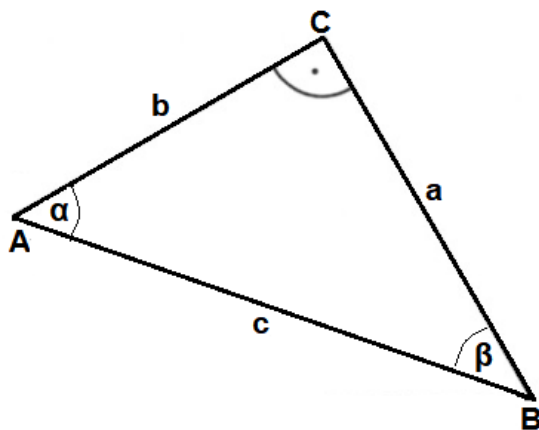


# Mathematik-Aufgabenpool

## > Trigonometrie I (rechtwinklige Dreiecke)

**Einleitung:** In einem rechtwinkligen Dreieck  $\triangle ABC$  mit den Seiten  $a$ ,  $b$ ,  $c$  und den Winkeln  $\alpha$ ,  $\beta$ ,  $\gamma$  bei  $\gamma = 90^\circ$  heißen  $a$  und  $b$  Katheten,  $c$  Hypotenuse. Die Kathete, die gegenüber einem Winkel  $\alpha$  oder  $\beta$  liegt, heißt Gegenkathete (bei Winkel  $\alpha$  Seite  $a$ , bei Winkel  $\beta$  Seite  $b$ ), die Kathete, die an einem Winkel  $\alpha$  oder  $\beta$  liegt, heißt Ankathete (bei Winkel  $\alpha$  Seite  $b$ , bei Winkel  $\beta$  Seite  $a$ ).

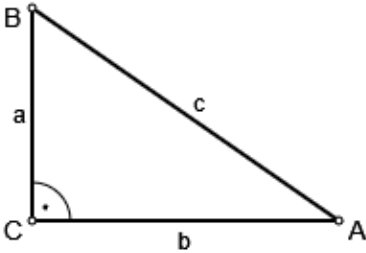
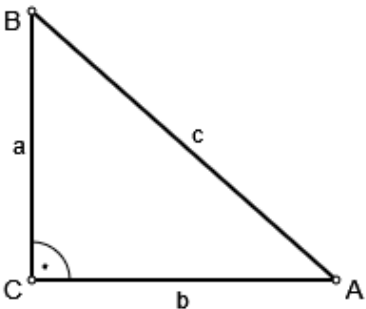
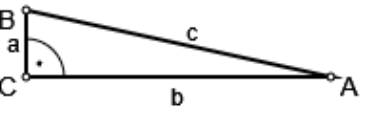
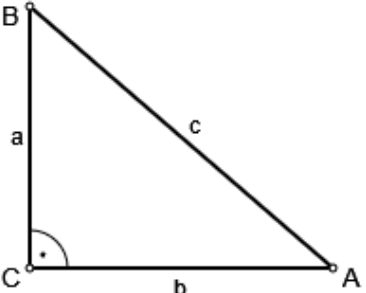


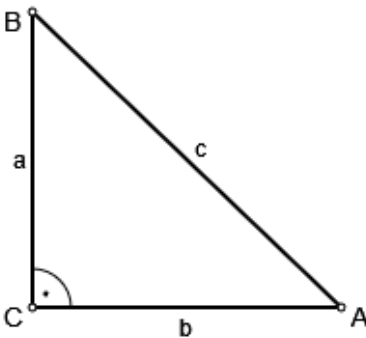
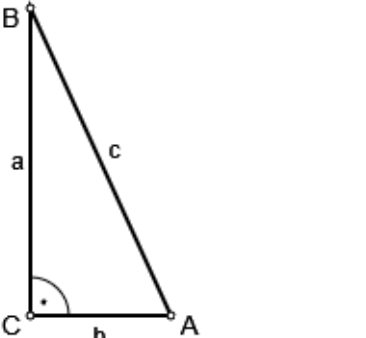
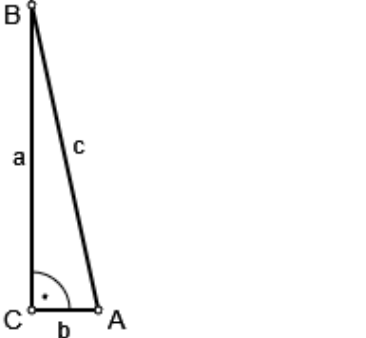
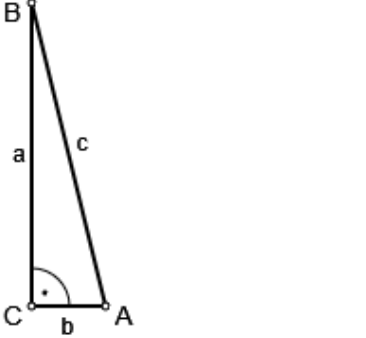
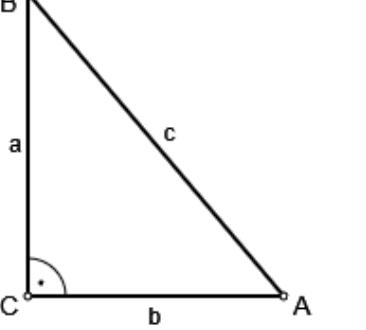
Rechtwinkliges Dreieck: Seiten  $a$ ,  $b$ ,  $c$ ; Winkel  $\alpha$ ,  $\beta$ ,  $\gamma=90^\circ$

**Formelsammlung:**

Satz des Pythagoras	$c^2 = a^2 + b^2 \Rightarrow c = \sqrt{a^2 + b^2}$ (Hypotenuse)		
	$a^2 = c^2 - b^2 \Rightarrow a = \sqrt{c^2 - b^2}$ (Kathete)		
	$b^2 = c^2 - a^2 \Rightarrow b = \sqrt{c^2 - a^2}$ (Kathete)		
Trigonometrische Beziehungen (Sinus, Kosinus, Tangens)	$\sin \alpha = \frac{a}{c} = \frac{\text{Gegenkathete}}{\text{Hypotenuse}}$	$\cos \alpha = \frac{b}{c} = \frac{\text{Ankathete}}{\text{Hypotenuse}}$	$\tan \alpha = \frac{a}{b} = \frac{\text{Gegenkathete}}{\text{Ankathete}}$
	$\sin \beta = \frac{b}{c} = \frac{\text{Gegenkathete}}{\text{Hypotenuse}}$	$\cos \beta = \frac{a}{c} = \frac{\text{Ankathete}}{\text{Hypotenuse}}$	$\tan \beta = \frac{b}{a} = \frac{\text{Gegenkathete}}{\text{Ankathete}}$
Winkel	$\alpha + \beta = 90^\circ$	$\alpha = 90^\circ - \beta$	$\beta = 90^\circ - \alpha$
Umfang	$u = a + b + c$		
Fläche	$A = \frac{1}{2} ab$		

