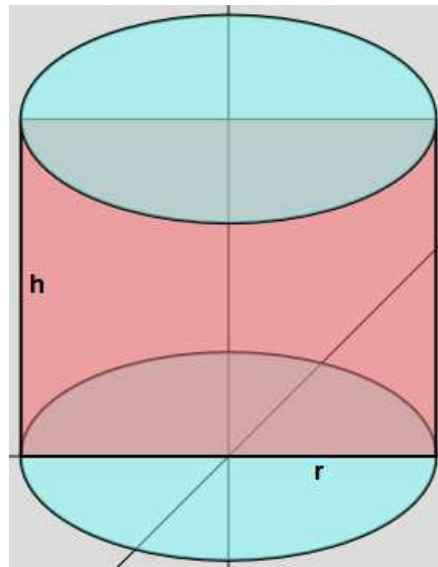


Mathematik-Aufgabenpool

> Zylinderberechnung

Einleitung: Ein (gerader) Zylinder mit einem Kreis als Grundfläche ist durch den Radius r des Kreises mit Durchmesser d und Kreisumfang u sowie durch die Zylinderhöhe h bestimmt, weiter durch die Grundfläche G , die Oberfläche O , die Mantelfläche M und das Volumen V . Es gilt: $d=2r$, $u=2\pi r$, $G=\pi r^2$, $M=2\pi r h$, $O=2G+M$, $V=Gh$.

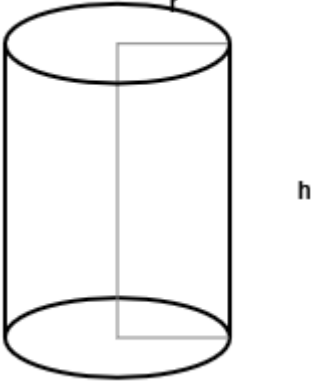
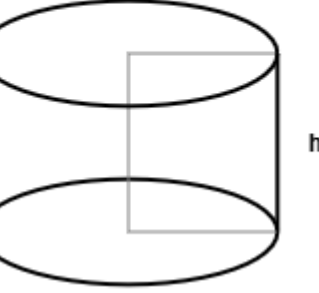
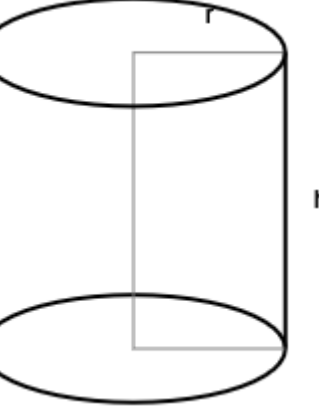
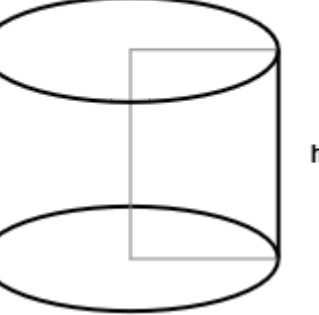


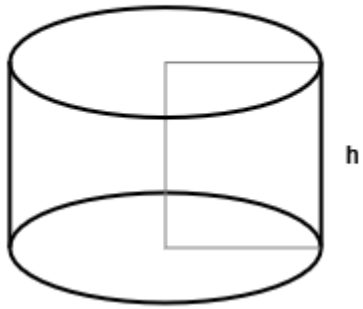
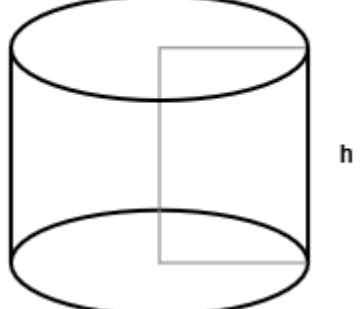
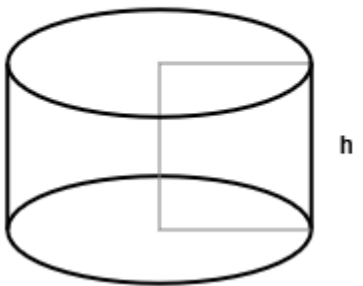
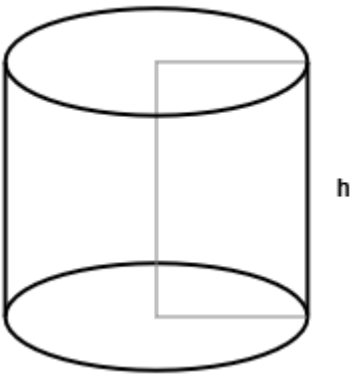
Zylinder: Radius r , Höhe h

