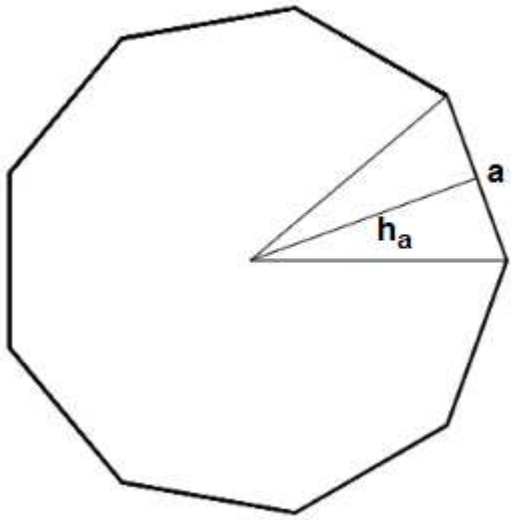
Michael Buhlmann

Mathematik-Aufgabenpool
> Berechnungen in regelmäßigen Vielecken I

Einleitung: Ein regelmäßiges Vieleck als regelmäßiges n-Eck mit n Ecken besteht aus n gleichschenkligen Dreiecken mit der Basisseite a und der Dreieckhöhe h_a. Daher lassen sich Umfang und Flächeninhalt des Vielecks berechnen als: $u = na$, $A = nah_a/2$.

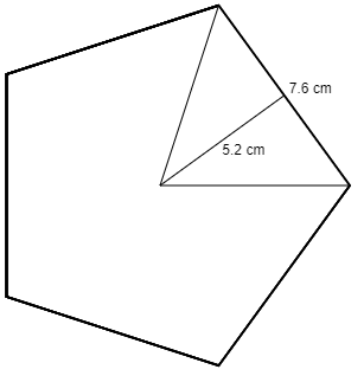
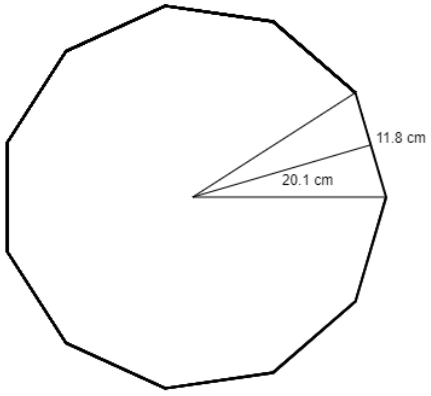
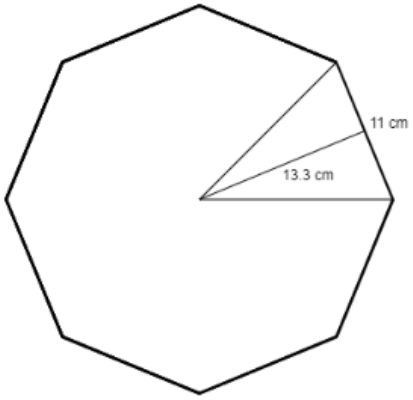


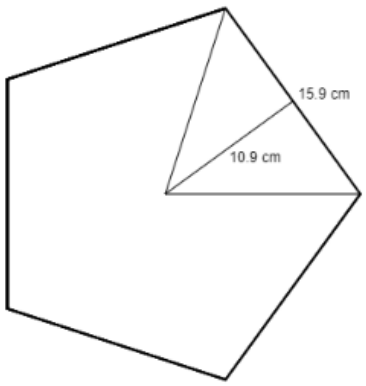
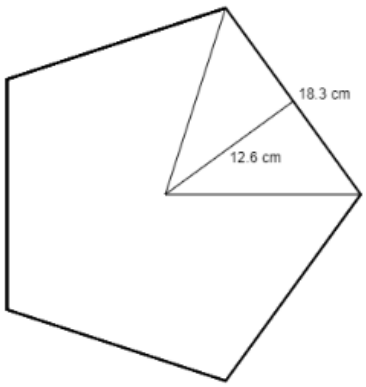
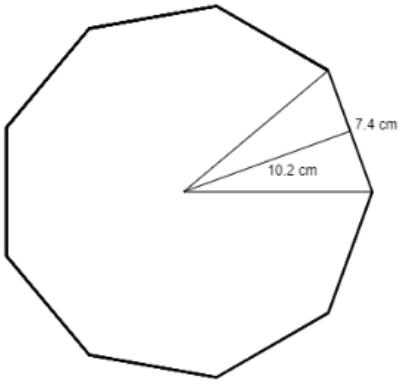
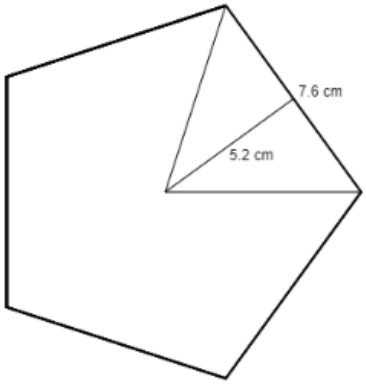
Regelmäßiges Vieleck: Eckenanzahl n, Seite a, Dreieckhöhe h_a