**Aufgabe 1:** Berechne die fehlenden Größen im rechtwinkligen Dreieck  $\triangle ABC$  (Winkel  $\gamma = 90^\circ$ ,  $a, b$  = Katheten,  $c$  = Hypotenuse, Winkel  $\alpha, \beta$ ).

Nr.	Gegeben:	Grafik:
1	$a = 6.6 \text{ cm}, \alpha = 34.8^\circ$	
2	$a = 4.5 \text{ cm}, \beta = 48.6^\circ$	
3	$b = 9.5 \text{ cm}, \beta = 77.5^\circ$	
4	$c = 9.8 \text{ cm}, \alpha = 40.9^\circ$	

5	$a = 9.2 \text{ cm}, b = 9.6 \text{ cm}$	
6	$c = 5.1 \text{ cm}, \alpha = 65.5^\circ$	
7	$c = 6 \text{ cm}, \beta = 12.4^\circ$	
8	$c = 5.9 \text{ cm}, \beta = 13.8^\circ$	
9	$b = 3.7 \text{ cm}, \alpha = 49.9^\circ$	

10	$a = 1.8 \text{ cm}, b = 1.8 \text{ cm}$	
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**Vorgehensweise:** Zur Ermittlung der fehlenden Größen beim rechtwinkligen Dreieck ist die obige Formelsammlung anzuwenden.

**Lösungen:**

Nr.	Gegeben:	Lösungen
1	$a = 6.6 \text{ cm}, \alpha = 34.8^\circ$	$a = 6.6 \text{ cm}, b = 9.5 \text{ cm}, c = 11.6 \text{ cm}, \alpha = 34.8^\circ, \beta = 55.2^\circ$
2	$a = 4.5 \text{ cm}, \beta = 48.6^\circ$	$a = 4.5 \text{ cm}, b = 5.1 \text{ cm}, c = 6.8 \text{ cm}, \alpha = 41.4^\circ, \beta = 48.6^\circ$
3	$b = 9.5 \text{ cm}, \beta = 77.5^\circ$	$a = 2.1 \text{ cm}, b = 9.5 \text{ cm}, c = 9.7 \text{ cm}, \alpha = 12.5^\circ, \beta = 77.5^\circ$
4	$c = 9.8 \text{ cm}, \alpha = 40.9^\circ$	$a = 6.4 \text{ cm}, b = 7.4 \text{ cm}, c = 9.8 \text{ cm}, \alpha = 40.9^\circ, \beta = 49.1^\circ$
5	$a = 9.2 \text{ cm}, b = 9.6 \text{ cm}$	$a = 9.2 \text{ cm}, b = 9.6 \text{ cm}, c = 13.3 \text{ cm}, \alpha = 43.8^\circ, \beta = 46.2^\circ$
6	$c = 5.1 \text{ cm}, \alpha = 65.5^\circ$	$a = 4.6 \text{ cm}, b = 2.1 \text{ cm}, c = 5.1 \text{ cm}, \alpha = 65.5^\circ, \beta = 24.5^\circ$
7	$c = 6 \text{ cm}, \beta = 12.4^\circ$	$a = 5.9 \text{ cm}, b = 1.3 \text{ cm}, c = 6 \text{ cm}, \alpha = 77.6^\circ, \beta = 12.4^\circ$
8	$c = 5.9 \text{ cm}, \beta = 13.8^\circ$	$a = 5.7 \text{ cm}, b = 1.4 \text{ cm}, c = 5.9 \text{ cm}, \alpha = 76.2^\circ, \beta = 13.8^\circ$
9	$b = 3.7 \text{ cm}, \alpha = 49.9^\circ$	$a = 4.4 \text{ cm}, b = 3.7 \text{ cm}, c = 5.7 \text{ cm}, \alpha = 49.9^\circ, \beta = 40.1^\circ$
10	$a = 1.8 \text{ cm}, b = 1.8 \text{ cm}$	$a = 1.8 \text{ cm}, b = 1.8 \text{ cm}, c = 2.5 \text{ cm}, \alpha = 45^\circ, \beta = 45^\circ$

**Aufgabe 2:** Berechne die fehlenden Größen im rechtwinkligen Dreieck  $\triangle ABC$  (Winkel  $\gamma = 90^\circ$ ,  $a, b$  = Katheten,  $c$  = Hypotenuse, Winkel  $\alpha, \beta$ ).

Nr.	Vorgaben
1	$a = 8.2 \text{ cm}, \alpha = 68.1^\circ$
2	$b = 9 \text{ cm}, \alpha = 20.1^\circ$
3	$b = 6.4 \text{ cm}, c = 11.6 \text{ cm}$
4	$a = 8.5 \text{ cm}, \beta = 20.6^\circ$
5	$a = 1.5 \text{ cm}, c = 9.3 \text{ cm}$
6	$c = 9.5 \text{ cm}, \beta = 11^\circ$
7	$a = 5.1 \text{ cm}, \beta = 12.2^\circ$
8	$b = 7.6 \text{ cm}, \alpha = 41.4^\circ$
9	$c = 9.5 \text{ cm}, \beta = 74.1^\circ$
10	$c = 8.5 \text{ cm}, \alpha = 27.2^\circ$
11	$c = 3.8 \text{ cm}, \beta = 32^\circ$
12	$b = 5.1 \text{ cm}, c = 6.7 \text{ cm}$
13	$b = 7 \text{ cm}, \alpha = 48.1^\circ$
14	$b = 3.5 \text{ cm}, \alpha = 69^\circ$
15	$c = 5.1 \text{ cm}, \alpha = 34.6^\circ$
16	$b = 2.2 \text{ cm}, \alpha = 75.5^\circ$
17	$a = 9.7 \text{ cm}, c = 10 \text{ cm}$
18	$a = 5.9 \text{ cm}, \alpha = 50.3^\circ$
19	$a = 8.6 \text{ cm}, b = 9.7 \text{ cm}$
20	$b = 9.3 \text{ cm}, \alpha = 30.6^\circ$

**Vorgehensweise:** Zur Ermittlung der fehlenden Größen beim rechtwinkligen Dreieck ist die obige Formelsammlung anzuwenden.