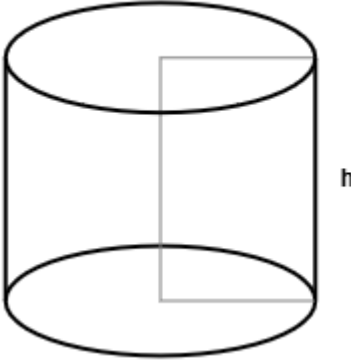
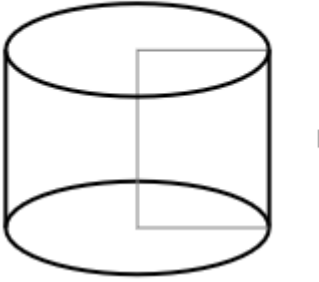
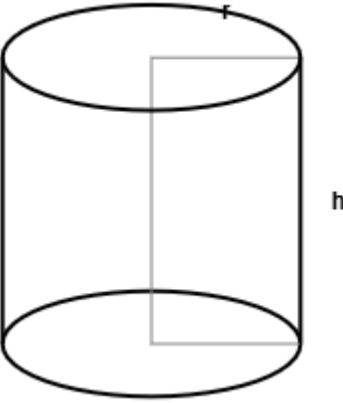
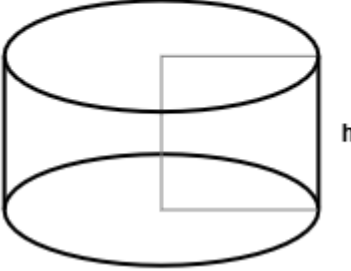
Formelsammlung:

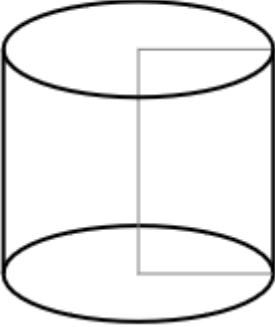
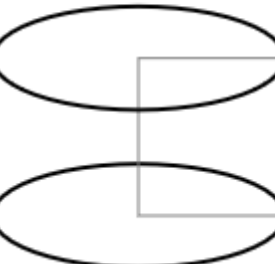

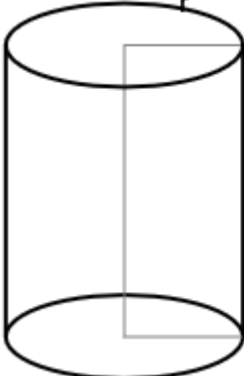
Grundfläche, Radius	$G = \pi r^2$	$r = \sqrt{\frac{G}{\pi}}$	
Durchmesser	$d = 2r$	$r = \frac{d}{2}$	
Kreisumfang	$u = 2\pi r$	$u = \pi d$	$r = \frac{u}{2\pi}$
Mantelfläche	$M = 2\pi r h$	$r = \frac{M}{2\pi h}$	$h = \frac{M}{2\pi r}$
	$O = 2 \cdot G + M = 2\pi r^2 + 2\pi r h = 2\pi r(r + h)$		
Oberfläche	$G = \frac{O - M}{2}$	$M = O - 2 \cdot G$	
		$r = -\frac{h}{2} + \sqrt{\frac{h^2}{4} + \frac{O}{2\pi}}$	$h = \frac{O}{2\pi r} - r$
Volumen	$V = G \cdot h = \pi r^2 h$	$r = \sqrt{\frac{V}{\pi h}}$	$h = \frac{V}{\pi r^2}$
Radius, Höhe	$r = \frac{2V}{M}$	$h = \frac{M^2}{4\pi V}$	$h = \frac{V}{G}$