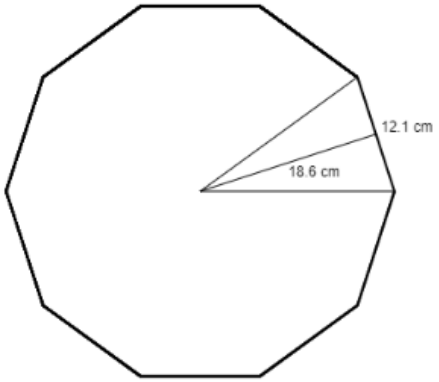
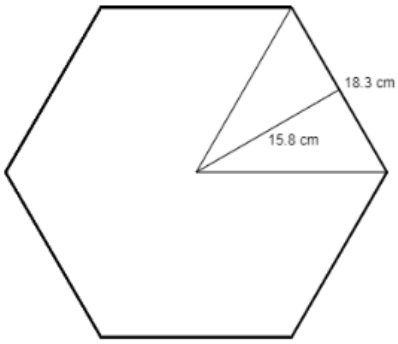
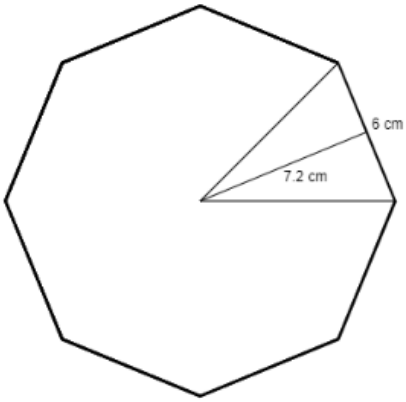
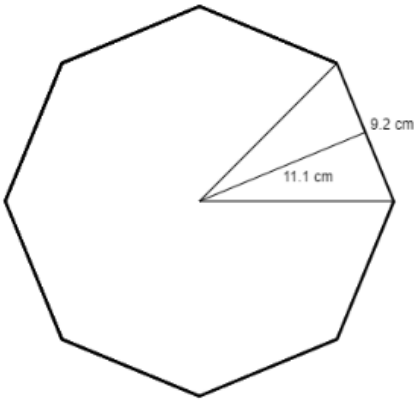
Formelsammlung:

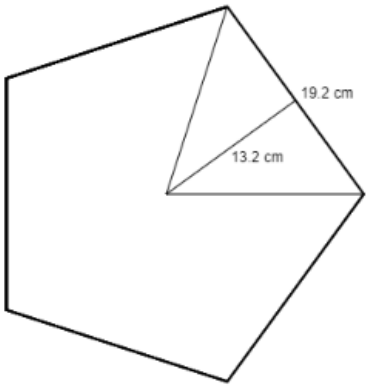
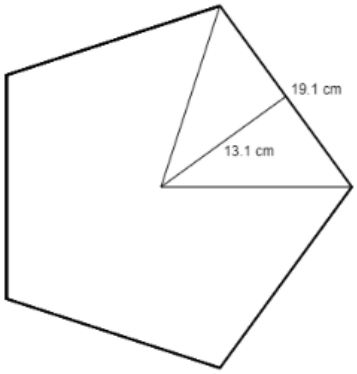
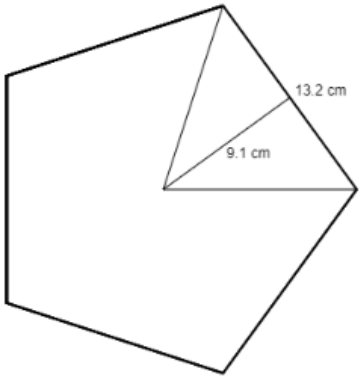
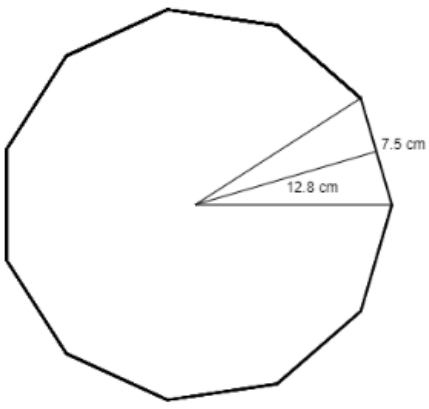
Eckenanzahl	n	
Umfang	u = na	
Seite	$a = \frac{u}{n}$	
Flächeninhalt	$A = \frac{nah_a}{2}$	$A = \frac{n}{2} ah_a$
Seite	$a = \frac{2A}{nh_a}$	
Dreieckhöhe	$h_a = \frac{2A}{na}$	