**Lösungen:**

Nr.	Vorgaben	Lösungen
1	a = 8.2 cm, $\alpha = 68.1^\circ$	a = 8.2 cm, b = 3.3 cm, c = 8.8 cm, $\alpha = 68.1^\circ$ , $\beta = 21.9^\circ$
2	b = 9 cm, $\alpha = 20.1^\circ$	a = 3.3 cm, b = 9 cm, c = 9.6 cm, $\alpha = 20.1^\circ$ , $\beta = 69.9^\circ$
3	b = 6.4 cm, c = 11.6 cm	a = 9.7 cm, b = 6.4 cm, c = 11.6 cm, $\alpha = 56.6^\circ$ , $\beta = 33.4^\circ$
4	a = 8.5 cm, $\beta = 20.6^\circ$	a = 8.5 cm, b = 3.2 cm, c = 9.1 cm, $\alpha = 69.4^\circ$ , $\beta = 20.6^\circ$
5	a = 1.5 cm, c = 9.3 cm	a = 1.5 cm, b = 9.2 cm, c = 9.3 cm, $\alpha = 9.3^\circ$ , $\beta = 80.7^\circ$
6	c = 9.5 cm, $\beta = 11^\circ$	a = 9.3 cm, b = 1.8 cm, c = 9.5 cm, $\alpha = 79^\circ$ , $\beta = 11^\circ$
7	a = 5.1 cm, $\beta = 12.2^\circ$	a = 5.1 cm, b = 1.1 cm, c = 5.2 cm, $\alpha = 77.8^\circ$ , $\beta = 12.2^\circ$
8	b = 7.6 cm, $\alpha = 41.4^\circ$	a = 6.7 cm, b = 7.6 cm, c = 10.1 cm, $\alpha = 41.4^\circ$ , $\beta = 48.6^\circ$
9	c = 9.5 cm, $\beta = 74.1^\circ$	a = 2.6 cm, b = 9.1 cm, c = 9.5 cm, $\alpha = 15.9^\circ$ , $\beta = 74.1^\circ$
10	c = 8.5 cm, $\alpha = 27.2^\circ$	a = 3.9 cm, b = 7.6 cm, c = 8.5 cm, $\alpha = 27.2^\circ$ , $\beta = 62.8^\circ$
11	c = 3.8 cm, $\beta = 32^\circ$	a = 3.2 cm, b = 2 cm, c = 3.8 cm, $\alpha = 58^\circ$ , $\beta = 32^\circ$
12	b = 5.1 cm, c = 6.7 cm	a = 4.3 cm, b = 5.1 cm, c = 6.7 cm, $\alpha = 40.1^\circ$ , $\beta = 49.9^\circ$
13	b = 7 cm, $\alpha = 48.1^\circ$	a = 7.8 cm, b = 7 cm, c = 10.5 cm, $\alpha = 48.1^\circ$ , $\beta = 41.9^\circ$
14	b = 3.5 cm, $\alpha = 69^\circ$	a = 9.1 cm, b = 3.5 cm, c = 9.7 cm, $\alpha = 69^\circ$ , $\beta = 21^\circ$
15	c = 5.1 cm, $\alpha = 34.6^\circ$	a = 2.9 cm, b = 4.2 cm, c = 5.1 cm, $\alpha = 34.6^\circ$ , $\beta = 55.4^\circ$
16	b = 2.2 cm, $\alpha = 75.5^\circ$	a = 8.5 cm, b = 2.2 cm, c = 8.8 cm, $\alpha = 75.5^\circ$ , $\beta = 14.5^\circ$
17	a = 9.7 cm, c = 10 cm	a = 9.7 cm, b = 2.6 cm, c = 10 cm, $\alpha = 75^\circ$ , $\beta = 15^\circ$
18	a = 5.9 cm, $\alpha = 50.3^\circ$	a = 5.9 cm, b = 4.9 cm, c = 7.7 cm, $\alpha = 50.3^\circ$ , $\beta = 39.7^\circ$
19	a = 8.6 cm, b = 9.7 cm	a = 8.6 cm, b = 9.7 cm, c = 13 cm, $\alpha = 41.6^\circ$ , $\beta = 48.4^\circ$
20	b = 9.3 cm, $\alpha = 30.6^\circ$	a = 5.5 cm, b = 9.3 cm, c = 10.8 cm, $\alpha = 30.6^\circ$ , $\beta = 59.4^\circ$

**Aufgabe 3:** Berechne die fehlenden Größen im rechtwinkligen Dreieck  $\triangle ABC$  (Winkel  $\gamma = 90^\circ$ , a, b = Katheten, c = Hypotenuse, Winkel  $\alpha$ ,  $\beta$ ).