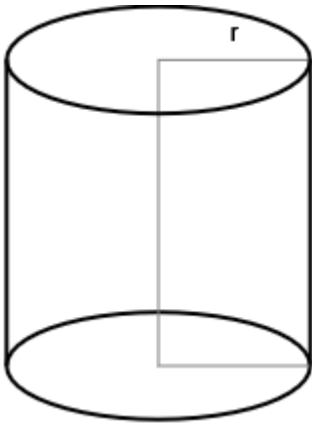
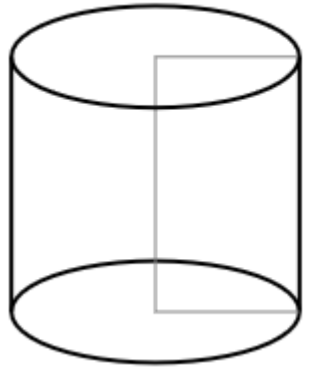
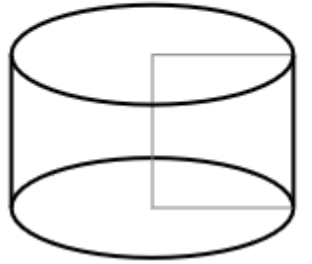
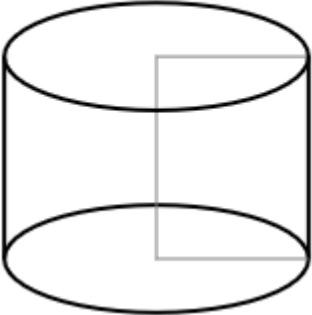
Aufgabe 1: Bestimme mit vorgegebenem Radius r und vorgegebener Höhe h den Durchmesser d , den Umfang u , die Grundfläche G , die Mantelfläche M , die Oberfläche O und das Volumen V des Zylinders.

Nr.	Gegeben:	Gesucht:	Grafik:
1	$r = 5.4 \text{ cm}, h = 14.1 \text{ cm}$	d, u, G, M, O, V	 <p>A 3D diagram of a cylinder. A horizontal line from the center of the top circular face to the edge is labeled 'r'. A vertical line along the right side of the cylinder is labeled 'h'.</p>
2	$r = 7.6 \text{ cm}, h = 9.1 \text{ cm}$	d, u, G, M, O, V	 <p>A 3D diagram of a cylinder. A horizontal line from the center of the top circular face to the edge is labeled 'r'. A vertical line along the right side of the cylinder is labeled 'h'.</p>
3	$r = 7.3 \text{ cm}, h = 14.2 \text{ cm}$	d, u, G, M, O, V	 <p>A 3D diagram of a cylinder. A horizontal line from the center of the top circular face to the edge is labeled 'r'. A vertical line along the right side of the cylinder is labeled 'h'.</p>
4	$r = 5.8 \text{ cm}, h = 8.2 \text{ cm}$	d, u, G, M, O, V	 <p>A 3D diagram of a cylinder. A horizontal line from the center of the top circular face to the edge is labeled 'r'. A vertical line along the right side of the cylinder is labeled 'h'.</p>

5	$r = 8.4 \text{ cm}, h = 10.0 \text{ cm}$	d, u, G, M, O, V	
6	$r = 6.7 \text{ cm}, h = 9.7 \text{ cm}$	d, u, G, M, O, V	
7	$r = 7.3 \text{ cm}, h = 8.0 \text{ cm}$	d, u, G, M, O, V	
8	$r = 8.6 \text{ cm}, h = 14.5 \text{ cm}$	d, u, G, M, O, V	

9	$r = 7.9 \text{ cm}, h = 12.4 \text{ cm}$	d, u, G, M, O, V	
10	$r = 4.0 \text{ cm}, h = 5.4 \text{ cm}$	d, u, G, M, O, V	
11	$r = 7.6 \text{ cm}, h = 14.6 \text{ cm}$	d, u, G, M, O, V	
12	$r = 9.4 \text{ cm}, h = 9.2 \text{ cm}$	d, u, G, M, O, V	