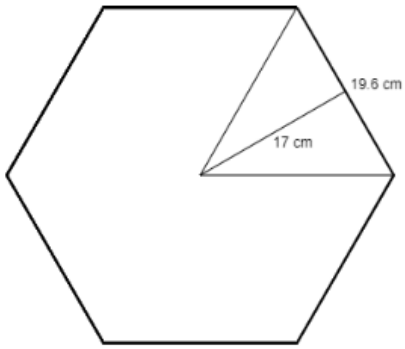
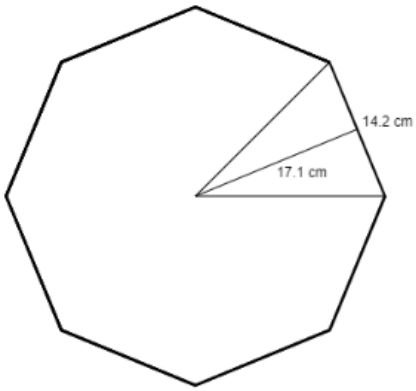
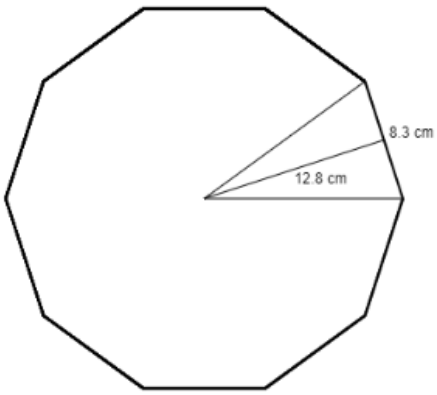
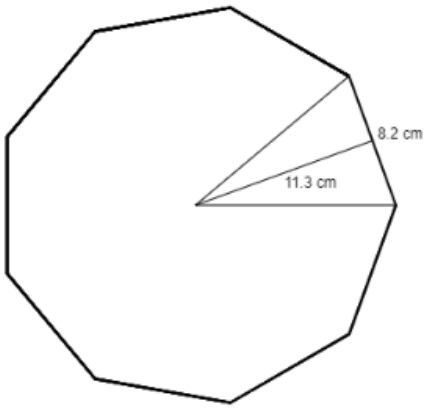
Aufgabe 1: Berechne Umfang und Flächeninhalt des regelmäßigen Vielecks (Seite a, Dreieckshöhe h_a, u = Umfang, A = Flächeninhalt).

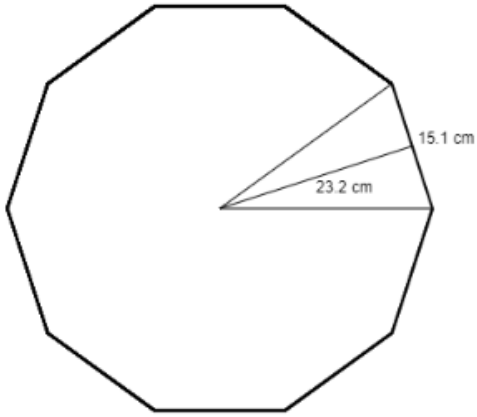
Nr.	*Gegeben:*	*Grafik:*
1	5-Eck: a = 7.6 cm, h_a = 5.2 cm	
2	11-Eck: a = 11.8 cm, h_a = 20.1 cm	
3	8-Eck: a = 11 cm, h_a = 13.3 cm	