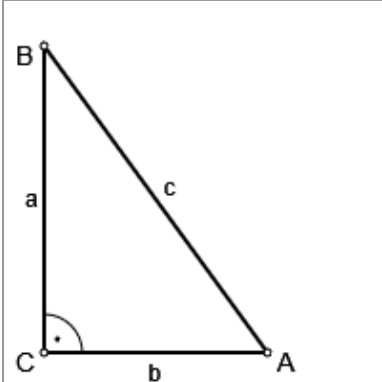
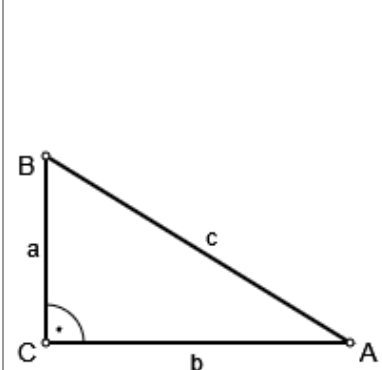
Nr.	Vorgaben
1	a = 19.9 dm, $\alpha = 56.8^\circ$
2	a = 5 dm, $\alpha = 37.6^\circ$
3	c = 19.4 dm, $\beta = 53.4^\circ$
4	a = 17.7 mm, $\alpha = 47.2^\circ$
5	a = 16.5 cm, b = 17.5 cm
6	b = 8.4 cm, $\beta = 34.5^\circ$
7	a = 8.3 mm, b = 14.5 mm
8	c = 20.6 cm, $\alpha = 43.6^\circ$
9	a = 6.5 mm, $\beta = 70.6^\circ$
10	b = 11.9 mm, c = 18.7 mm
11	c = 21.3 m, $\alpha = 58.6^\circ$
12	c = 19.4 mm, $\beta = 55.9^\circ$
13	a = 17.5 m, $\alpha = 41.8^\circ$
14	b = 13.3 mm, $\beta = 35.4^\circ$
15	b = 19.3 dm, $\beta = 66.2^\circ$
16	c = 25.1 mm, $\beta = 48.9^\circ$
17	b = 8.8 mm, c = 10.9 mm
18	a = 18.7 mm, $\beta = 36.4^\circ$
19	c = 22.6 cm, $\beta = 32.9^\circ$
20	b = 11 dm, c = 16.2 dm

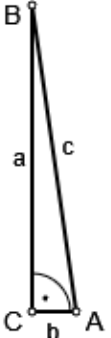
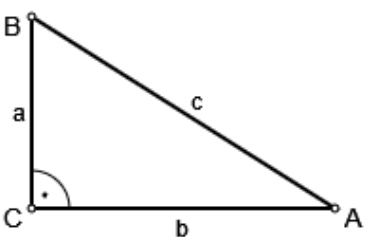
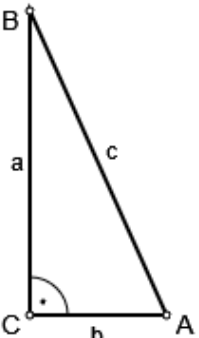
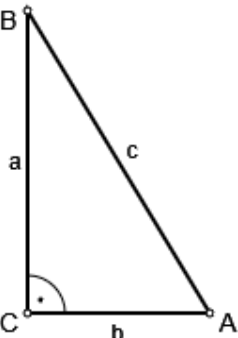
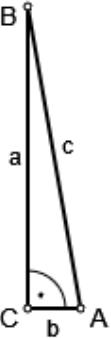
**Vorgehensweise:** Zur Ermittlung der fehlenden Größen beim rechtwinkligen Dreieck ist die obige Formelsammlung anzuwenden.

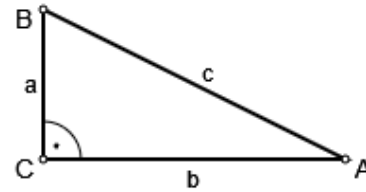
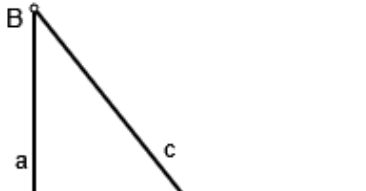
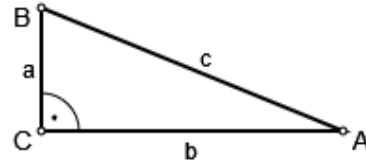
**Lösungen:**

Nr.	Vorgaben	Lösungen
1	$a = 19.9 \text{ dm}, \alpha = 56.8^\circ$	$a = 19.9 \text{ dm}, b = 13 \text{ dm}, c = 23.8 \text{ dm}, \alpha = 56.8^\circ, \beta = 33.2^\circ$
2	$a = 5 \text{ dm}, \alpha = 37.6^\circ$	$a = 5 \text{ dm}, b = 6.5 \text{ dm}, c = 8.2 \text{ dm}, \alpha = 37.6^\circ, \beta = 52.4^\circ$
3	$c = 19.4 \text{ dm}, \beta = 53.4^\circ$	$a = 11.6 \text{ dm}, b = 15.6 \text{ dm}, c = 19.4 \text{ dm}, \alpha = 36.6^\circ, \beta = 53.4^\circ$
4	$a = 17.7 \text{ mm}, \alpha = 47.2^\circ$	$a = 17.7 \text{ mm}, b = 16.4 \text{ mm}, c = 24.1 \text{ mm}, \alpha = 47.2^\circ, \beta = 42.8^\circ$
5	$a = 16.5 \text{ cm}, b = 17.5 \text{ cm}$	$a = 16.5 \text{ cm}, b = 17.5 \text{ cm}, c = 24.1 \text{ cm}, \alpha = 43.3^\circ, \beta = 46.7^\circ$
6	$b = 8.4 \text{ cm}, \beta = 34.5^\circ$	$a = 12.2 \text{ cm}, b = 8.4 \text{ cm}, c = 14.8 \text{ cm}, \alpha = 55.5^\circ, \beta = 34.5^\circ$
7	$a = 8.3 \text{ mm}, b = 14.5 \text{ mm}$	$a = 8.3 \text{ mm}, b = 14.5 \text{ mm}, c = 16.7 \text{ mm}, \alpha = 29.8^\circ, \beta = 60.2^\circ$
8	$c = 20.6 \text{ cm}, \alpha = 43.6^\circ$	$a = 14.2 \text{ cm}, b = 14.9 \text{ cm}, c = 20.6 \text{ cm}, \alpha = 43.6^\circ, \beta = 46.4^\circ$
9	$a = 6.5 \text{ mm}, \beta = 70.6^\circ$	$a = 6.5 \text{ mm}, b = 18.5 \text{ mm}, c = 19.6 \text{ mm}, \alpha = 19.4^\circ, \beta = 70.6^\circ$
10	$b = 11.9 \text{ mm}, c = 18.7 \text{ mm}$	$a = 14.4 \text{ mm}, b = 11.9 \text{ mm}, c = 18.7 \text{ mm}, \alpha = 50.4^\circ, \beta = 39.6^\circ$
11	$c = 21.3 \text{ m}, \alpha = 58.6^\circ$	$a = 18.2 \text{ m}, b = 11.1 \text{ m}, c = 21.3 \text{ m}, \alpha = 58.6^\circ, \beta = 31.4^\circ$
12	$c = 19.4 \text{ mm}, \beta = 55.9^\circ$	$a = 10.9 \text{ mm}, b = 16.1 \text{ mm}, c = 19.4 \text{ mm}, \alpha = 34.1^\circ, \beta = 55.9^\circ$
13	$a = 17.5 \text{ m}, \alpha = 41.8^\circ$	$a = 17.5 \text{ m}, b = 19.6 \text{ m}, c = 26.3 \text{ m}, \alpha = 41.8^\circ, \beta = 48.2^\circ$
14	$b = 13.3 \text{ mm}, \beta = 35.4^\circ$	$a = 18.7 \text{ mm}, b = 13.3 \text{ mm}, c = 22.9 \text{ mm}, \alpha = 54.6^\circ, \beta = 35.4^\circ$
15	$b = 19.3 \text{ dm}, \beta = 66.2^\circ$	$a = 8.5 \text{ dm}, b = 19.3 \text{ dm}, c = 21.1 \text{ dm}, \alpha = 23.8^\circ, \beta = 66.2^\circ$
16	$c = 25.1 \text{ mm}, \beta = 48.9^\circ$	$a = 16.5 \text{ mm}, b = 18.9 \text{ mm}, c = 25.1 \text{ mm}, \alpha = 41.1^\circ, \beta = 48.9^\circ$
17	$b = 8.8 \text{ mm}, c = 10.9 \text{ mm}$	$a = 6.5 \text{ mm}, b = 8.8 \text{ mm}, c = 10.9 \text{ mm}, \alpha = 36.5^\circ, \beta = 53.5^\circ$
18	$a = 18.7 \text{ mm}, \beta = 36.4^\circ$	$a = 18.7 \text{ mm}, b = 13.8 \text{ mm}, c = 23.2 \text{ mm}, \alpha = 53.6^\circ, \beta = 36.4^\circ$
19	$c = 22.6 \text{ cm}, \beta = 32.9^\circ$	$a = 19 \text{ cm}, b = 12.3 \text{ cm}, c = 22.6 \text{ cm}, \alpha = 57.1^\circ, \beta = 32.9^\circ$
20	$b = 11 \text{ dm}, c = 16.2 \text{ dm}$	$a = 11.9 \text{ dm}, b = 11 \text{ dm}, c = 16.2 \text{ dm}, \alpha = 47.3^\circ, \beta = 42.7^\circ$