13	$r = 4.1 \text{ cm}, h = 6.8 \text{ cm}$	d, u, G, M, O, V	
14	$r = 5.3 \text{ cm}, h = 5.7 \text{ cm}$	d, u, G, M, O, V	
15	$r = 4.3 \text{ cm}, h = 13.5 \text{ cm}$	d, u, G, M, O, V	
16	$r = 5.0 \text{ cm}, h = 12.3 \text{ cm}$	d, u, G, M, O, V	

17	$r = 6.4 \text{ cm}$, $h = 12.9 \text{ cm}$	d, u, G, M, O, V	
18	$r = 4.8 \text{ cm}$, $h = 8.5 \text{ cm}$	d, u, G, M, O, V	
19	$r = 4.7 \text{ cm}$, $h = 5.1 \text{ cm}$	d, u, G, M, O, V	
20	$r = 10.0 \text{ cm}$, $h = 13.3 \text{ cm}$	d, u, G, M, O, V	

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

Lösungen:

Nr.	r=	d=	u=	G=	h=	M=	O=	V=
1	5.4 cm	10.8 cm	33.9 cm	91.6 cm ²	14.1 cm	478.4 cm ²	661.6 cm ²	1291.7 cm ³
2	7.6 cm	15.2 cm	47.8 cm	181.5 cm ²	9.1 cm	434.5 cm ²	797.5 cm ²	1651.3 cm ³
3	7.3 cm	14.6 cm	45.9 cm	167.4 cm ²	14.2 cm	651.3 cm ²	986.1 cm ²	2377.3 cm ³
4	5.8 cm	11.6 cm	36.4 cm	105.7 cm ²	8.2 cm	298.8 cm ²	510.2 cm ²	866.6 cm ³
5	8.4 cm	16.8 cm	52.8 cm	221.7 cm ²	10.0 cm	527.8 cm ²	971.2 cm ²	2216.7 cm ³
6	6.7 cm	13.4 cm	42.1 cm	141.0 cm ²	9.7 cm	408.3 cm ²	690.3 cm ²	1368.0 cm ³
7	7.3 cm	14.6 cm	45.9 cm	167.4 cm ²	8.0 cm	366.9 cm ²	701.7 cm ²	1339.3 cm ³
8	8.6 cm	17.2 cm	54.0 cm	232.4 cm ²	14.5 cm	783.5 cm ²	1248.3 cm ²	3369.1 cm ³
9	7.9 cm	15.8 cm	49.6 cm	196.1 cm ²	12.4 cm	615.5 cm ²	1007.7 cm ²	2431.2 cm ³
10	4.0 cm	8.0 cm	25.1 cm	50.3 cm ²	5.4 cm	135.7 cm ²	236.3 cm ²	271.4 cm ³
11	7.6 cm	15.2 cm	47.8 cm	181.5 cm ²	14.6 cm	697.2 cm ²	1060.2 cm ²	2649.3 cm ³
12	9.4 cm	18.8 cm	59.1 cm	277.6 cm ²	9.2 cm	543.4 cm ²	1098.6 cm ²	2553.8 cm ³
13	4.1 cm	8.2 cm	25.8 cm	52.8 cm ²	6.8 cm	175.2 cm ²	280.8 cm ²	359.1 cm ³
14	5.3 cm	10.6 cm	33.3 cm	88.2 cm ²	5.7 cm	189.8 cm ²	366.2 cm ²	503.0 cm ³
15	4.3 cm	8.6 cm	27.0 cm	58.1 cm ²	13.5 cm	364.7 cm ²	480.9 cm ²	784.2 cm ³
16	5.0 cm	10.0 cm	31.4 cm	78.5 cm ²	12.3 cm	386.4 cm ²	543.4 cm ²	966.0 cm ³
17	6.4 cm	12.8 cm	40.2 cm	128.7 cm ²	12.9 cm	518.7 cm ²	776.1 cm ²	1660.0 cm ³
18	4.8 cm	9.6 cm	30.2 cm	72.4 cm ²	8.5 cm	256.4 cm ²	401.2 cm ²	615.2 cm ³
19	4.7 cm	9.4 cm	29.5 cm	69.4 cm ²	5.1 cm	150.6 cm ²	289.4 cm ²	353.9 cm ³
20	10.0 cm	20.0 cm	62.8 cm	314.2 cm ²	13.3 cm	835.7 cm ²	1464.1 cm ²	4178.3 cm ³