4	5-Eck: a = 15.9 cm, h_a = 10.9 cm	
5	5-Eck: a = 18.3 cm, h_a = 12.6 cm	
6	9-Eck: a = 7.4 cm, h_a = 10.2 cm	
7	5-Eck: a = 7.6 cm, h_a = 5.2 cm	

8	10-Eck: a = 12.1 cm, h_a = 18.6 cm	
9	6-Eck: a = 18.3 cm, h_a = 15.8 cm	
10	8-Eck: a = 6 cm, h_a = 7.2 cm	
11	8-Eck: a = 9.2 cm, h_a = 11.1 cm	

12	5-Eck: a = 19.2 cm, h_a = 13.2 cm	
13	5-Eck: a = 19.1 cm, h_a = 13.1 cm	
14	5-Eck: a = 13.2 cm, h_a = 9.1 cm	
15	11-Eck: a = 7.5 cm, h_a = 12.8 cm	

16	6-Eck: a = 19.6 cm, h_a = 17 cm	
17	8-Eck: a = 14.2 cm, h_a = 17.1 cm	
18	10-Eck: a = 8.3 cm, h_a = 12.8 cm	
19	9-Eck: a = 8.2 cm, h_a = 11.3 cm	

20	10-Eck: a = 15.1 cm, h_a = 23.2 cm	

Vorgehensweise: Zur Ermittlung der fehlenden Größen beim regelmäßigen Vieleck ist die obige Formelsammlung anzuwenden.

Lösungen:

Nr.	*Gegeben:*	*Lösungen*
1	5-Eck: a = 7.6 cm, h_a = 5.2 cm	u = 38 cm, A = 98.8 cm^2
2	11-Eck: a = 11.8 cm, h_a = 20.1 cm	u = 129.8 cm, A = 1304.5 cm^2
3	8-Eck: a = 11 cm, h_a = 13.3 cm	u = 88 cm, A = 585.2 cm^2
4	5-Eck: a = 15.9 cm, h_a = 10.9 cm	u = 79.5 cm, A = 433.3 cm^2
5	5-Eck: a = 18.3 cm, h_a = 12.6 cm	u = 91.5 cm, A = 576.4 cm^2
6	9-Eck: a = 7.4 cm, h_a = 10.2 cm	u = 66.6 cm, A = 339.7 cm^2
7	5-Eck: a = 7.6 cm, h_a = 5.2 cm	u = 38 cm, A = 98.8 cm^2
8	10-Eck: a = 12.1 cm, h_a = 18.6 cm	u = 121 cm, A = 1125.3 cm^2
9	6-Eck: a = 18.3 cm, h_a = 15.8 cm	u = 109.8 cm, A = 867.4 cm^2
10	8-Eck: a = 6 cm, h_a = 7.2 cm	u = 48 cm, A = 172.8 cm^2
11	8-Eck: a = 9.2 cm, h_a = 11.1 cm	u = 73.6 cm, A = 408.5 cm^2
12	5-Eck: a = 19.2 cm, h_a = 13.2 cm	u = 96 cm, A = 633.6 cm^2
13	5-Eck: a = 19.1 cm, h_a = 13.1 cm	u = 95.5 cm, A = 625.5 cm^2
14	5-Eck: a = 13.2 cm, h_a = 9.1 cm	u = 66 cm, A = 300.3 cm^2
15	11-Eck: a = 7.5 cm, h_a = 12.8 cm	u = 82.5 cm, A = 528 cm^2
16	6-Eck: a = 19.6 cm, h_a = 17 cm	u = 117.6 cm, A = 999.6 cm^2
17	8-Eck: a = 14.2 cm, h_a = 17.1 cm	u = 113.6 cm, A = 971.3 cm^2
18	10-Eck: a = 8.3 cm, h_a = 12.8 cm	u = 83 cm, A = 531.2 cm^2
19	9-Eck: a = 8.2 cm, h_a = 11.3 cm	u = 73.8 cm, A = 417 cm^2
20	10-Eck: a = 15.1 cm, h_a = 23.2 cm	u = 151 cm, A = 1751.6 cm^2

Aufgabe 2: Berechne Umfang und Flächeninhalt des regelmäßigen Vielecks (Seite a, Dreieckshöhe h_a, u = Umfang, A = Flächeninhalt).