**Aufgabe 4:** Berechne die fehlenden Größen im rechtwinkligen Dreieck  $\triangle ABC$  (Winkel  $\gamma = 90^\circ$ ,  $a, b$  = Katheten,  $c$  = Hypotenuse, Winkel  $\alpha, \beta$ ,  $A$  = Flächeninhalt,  $u$  = Umfang).

Nr.	Gegeben:	Grafik:
1	$c = 11.2 \text{ cm}, \beta = 36.3^\circ$	
2	$b = 8 \text{ cm}, c = 9.4 \text{ cm}$	

3	$c = 7.6 \text{ cm}, \alpha = 81.7^\circ$	
4	$b = 7.8 \text{ cm}, \beta = 57.9^\circ$	
5	$a = 4.2 \text{ cm}, \beta = 24.3^\circ$	
6	$c = 6.8 \text{ cm}, \beta = 31.1^\circ$	
7	$c = 6.4 \text{ cm}, \alpha = 80.1^\circ$	

8	$a = 3.4 \text{ cm}, c = 7.7 \text{ cm}$	
9	$b = 7.7 \text{ cm}, \beta = 38.7^\circ$	
10	$b = 5.9 \text{ cm}, \alpha = 22.1^\circ$	

**Vorgehensweise:** Zur Ermittlung der fehlenden Größen beim rechtwinkligen Dreieck ist die obige Formelsammlung anzuwenden.

**Lösungen:**

Nr.	Gegeben:	Lösungen
1	$c = 11.2 \text{ cm}, \beta = 36.3^\circ$	$a = 9 \text{ cm}, b = 6.6 \text{ cm}, c = 11.2 \text{ cm}, \alpha = 53.7^\circ, \beta = 36.3^\circ, A = 29.7 \text{ cm}^2, u = 26.8 \text{ cm}$
2	$b = 8 \text{ cm}, c = 9.4 \text{ cm}$	$a = 4.9 \text{ cm}, b = 8 \text{ cm}, c = 9.4 \text{ cm}, \alpha = 31.5^\circ, \beta = 58.5^\circ, A = 19.6 \text{ cm}^2, u = 22.3 \text{ cm}$
3	$c = 7.6 \text{ cm}, \alpha = 81.7^\circ$	$a = 7.5 \text{ cm}, b = 1.1 \text{ cm}, c = 7.6 \text{ cm}, \alpha = 81.7^\circ, \beta = 8.3^\circ, A = 4.1 \text{ cm}^2, u = 16.2 \text{ cm}$
4	$b = 7.8 \text{ cm}, \beta = 57.9^\circ$	$a = 4.9 \text{ cm}, b = 7.8 \text{ cm}, c = 9.2 \text{ cm}, \alpha = 32.1^\circ, \beta = 57.9^\circ, A = 19.1 \text{ cm}^2, u = 21.9 \text{ cm}$
5	$a = 4.2 \text{ cm}, \beta = 24.3^\circ$	$a = 4.2 \text{ cm}, b = 1.9 \text{ cm}, c = 4.6 \text{ cm}, \alpha = 65.7^\circ, \beta = 24.3^\circ, A = 4 \text{ cm}^2, u = 10.7 \text{ cm}$
6	$c = 6.8 \text{ cm}, \beta = 31.1^\circ$	$a = 5.8 \text{ cm}, b = 3.5 \text{ cm}, c = 6.8 \text{ cm}, \alpha = 58.9^\circ, \beta = 31.1^\circ, A = 10.2 \text{ cm}^2, u = 16.1 \text{ cm}$
7	$c = 6.4 \text{ cm}, \alpha = 80.1^\circ$	$a = 6.3 \text{ cm}, b = 1.1 \text{ cm}, c = 6.4 \text{ cm}, \alpha = 80.1^\circ, \beta = 9.9^\circ, A = 3.5 \text{ cm}^2, u = 13.8 \text{ cm}$
8	$a = 3.4 \text{ cm}, c = 7.7 \text{ cm}$	$a = 3.4 \text{ cm}, b = 6.9 \text{ cm}, c = 7.7 \text{ cm}, \alpha = 26.2^\circ, \beta = 63.8^\circ, A = 11.7 \text{ cm}^2, u = 18 \text{ cm}$
9	$b = 7.7 \text{ cm}, \beta = 38.7^\circ$	$a = 9.6 \text{ cm}, b = 7.7 \text{ cm}, c = 12.3 \text{ cm}, \alpha = 51.3^\circ, \beta = 38.7^\circ, A = 37 \text{ cm}^2, u = 29.6 \text{ cm}$
10	$b = 5.9 \text{ cm}, \alpha = 22.1^\circ$	$a = 2.4 \text{ cm}, b = 5.9 \text{ cm}, c = 6.4 \text{ cm}, \alpha = 22.1^\circ, \beta = 67.9^\circ, A = 7.1 \text{ cm}^2, u = 14.7 \text{ cm}$