Aufgabe 2: Bestimme die fehlenden Größen (Radius r, Durchmesser d, Umfang u, Grundfläche G, Mantelfläche M, Oberfläche O, Volumen V) des Zylinders.

Nr.	Gegeben:	Gesucht:
1	G = 248.8 cm ² , O = 615.0 cm ²	r, d, u, h, M, V
2	u = 12.6 cm, M = 42.7 cm ²	r, d, G, h, O, V
3	d = 9.8 cm, h = 4.8 cm	r, u, G, M, O, V
4	u = 46.5 cm, O = 539.3 cm ²	r, d, G, h, M, V
5	h = 8.9 cm, V = 699.0 cm ³	r, d, u, G, M, O
6	d = 12.8 cm, V = 707.7 cm ³	r, u, G, h, M, O
7	h = 2.9 cm, M = 123.9 cm ²	r, d, u, G, O, V
8	d = 16.6 cm, M = 119.9 cm ²	r, u, G, h, O, V
9	u = 55.3 cm, O = 1000.8 cm ²	r, d, G, h, M, V
10	u = 8.8 cm, h = 2.5 cm	r, d, G, M, O, V
11	M = 93.3 cm ² , V = 70.0 cm ³	r, d, u, G, h, O
12	u = 17.6 cm, O = 98.5 cm ²	r, d, G, h, M, V
13	h = 2.6 cm, M = 63.7 cm ²	r, d, u, G, O, V
14	h = 7.1 cm, M = 107.1 cm ²	r, d, u, G, O, V
15	G = 162.9 cm ² , M = 312.1 cm ²	r, d, u, h, O, V

16	$u = 30.8 \text{ cm}, V = 460.1 \text{ cm}^3$	r, d, G, h, M, O
17	$h = 9.5 \text{ cm}, M = 328.3 \text{ cm}^2$	r, d, u, G, O, V
18	$d = 14.4 \text{ cm}, M = 54.3 \text{ cm}^2$	r, u, G, h, O, V
19	$M = 89.3 \text{ cm}^2, O = 109.7 \text{ cm}^2$	r, d, u, G, h, V
20	$G = 81.7 \text{ cm}^2, M = 48.1 \text{ cm}^2$	r, d, u, h, O, V

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

Lösungen:

Nr.	r=	d=	u=	G=	h=	M=	O=	V=
1	8.9 cm	17.8 cm	55.9 cm	248.8 cm ²	2.1 cm	117.4 cm ²	615.0 cm ²	522.6 cm ³
2	2.0 cm	4.0 cm	12.6 cm	12.6 cm ²	3.4 cm	42.7 cm ²	67.9 cm ²	42.7 cm ³
3	4.9 cm	9.8 cm	30.8 cm	75.4 cm ²	4.8 cm	147.8 cm ²	298.6 cm ²	362.1 cm ³
4	7.4 cm	14.8 cm	46.5 cm	172.0 cm ²	4.2 cm	195.3 cm ²	539.3 cm ²	722.5 cm ³
5	5.0 cm	10.0 cm	31.4 cm	78.5 cm ²	8.9 cm	279.6 cm ²	436.6 cm ²	699.0 cm ³
6	6.4 cm	12.8 cm	40.2 cm	128.7 cm ²	5.5 cm	221.2 cm ²	478.6 cm ²	707.7 cm ³
7	6.8 cm	13.6 cm	42.7 cm	145.3 cm ²	2.9 cm	123.9 cm ²	414.5 cm ²	421.3 cm ³
8	8.3 cm	16.6 cm	52.2 cm	216.4 cm ²	2.3 cm	119.9 cm ²	552.7 cm ²	497.8 cm ³
9	8.8 cm	17.6 cm	55.3 cm	243.3 cm ²	9.3 cm	514.2 cm ²	1000.8 cm ²	2262.5 cm ³
10	1.4 cm	2.8 cm	8.8 cm	6.2 cm ²	2.5 cm	22.0 cm ²	34.4 cm ²	15.4 cm ³
11	1.5 cm	3.0 cm	9.4 cm	7.1 cm ²	9.9 cm	93.3 cm ²	107.5 cm ²	70.0 cm ³
12	2.8 cm	5.6 cm	17.6 cm	24.6 cm ²	2.8 cm	49.3 cm ²	98.5 cm ²	69.0 cm ³
13	3.9 cm	7.8 cm	24.5 cm	47.8 cm ²	2.6 cm	63.7 cm ²	159.3 cm ²	124.2 cm ³
14	2.4 cm	4.8 cm	15.1 cm	18.1 cm ²	7.1 cm	107.1 cm ²	143.3 cm ²	128.5 cm ³
15	7.2 cm	14.4 cm	45.2 cm	162.9 cm ²	6.9 cm	312.1 cm ²	637.9 cm ²	1123.7 cm ³
16	4.9 cm	9.8 cm	30.8 cm	75.4 cm ²	6.1 cm	187.8 cm ²	338.6 cm ²	460.1 cm ³
17	5.5 cm	11.0 cm	34.6 cm	95.0 cm ²	9.5 cm	328.3 cm ²	518.3 cm ²	902.8 cm ³
18	7.2 cm	14.4 cm	45.2 cm	162.9 cm ²	1.2 cm	54.3 cm ²	380.1 cm ²	195.4 cm ³
19	1.8 cm	3.6 cm	11.3 cm	10.2 cm ²	7.9 cm	89.3 cm ²	109.7 cm ²	80.4 cm ³
20	5.1 cm	10.2 cm	32.0 cm	81.7 cm ²	1.5 cm	48.1 cm ²	211.5 cm ²	122.6 cm ³

Aufgabe 3: Bestimme die fehlenden Größen (Radius r, Durchmesser d, Umfang u, Grundfläche G, Mantelfläche M, Oberfläche O, Volumen V) des Zylinders.

Nr.	Gegeben:	Gesucht:
1	$u = 18.8 \text{ dm}, M = 231.8 \text{ dm}^2$	r, d, G, h, O, V
2	$M = 463.1 \text{ m}^2, O = 653.1 \text{ m}^2$	r, d, u, G, h, V
3	$u = 44.6 \text{ cm}, h = 2.1 \text{ cm}$	r, d, G, M, O, V
4	$u = 43.4 \text{ m}, h = 17.4 \text{ m}$	r, d, G, M, O, V
5	$u = 47.8 \text{ mm}, h = 8.4 \text{ mm}$	r, d, G, M, O, V
6	$h = 4.0 \text{ cm}, V = 60.8 \text{ cm}^3$	r, d, u, G, M, O
7	$u = 37.7 \text{ cm}, O = 923.6 \text{ cm}^2$	r, d, G, h, M, V
8	$r = 3.5 \text{ mm}, V = 696.6 \text{ mm}^3$	d, u, G, h, M, O
9	$G = 21.2 \text{ cm}^2, M = 96.4 \text{ cm}^2$	r, d, u, h, O, V