Nr.	*Gegeben:*
1	12-Eck: a = 38.8 cm, h_a = 72.4 cm
2	9-Eck: a = 91.5 cm, h_a = 125.7 cm
3	11-Eck: a = 43.2 cm, h_a = 73.6 cm

4	9-Eck: a = 59.1 cm, h_a = 81.2 cm
5	11-Eck: a = 36.2 cm, h_a = 61.6 cm
6	6-Eck: a = 66.5 cm, h_a = 57.6 cm
7	8-Eck: a = 36.4 cm, h_a = 43.9 cm
8	15-Eck: a = 57.9 cm, h_a = 136.2 cm
9	13-Eck: a = 84.8 cm, h_a = 172 cm
10	16-Eck: a = 52.6 cm, h_a = 132.2 cm
11	5-Eck: a = 30.6 cm, h_a = 21.1 cm
12	11-Eck: a = 94 cm, h_a = 160.1 cm
13	16-Eck: a = 27.2 cm, h_a = 68.4 cm
14	11-Eck: a = 38.1 cm, h_a = 64.9 cm
15	16-Eck: a = 97.4 cm, h_a = 244.8 cm
16	6-Eck: a = 67.5 cm, h_a = 58.5 cm
17	6-Eck: a = 6.8 cm, h_a = 5.9 cm
18	10-Eck: a = 92.6 cm, h_a = 142.5 cm
19	6-Eck: a = 29 cm, h_a = 25.1 cm
20	6-Eck: a = 49.3 cm, h_a = 42.7 cm
21	5-Eck: a = 13.2 cm, h_a = 9.1 cm
22	10-Eck: a = 20 cm, h_a = 30.8 cm
23	6-Eck: a = 5.9 cm, h_a = 5.1 cm
24	7-Eck: a = 58.8 cm, h_a = 61 cm
25	7-Eck: a = 92.7 cm, h_a = 96.2 cm
26	7-Eck: a = 11.6 cm, h_a = 12 cm
27	16-Eck: a = 54.8 cm, h_a = 137.7 cm
28	15-Eck: a = 90.5 cm, h_a = 212.9 cm
29	6-Eck: a = 6.6 cm, h_a = 5.7 cm
30	5-Eck: a = 30.9 cm, h_a = 21.3 cm

Vorgehensweise: Zur Ermittlung der fehlenden Größen beim regelmäßigen Vieleck ist die obige Formelsammlung anzuwenden.

Lösungen:

Nr.	Gegeben:	Lösungen
1	12-Eck: a = 38.8 cm, h_a = 72.4 cm	u = 465.6 cm, A = 16854.7 cm^2
2	9-Eck: a = 91.5 cm, h_a = 125.7 cm	u = 823.5 cm, A = 51757 cm^2
3	11-Eck: a = 43.2 cm, h_a = 73.6 cm	u = 475.2 cm, A = 17487.4 cm^2
4	9-Eck: a = 59.1 cm, h_a = 81.2 cm	u = 531.9 cm, A = 21595.1 cm^2
5	11-Eck: a = 36.2 cm, h_a = 61.6 cm	u = 398.2 cm, A = 12264.6 cm^2
6	6-Eck: a = 66.5 cm, h_a = 57.6 cm	u = 399 cm, A = 11491.2 cm^2
7	8-Eck: a = 36.4 cm, h_a = 43.9 cm	u = 291.2 cm, A = 6391.8 cm^2
8	15-Eck: a = 57.9 cm, h_a = 136.2 cm	u = 868.5 cm, A = 59144.9 cm^2
9	13-Eck: a = 84.8 cm, h_a = 172 cm	u = 1102.4 cm, A = 94806.4 cm^2
10	16-Eck: a = 52.6 cm, h_a = 132.2 cm	u = 841.6 cm, A = 55629.8 cm^2