**Aufgabe 5:** Berechne die fehlenden Größen im rechtwinkligen Dreieck  $\triangle ABC$  (Winkel  $\gamma = 90^\circ$ ,  $a, b$  = Katheten,  $c$  = Hypotenuse, Winkel  $\alpha, \beta$ ,  $A$  = Flächeninhalt,  $u$  = Umfang).

Nr.	Vorgaben
1	$c = 7.4 \text{ dm}, \alpha = 64.5^\circ$
2	$a = 7 \text{ cm}, b = 4.6 \text{ cm}$



3	$b = 3.4 \text{ mm}, \alpha = 16.4^\circ$
4	$b = 6.3 \text{ dm}, c = 7.3 \text{ dm}$
5	$b = 3.9 \text{ mm}, c = 4.4 \text{ mm}$
6	$b = 1 \text{ cm}, \alpha = 78.5^\circ$
7	$c = 11.9 \text{ dm}, \beta = 40.2^\circ$
8	$b = 7.2 \text{ cm}, c = 7.5 \text{ cm}$
9	$a = 2.3 \text{ mm}, \alpha = 62.4^\circ$
10	$b = 3.9 \text{ m}, c = 5.6 \text{ m}$
11	$a = 8.3 \text{ m}, \beta = 31.6^\circ$
12	$a = 3.8 \text{ dm}, \alpha = 26.3^\circ$
13	$a = 6.1 \text{ mm}, b = 5.3 \text{ mm}$
14	$a = 7.3 \text{ mm}, c = 9.6 \text{ mm}$
15	$b = 4.6 \text{ cm}, \beta = 33.3^\circ$
16	$c = 5.4 \text{ cm}, \beta = 25.1^\circ$
17	$b = 9.6 \text{ dm}, c = 12.2 \text{ dm}$
18	$b = 2.6 \text{ mm}, \alpha = 61^\circ$
19	$b = 1 \text{ mm}, \beta = 9.6^\circ$
20	$a = 7.4 \text{ cm}, \alpha = 43.9^\circ$

**Vorgehensweise:** Zur Ermittlung der fehlenden Größen beim rechtwinkligen Dreieck ist die obige Formelsammlung anzuwenden.

