Dr Oliver Mathematics
Worked Examples
Two Tangent Circles 1

From: PreMath, 11 May 2023

1. Two tangent circles are drawn, as shown in Figure 1.

Diagram is not to scale

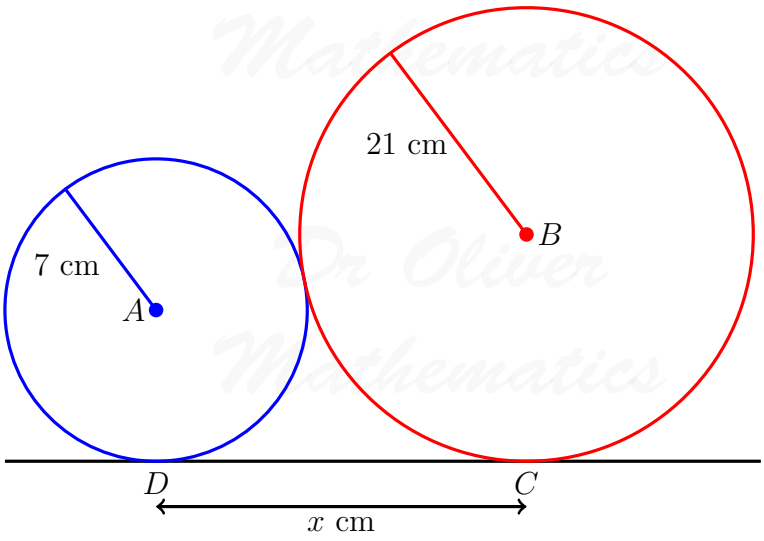

Figure 1: two tangent circles

The circle, centred at A, has a radius of 7 cm.
The circle, centred at B, has a radius of 21 cm.
C and D are the points of tangency.
Let x cm be the horizontal distance CD.

Find x.

Solution

Connect the centres A and B with their respective points of tangency D and C.
The angle between the radius and the tangent will be 90°.
Connect the centres of A and B: the centres and the point of contact are collinear.
Let E the the point of contact.
Then AEB is a straight line.
How long is it?

$$AEB = 7 + 21 = 28 \text{ cm}.$$

Now, draw the auxiliary line AF parallel to the DC.
So

$$BF = 21 - 7 = 14 \text{ cm}$$

and $AF = x$, as shown in Figure 2.

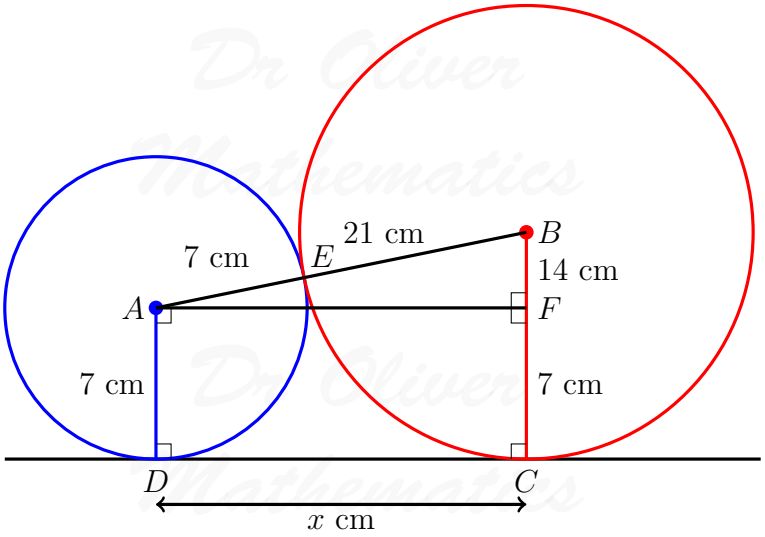

Figure 2: with the dimensions

We invoke Pythagoras' theorem:

$$\begin{aligned} x^2 + 14^2 = (21+7)^2 &\Rightarrow x^2 + 14^2 = 28^2 \\ &\Rightarrow x^2 + 196 = 784 \\ &\Rightarrow x^2 = 588 \\ &\Rightarrow \underline{\underline{x = 14\sqrt{3}}}. \end{aligned}$$