11	5-Eck: a = 30.6 cm, h_a = 21.1 cm	u = 153 cm, A = 1614.2 cm^2
12	11-Eck: a = 94 cm, h_a = 160.1 cm	u = 1034 cm, A = 82771.7 cm^2
13	16-Eck: a = 27.2 cm, h_a = 68.4 cm	u = 435.2 cm, A = 14883.8 cm^2
14	11-Eck: a = 38.1 cm, h_a = 64.9 cm	u = 419.1 cm, A = 13599.8 cm^2
15	16-Eck: a = 97.4 cm, h_a = 244.8 cm	u = 1558.4 cm, A = 190748.2 cm^2
16	6-Eck: a = 67.5 cm, h_a = 58.5 cm	u = 405 cm, A = 11846.3 cm^2
17	6-Eck: a = 6.8 cm, h_a = 5.9 cm	u = 40.8 cm, A = 120.4 cm^2
18	10-Eck: a = 92.6 cm, h_a = 142.5 cm	u = 926 cm, A = 65977.5 cm^2
19	6-Eck: a = 29 cm, h_a = 25.1 cm	u = 174 cm, A = 2183.7 cm^2
20	6-Eck: a = 49.3 cm, h_a = 42.7 cm	u = 295.8 cm, A = 6315.3 cm^2
21	5-Eck: a = 13.2 cm, h_a = 9.1 cm	u = 66 cm, A = 300.3 cm^2
22	10-Eck: a = 20 cm, h_a = 30.8 cm	u = 200 cm, A = 3080 cm^2
23	6-Eck: a = 5.9 cm, h_a = 5.1 cm	u = 35.4 cm, A = 90.3 cm^2
24	7-Eck: a = 58.8 cm, h_a = 61 cm	u = 411.6 cm, A = 12553.8 cm^2
25	7-Eck: a = 92.7 cm, h_a = 96.2 cm	u = 648.9 cm, A = 31212.1 cm^2
26	7-Eck: a = 11.6 cm, h_a = 12 cm	u = 81.2 cm, A = 487.2 cm^2
27	16-Eck: a = 54.8 cm, h_a = 137.7 cm	u = 876.8 cm, A = 60367.7 cm^2
28	15-Eck: a = 90.5 cm, h_a = 212.9 cm	u = 1357.5 cm, A = 144505.9 cm^2
29	6-Eck: a = 6.6 cm, h_a = 5.7 cm	u = 39.6 cm, A = 112.9 cm^2
30	5-Eck: a = 30.9 cm, h_a = 21.3 cm	u = 154.5 cm, A = 1645.4 cm^2

Aufgabe 3: Berechne Umfang und Flächeninhalt des regelmäßigen Vielecks (Seite a, Dreieckshöhe h_a, u = Umfang, A = Flächeninhalt).

Nr.	*Gegeben:*
1	18-Eck: a = 42.8 m, h_a = 121.4 m
2	14-Eck: a = 60.5 cm, h_a = 132.5 cm
3	9-Eck: a = 53.8 mm, h_a = 73.9 mm
4	9-Eck: a = 28.1 m, h_a = 38.6 m
5	9-Eck: a = 41.9 dm, h_a = 57.6 dm
6	11-Eck: a = 17.7 dm, h_a = 30.1 dm
7	10-Eck: a = 90.9 cm, h_a = 139.9 cm
8	18-Eck: a = 59.1 m, h_a = 167.6 m
9	13-Eck: a = 6.1 mm, h_a = 12.4 mm
10	8-Eck: a = 66.2 dm, h_a = 79.9 dm
11	16-Eck: a = 38.8 cm, h_a = 97.5 cm
12	5-Eck: a = 20.2 cm, h_a = 13.9 cm
13	19-Eck: a = 54.8 m, h_a = 164.2 m
14	13-Eck: a = 42 dm, h_a = 85.2 dm
15	18-Eck: a = 46.7 mm, h_a = 132.4 mm
16	15-Eck: a = 30.4 m, h_a = 71.5 m
17	17-Eck: a = 77.4 m, h_a = 207 m

18	11-Eck: a = 7.1 mm, h_a = 12.1 mm
19	5-Eck: a = 17.2 dm, h_a = 11.8 dm
20	9-Eck: a = 89.9 cm, h_a = 123.5 cm
21	13-Eck: a = 19.1 dm, h_a = 38.7 dm
22	5-Eck: a = 56.4 m, h_a = 38.8 m
23	17-Eck: a = 11.5 m, h_a = 30.8 m
24	18-Eck: a = 76.6 mm, h_a = 217.2 mm
25	13-Eck: a = 66.8 cm, h_a = 135.5 cm
26	5-Eck: a = 8.2 m, h_a = 5.6 m
27	10-Eck: a = 26.1 mm, h_a = 40.2 mm
28	17-Eck: a = 11 dm, h_a = 29.4 dm
29	7-Eck: a = 53.4 mm, h_a = 55.4 mm
30	18-Eck: a = 53.5 mm, h_a = 151.7 mm

Vorgehensweise: Zur Ermittlung der fehlenden Größen beim regelmäßigen Vieleck ist die obige Formelsammlung anzuwenden.