**Lösungen:**

Nr.	Vorgaben	Lösungen
1	$c = 7.4 \text{ dm}, \alpha = 64.5^\circ$	$a = 6.7 \text{ dm}, b = 3.2 \text{ dm}, c = 7.4 \text{ dm}, \alpha = 64.5^\circ, \beta = 25.5^\circ, A = 10.7 \text{ dm}^2, u = 17.3 \text{ dm}$
2	$a = 7 \text{ cm}, b = 4.6 \text{ cm}$	$a = 7 \text{ cm}, b = 4.6 \text{ cm}, c = 8.4 \text{ cm}, \alpha = 56.7^\circ, \beta = 33.3^\circ, A = 16.1 \text{ cm}^2, u = 20 \text{ cm}$
3	$b = 3.4 \text{ mm}, \alpha = 16.4^\circ$	$a = 1 \text{ mm}, b = 3.4 \text{ mm}, c = 3.5 \text{ mm}, \alpha = 16.4^\circ, \beta = 73.6^\circ, A = 1.7 \text{ mm}^2, u = 7.9 \text{ mm}$
4	$b = 6.3 \text{ dm}, c = 7.3 \text{ dm}$	$a = 3.7 \text{ dm}, b = 6.3 \text{ dm}, c = 7.3 \text{ dm}, \alpha = 30.4^\circ, \beta = 59.6^\circ, A = 11.7 \text{ dm}^2, u = 17.3 \text{ dm}$
5	$b = 3.9 \text{ mm}, c = 4.4 \text{ mm}$	$a = 2.1 \text{ mm}, b = 3.9 \text{ mm}, c = 4.4 \text{ mm}, \alpha = 28.3^\circ, \beta = 61.7^\circ, A = 4.1 \text{ mm}^2, u = 10.4 \text{ mm}$
6	$b = 1 \text{ cm}, \alpha = 78.5^\circ$	$a = 4.9 \text{ cm}, b = 1 \text{ cm}, c = 5 \text{ cm}, \alpha = 78.5^\circ, \beta = 11.5^\circ, A = 2.5 \text{ cm}^2, u = 10.9 \text{ cm}$
7	$c = 11.9 \text{ dm}, \beta = 40.2^\circ$	$a = 9.1 \text{ dm}, b = 7.7 \text{ dm}, c = 11.9 \text{ dm}, \alpha = 49.8^\circ, \beta = 40.2^\circ, A = 35 \text{ dm}^2, u = 28.7 \text{ dm}$
8	$b = 7.2 \text{ cm}, c = 7.5 \text{ cm}$	$a = 2.2 \text{ cm}, b = 7.2 \text{ cm}, c = 7.5 \text{ cm}, \alpha = 17^\circ, \beta = 73^\circ, A = 7.9 \text{ cm}^2, u = 16.9 \text{ cm}$
9	$a = 2.3 \text{ mm}, \alpha = 62.4^\circ$	$a = 2.3 \text{ mm}, b = 1.2 \text{ mm}, c = 2.6 \text{ mm}, \alpha = 62.4^\circ, \beta = 27.6^\circ, A = 1.4 \text{ mm}^2, u = 6.1 \text{ mm}$
10	$b = 3.9 \text{ m}, c = 5.6 \text{ m}$	$a = 4 \text{ m}, b = 3.9 \text{ m}, c = 5.6 \text{ m}, \alpha = 45.7^\circ, \beta = 44.3^\circ, A = 7.8 \text{ m}^2, u = 13.5 \text{ m}$
11	$a = 8.3 \text{ m}, \beta = 31.6^\circ$	$a = 8.3 \text{ m}, b = 5.1 \text{ m}, c = 9.7 \text{ m}, \alpha = 58.4^\circ, \beta = 31.6^\circ, A = 21.2 \text{ m}^2, u = 23.1 \text{ m}$
12	$a = 3.8 \text{ dm}, \alpha = 26.3^\circ$	$a = 3.8 \text{ dm}, b = 7.7 \text{ dm}, c = 8.6 \text{ dm}, \alpha = 26.3^\circ, \beta = 63.7^\circ, A = 14.6 \text{ dm}^2, u = 20.1 \text{ dm}$
13	$a = 6.1 \text{ mm}, b = 5.3 \text{ mm}$	$a = 6.1 \text{ mm}, b = 5.3 \text{ mm}, c = 8.1 \text{ mm}, \alpha = 49^\circ, \beta = 41^\circ, A = 16.2 \text{ mm}^2, u = 19.5 \text{ mm}$
14	$a = 7.3 \text{ mm}, c = 9.6 \text{ mm}$	$a = 7.3 \text{ mm}, b = 6.2 \text{ mm}, c = 9.6 \text{ mm}, \alpha = 49.7^\circ, \beta = 40.3^\circ, A = 22.6 \text{ mm}^2, u = 23.1 \text{ mm}$
15	$b = 4.6 \text{ cm}, \beta = 33.3^\circ$	$a = 7 \text{ cm}, b = 4.6 \text{ cm}, c = 8.4 \text{ cm}, \alpha = 56.7^\circ, \beta = 33.3^\circ, A = 16.1 \text{ cm}^2, u = 20 \text{ cm}$
16	$c = 5.4 \text{ cm}, \beta = 25.1^\circ$	$a = 4.9 \text{ cm}, b = 2.3 \text{ cm}, c = 5.4 \text{ cm}, \alpha = 64.9^\circ, \beta = 25.1^\circ, A = 5.6 \text{ cm}^2, u = 12.6 \text{ cm}$
17	$b = 9.6 \text{ dm}, c = 12.2 \text{ dm}$	$a = 7.5 \text{ dm}, b = 9.6 \text{ dm}, c = 12.2 \text{ dm}, \alpha = 38^\circ, \beta = 52^\circ, A = 36 \text{ dm}^2, u = 29.3 \text{ dm}$
18	$b = 2.6 \text{ mm}, \alpha = 61^\circ$	$a = 4.7 \text{ mm}, b = 2.6 \text{ mm}, c = 5.4 \text{ mm}, \alpha = 61^\circ, \beta = 29^\circ, A = 6.1 \text{ mm}^2, u = 12.7 \text{ mm}$
19	$b = 1 \text{ mm}, \beta = 9.6^\circ$	$a = 5.9 \text{ mm}, b = 1 \text{ mm}, c = 6 \text{ mm}, \alpha = 80.4^\circ, \beta = 9.6^\circ, A = 3 \text{ mm}^2, u = 12.9 \text{ mm}$
20	$a = 7.4 \text{ cm}, \alpha = 43.9^\circ$	$a = 7.4 \text{ cm}, b = 7.7 \text{ cm}, c = 10.7 \text{ cm}, \alpha = 43.9^\circ, \beta = 46.1^\circ, A = 28.5 \text{ cm}^2, u = 25.8 \text{ cm}$

**Aufgabe 6:** Berechne die fehlenden Größen im rechtwinkligen Dreieck  $\triangle ABC$  (Winkel  $\gamma = 90^\circ$ ,  $a, b$  = Katheten,  $c$  = Hypotenuse, Winkel  $\alpha, \beta$ ,  $A$  = Flächeninhalt,  $u$  = Umfang).

Nr.	Vorgaben
1	$c = 37 \text{ mm}, \alpha = 13.4^\circ$
2	$a = 6.2 \text{ mm}, \beta = 77.2^\circ$
3	$b = 24.5 \text{ dm}, c = 32.9 \text{ dm}$

4	$b = 33.7 \text{ dm}, \alpha = 33.7^\circ$
5	$b = 9.9 \text{ m}, \alpha = 52.3^\circ$
6	$a = 5.7 \text{ dm}, c = 39.5 \text{ dm}$
7	$a = 7.8 \text{ dm}, c = 18.6 \text{ dm}$
8	$a = 22.9 \text{ m}, b = 20.8 \text{ m}$
9	$c = 33.5 \text{ mm}, \alpha = 13.8^\circ$
10	$a = 7 \text{ dm}, \beta = 65.8^\circ$
11	$b = 34.3 \text{ m}, \beta = 58.3^\circ$
12	$a = 5 \text{ mm}, c = 19.6 \text{ mm}$
13	$a = 17.6 \text{ dm}, c = 29.9 \text{ dm}$
14	$a = 16 \text{ dm}, b = 22.1 \text{ dm}$
15	$c = 10.6 \text{ m}, \alpha = 53.5^\circ$
16	$a = 18.9 \text{ dm}, c = 32.2 \text{ dm}$
17	$a = 11.8 \text{ cm}, b = 20.9 \text{ cm}$
18	$b = 32.2 \text{ cm}, \beta = 70.8^\circ$
19	$c = 36.7 \text{ cm}, \beta = 49.6^\circ$
20	$b = 28.8 \text{ m}, c = 29.3 \text{ m}$

**Vorgehensweise:** Zur Ermittlung der fehlenden Größen beim rechtwinkligen Dreieck ist die obige Formelsammlung anzuwenden.

