s-a)(s-b)(s-e)},\ U:e+c+d,\ s:\frac{U}{2},\ A2:\sqrt{s(s-e)(s-c)(s-d)},\ F:A1+A2,\ F:\frac{\mathrm{floor}(F\,100+0.5)}{100.0}\right)$$

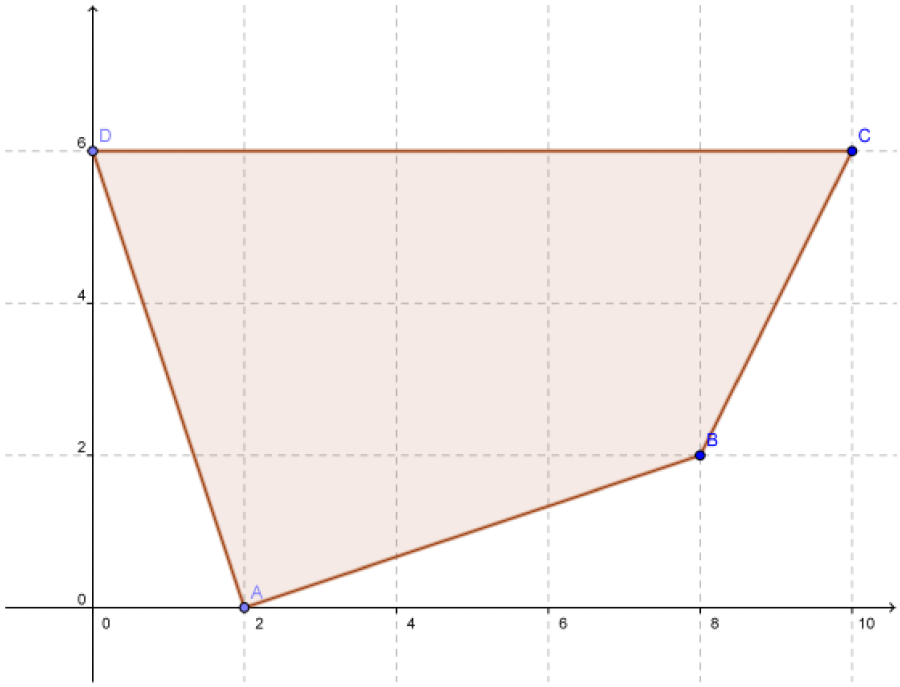
Test der Lösungsfunktion =
Programmtest

```
(%i27) flaeche([0,0],[4,0],[4,4],[0,4]),numer;
(%o27) 16.0
```

```
(%i28) A:[4,8];B:[1,3];C:[10,1];D:[14,5];
(%o28) [4,8]
(%o29) [1,3]
(%o30) [10,1]
(%o31) [14,5]
```

```
(%i32) flaeche(A,B,C,D);
(%o32) 51.5
```

Figure 2:Zeige, dass diese Fläche 40 FE hat.




```
(%i33) flaeche([2,0],[8,2],[10,6],[0,6]);
(%o33) 40.0
```