Lösungen:

Nr.	*Gegeben:*	*Lösungen*
1	18-Eck: a = 42.8 m, h_a = 121.4 m	u = 770.4 m, A = 46763.3 m^2
2	14-Eck: a = 60.5 cm, h_a = 132.5 cm	u = 847 cm, A = 56113.8 cm^2
3	9-Eck: a = 53.8 mm, h_a = 73.9 mm	u = 484.2 mm, A = 17891.2 mm^2
4	9-Eck: a = 28.1 m, h_a = 38.6 m	u = 252.9 m, A = 4881 m^2
5	9-Eck: a = 41.9 dm, h_a = 57.6 dm	u = 377.1 dm, A = 10860.5 dm^2
6	11-Eck: a = 17.7 dm, h_a = 30.1 dm	u = 194.7 dm, A = 2930.2 dm^2
7	10-Eck: a = 90.9 cm, h_a = 139.9 cm	u = 909 cm, A = 63584.6 cm^2
8	18-Eck: a = 59.1 m, h_a = 167.6 m	u = 1063.8 m, A = 89146.4 m^2
9	13-Eck: a = 6.1 mm, h_a = 12.4 mm	u = 79.3 mm, A = 491.7 mm^2
10	8-Eck: a = 66.2 dm, h_a = 79.9 dm	u = 529.6 dm, A = 21157.5 dm^2
11	16-Eck: a = 38.8 cm, h_a = 97.5 cm	u = 620.8 cm, A = 30264 cm^2
12	5-Eck: a = 20.2 cm, h_a = 13.9 cm	u = 101 cm, A = 702 cm^2
13	19-Eck: a = 54.8 m, h_a = 164.2 m	u = 1041.2 m, A = 85482.5 m^2
14	13-Eck: a = 42 dm, h_a = 85.2 dm	u = 546 dm, A = 23259.6 dm^2
15	18-Eck: a = 46.7 mm, h_a = 132.4 mm	u = 840.6 mm, A = 55647.7 mm^2
16	15-Eck: a = 30.4 m, h_a = 71.5 m	u = 456 m, A = 16302 m^2
17	17-Eck: a = 77.4 m, h_a = 207 m	u = 1315.8 m, A = 136185.3 m^2
18	11-Eck: a = 7.1 mm, h_a = 12.1 mm	u = 78.1 mm, A = 472.5 mm^2
19	5-Eck: a = 17.2 dm, h_a = 11.8 dm	u = 86 dm, A = 507.4 dm^2
20	9-Eck: a = 89.9 cm, h_a = 123.5 cm	u = 809.1 cm, A = 49961.9 cm^2
21	13-Eck: a = 19.1 dm, h_a = 38.7 dm	u = 248.3 dm, A = 4804.6 dm^2
22	5-Eck: a = 56.4 m, h_a = 38.8 m	u = 282 m, A = 5470.8 m^2
23	17-Eck: a = 11.5 m, h_a = 30.8 m	u = 195.5 m, A = 3010.7 m^2
24	18-Eck: a = 76.6 mm, h_a = 217.2 mm	u = 1378.8 mm, A = 149737.7 mm^2
25	13-Eck: a = 66.8 cm, h_a = 135.5 cm	u = 868.4 cm, A = 58834.1 cm^2
26	5-Eck: a = 8.2 m, h_a = 5.6 m	u = 41 m, A = 114.8 m^2

27	10-Eck: a = 26.1 mm, h_a = 40.2 mm	u = 261 mm, A = 5246.1 mm^2
28	17-Eck: a = 11 dm, h_a = 29.4 dm	u = 187 dm, A = 2748.9 dm^2
29	7-Eck: a = 53.4 mm, h_a = 55.4 mm	u = 373.8 mm, A = 10354.3 mm^2
30	18-Eck: a = 53.5 mm, h_a = 151.7 mm	u = 963 mm, A = 73043.5 mm^2