10	$G = 10.2 \text{ cm}^2, V = 76.3 \text{ cm}^3$	r, d, u, h, M, O
11	$G = 271.7 \text{ m}^2, O = 806.4 \text{ m}^2$	r, d, u, h, M, V
12	$M = 632.7 \text{ mm}^2, O = 1199.7 \text{ mm}^2$	r, d, u, G, h, V
13	$r = 3.1 \text{ dm}, O = 138.3 \text{ dm}^2$	d, u, G, h, M, V
14	$r = 4.9 \text{ mm}, O = 344.8 \text{ mm}^2$	d, u, G, h, M, V
15	$r = 7.8 \text{ mm}, h = 18.9 \text{ mm}$	d, u, G, M, O, V
16	$h = 15.6 \text{ dm}, M = 833.2 \text{ dm}^2$	r, d, u, G, O, V
17	$h = 14.7 \text{ mm}, O = 1046.1 \text{ mm}^2$	r, d, u, G, M, V
18	$d = 11.4 \text{ mm}, V = 1694.4 \text{ mm}^3$	r, u, G, h, M, O
19	$G = 271.7 \text{ mm}^2, V = 2037.9 \text{ mm}^3$	r, d, u, h, M, O
20	$r = 1.6 \text{ mm}, O = 133.6 \text{ mm}^2$	d, u, G, h, M, V

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

Lösungen:

Nr.	r=	d=	u=	G=	h=	M=	O=	V=
1	3.0 dm	6.0 dm	18.8 dm	28.3 dm ²	12.3 dm	231.8 dm ²	288.4 dm ²	347.8 dm ³
2	5.5 m	11.0 m	34.6 m	95.0 m ²	13.4 m	463.1 m ²	653.1 m ²	1273.4 m ³
3	7.1 cm	14.2 cm	44.6 cm	158.4 cm ²	2.1 cm	93.7 cm ²	410.5 cm ²	332.6 cm ³
4	6.9 m	13.8 m	43.4 m	149.6 m ²	17.4 m	754.4 m ²	1053.6 m ²	2602.5 m ³
5	7.6 mm	15.2 mm	47.8 mm	181.5 mm ²	8.4 mm	401.1 mm ²	764.1 mm ²	1524.3 mm ³
6	2.2 cm	4.4 cm	13.8 cm	15.2 cm ²	4.0 cm	55.3 cm ²	85.7 cm ²	60.8 cm ³
7	6.0 cm	12.0 cm	37.7 cm	113.1 cm ²	18.5 cm	697.4 cm ²	923.6 cm ²	2092.3 cm ³
8	3.5 mm	7.0 mm	22.0 mm	38.5 mm ²	18.1 mm	398.0 mm ²	475.0 mm ²	696.6 mm ³
9	2.6 cm	5.2 cm	16.3 cm	21.2 cm ²	5.9 cm	96.4 cm ²	138.8 cm ²	125.3 cm ³
10	1.8 cm	3.6 cm	11.3 cm	10.2 cm ²	7.5 cm	84.8 cm ²	105.2 cm ²	76.3 cm ³
11	9.3 m	18.6 m	58.4 m	271.7 m ²	4.5 m	263.0 m ²	806.4 m ²	1222.7 m ³
12	9.5 mm	19.0 mm	59.7 mm	283.5 mm ²	10.6 mm	632.7 mm ²	1199.7 mm ²	3005.4 mm ³
13	3.1 dm	6.2 dm	19.5 dm	30.2 dm ²	4.0 dm	77.9 dm ²	138.3 dm ²	120.8 dm ³
14	4.9 mm	9.8 mm	30.8 mm	75.4 mm ²	6.3 mm	194.0 mm ²	344.8 mm ²	475.2 mm ³
15	7.8 mm	15.6 mm	49.0 mm	191.1 mm ²	18.9 mm	926.3 mm ²	1308.5 mm ²	3612.4 mm ³
16	8.5 dm	17.0 dm	53.4 dm	227.0 dm ²	15.6 dm	833.2 dm ²	1287.2 dm ²	3540.9 dm ³
17	7.5 mm	15.0 mm	47.1 mm	176.7 mm ²	14.7 mm	692.7 mm ²	1046.1 mm ²	2597.7 mm ³
18	5.7 mm	11.4 mm	35.8 mm	102.1 mm ²	16.6 mm	594.5 mm ²	798.7 mm ²	1694.4 mm ³
19	9.3 mm	18.6 mm	58.4 mm	271.7 mm ²	7.5 mm	438.3 mm ²	981.7 mm ²	2037.9 mm ³
20	1.6 mm	3.2 mm	10.1 mm	8.0 mm ²	11.7 mm	117.6 mm ²	133.6 mm ²	94.1 mm ³

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