**Lösungen:**

Nr.	Vorgaben	Lösungen
1	$c = 37 \text{ mm}, \alpha = 13.4^\circ$	$a = 8.6 \text{ mm}, b = 36 \text{ mm}, c = 37 \text{ mm}, \alpha = 13.4^\circ, \beta = 76.6^\circ, A = 154.8 \text{ mm}^2, u = 81.6 \text{ mm}$
2	$a = 6.2 \text{ mm}, \beta = 77.2^\circ$	$a = 6.2 \text{ mm}, b = 27.3 \text{ mm}, c = 28 \text{ mm}, \alpha = 12.8^\circ, \beta = 77.2^\circ, A = 84.6 \text{ mm}^2, u = 61.5 \text{ mm}$
3	$b = 24.5 \text{ dm}, c = 32.9 \text{ dm}$	$a = 22 \text{ dm}, b = 24.5 \text{ dm}, c = 32.9 \text{ dm}, \alpha = 41.9^\circ, \beta = 48.1^\circ, A = 269.5 \text{ dm}^2, u = 79.4 \text{ dm}$
4	$b = 33.7 \text{ dm}, \alpha = 33.7^\circ$	$a = 22.5 \text{ dm}, b = 33.7 \text{ dm}, c = 40.5 \text{ dm}, \alpha = 33.7^\circ, \beta = 56.3^\circ, A = 379.1 \text{ dm}^2, u = 96.7 \text{ dm}$
5	$b = 9.9 \text{ m}, \alpha = 52.3^\circ$	$a = 12.8 \text{ m}, b = 9.9 \text{ m}, c = 16.2 \text{ m}, \alpha = 52.3^\circ, \beta = 37.7^\circ, A = 63.4 \text{ m}^2, u = 38.9 \text{ m}$
6	$a = 5.7 \text{ dm}, c = 39.5 \text{ dm}$	$a = 5.7 \text{ dm}, b = 39.1 \text{ dm}, c = 39.5 \text{ dm}, \alpha = 8.3^\circ, \beta = 81.7^\circ, A = 111.4 \text{ dm}^2, u = 84.3 \text{ dm}$
7	$a = 7.8 \text{ dm}, c = 18.6 \text{ dm}$	$a = 7.8 \text{ dm}, b = 16.9 \text{ dm}, c = 18.6 \text{ dm}, \alpha = 24.8^\circ, \beta = 65.2^\circ, A = 65.9 \text{ dm}^2, u = 43.3 \text{ dm}$
8	$a = 22.9 \text{ m}, b = 20.8 \text{ m}$	$a = 22.9 \text{ m}, b = 20.8 \text{ m}, c = 30.9 \text{ m}, \alpha = 47.8^\circ, \beta = 42.2^\circ, A = 238.2 \text{ m}^2, u = 74.6 \text{ m}$
9	$c = 33.5 \text{ mm}, \alpha = 13.8^\circ$	$a = 8 \text{ mm}, b = 32.5 \text{ mm}, c = 33.5 \text{ mm}, \alpha = 13.8^\circ, \beta = 76.2^\circ, A = 130 \text{ mm}^2, u = 74 \text{ mm}$
10	$a = 7 \text{ dm}, \beta = 65.8^\circ$	$a = 7 \text{ dm}, b = 15.6 \text{ dm}, c = 17.1 \text{ dm}, \alpha = 24.2^\circ, \beta = 65.8^\circ, A = 54.6 \text{ dm}^2, u = 39.7 \text{ dm}$
11	$b = 34.3 \text{ m}, \beta = 58.3^\circ$	$a = 21.2 \text{ m}, b = 34.3 \text{ m}, c = 40.3 \text{ m}, \alpha = 31.7^\circ, \beta = 58.3^\circ, A = 363.6 \text{ m}^2, u = 95.8 \text{ m}$
12	$a = 5 \text{ mm}, c = 19.6 \text{ mm}$	$a = 5 \text{ mm}, b = 19 \text{ mm}, c = 19.6 \text{ mm}, \alpha = 14.7^\circ, \beta = 75.3^\circ, A = 47.5 \text{ mm}^2, u = 43.6 \text{ mm}$
13	$a = 17.6 \text{ dm}, c = 29.9 \text{ dm}$	$a = 17.6 \text{ dm}, b = 24.2 \text{ dm}, c = 29.9 \text{ dm}, \alpha = 36^\circ, \beta = 54^\circ, A = 213 \text{ dm}^2, u = 71.7 \text{ dm}$
14	$a = 16 \text{ dm}, b = 22.1 \text{ dm}$	$a = 16 \text{ dm}, b = 22.1 \text{ dm}, c = 27.3 \text{ dm}, \alpha = 35.9^\circ, \beta = 54.1^\circ, A = 176.8 \text{ dm}^2, u = 65.4 \text{ dm}$
15	$c = 10.6 \text{ m}, \alpha = 53.5^\circ$	$a = 8.5 \text{ m}, b = 6.3 \text{ m}, c = 10.6 \text{ m}, \alpha = 53.5^\circ, \beta = 36.5^\circ, A = 26.8 \text{ m}^2, u = 25.4 \text{ m}$
16	$a = 18.9 \text{ dm}, c = 32.2 \text{ dm}$	$a = 18.9 \text{ dm}, b = 26.1 \text{ dm}, c = 32.2 \text{ dm}, \alpha = 35.9^\circ, \beta = 54.1^\circ, A = 246.6 \text{ dm}^2, u = 77.2 \text{ dm}$
17	$a = 11.8 \text{ cm}, b = 20.9 \text{ cm}$	$a = 11.8 \text{ cm}, b = 20.9 \text{ cm}, c = 24 \text{ cm}, \alpha = 29.4^\circ, \beta = 60.6^\circ, A = 123.3 \text{ cm}^2, u = 56.7 \text{ cm}$
18	$b = 32.2 \text{ cm}, \beta = 70.8^\circ$	$a = 11.2 \text{ cm}, b = 32.2 \text{ cm}, c = 34.1 \text{ cm}, \alpha = 19.2^\circ, \beta = 70.8^\circ, A = 180.3 \text{ cm}^2, u = 77.5 \text{ cm}$
19	$c = 36.7 \text{ cm}, \beta = 49.6^\circ$	$a = 23.8 \text{ cm}, b = 28 \text{ cm}, c = 36.7 \text{ cm}, \alpha = 40.4^\circ, \beta = 49.6^\circ, A = 333.2 \text{ cm}^2, u = 88.5 \text{ cm}$
20	$b = 28.8 \text{ m}, c = 29.3 \text{ m}$	$a = 5.5 \text{ m}, b = 28.8 \text{ m}, c = 29.3 \text{ m}, \alpha = 10.8^\circ, \beta = 79.2^\circ, A = 79.2 \text{ m}^2, u = 63.6 \text{ m}$