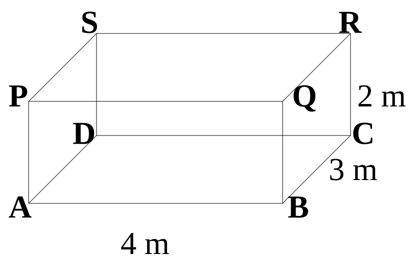
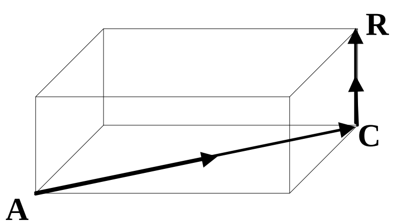
<u>AN ABSOLUTELY FABULOUS LESSON TO TEACH!!!!</u>
<u>Pythagoras Application</u>

Apparatus: (a shoe box is invaluable!) FOR TEACHER TO TEACH.

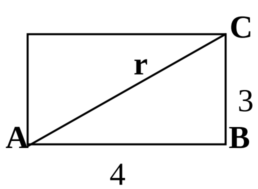
Ask this question: Suppose a spider is at **A** (the bottom corner of the room). If it wants to crawl to the opposite corner **R,** what is the shortest distance?



Most people will say “Go straight from **A** to **C**, then vertically up to **R**”.
(Some may suggest **A** to **P**, then across the ceiling to R – but this is just the same distance).



Now calculate this distance carefully:

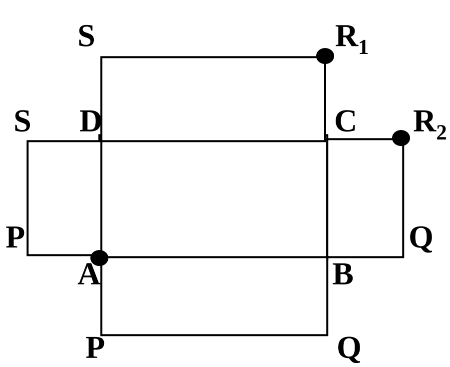


$\mathbf{r}^2 = 4^2 + 3^2$ }
$= 16 + 9$ }
$= 25$ }
$\mathbf{r} = 5$ }

Distance is **AC + AR**
= 5 + 2
= 7 metres

BUT THIS IS NOT THE SHORTEST DISTANCE!

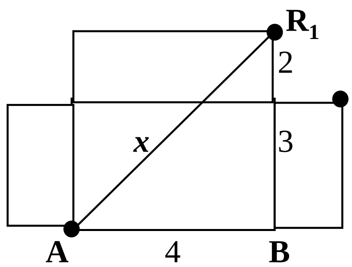
Using the shoe box, cut sides **PA**, **SD**, **QB** and **RC** so that it can lie out flat.

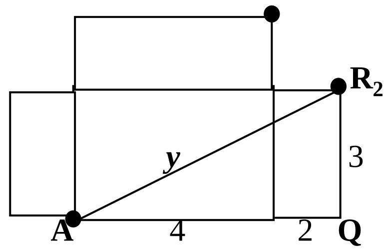


Notice **R** has actually split into two separate points, $\mathbf{R_1}$ and $\mathbf{R_2}$.

The shortest distance from **A** to **R** is a straight line….

We will work out **A R_1** and **A R_2** separately.





In Δ **ABR_1** :

$x^2 = (\mathbf{AB})^2 + (\mathbf{BR_1})^2$

$= 4^2 + 5^2$

$= 16 + 25$

$= 41$

$x \approx 6.4$ m

In Δ **ABR_2** :

$y^2 = (\mathbf{AQ})^2 + (\mathbf{QR_2})^2$

$= 6^2 + 3^2$

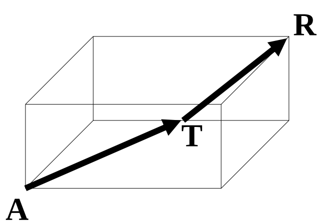
$= 36 + 9$

$= 45$

$y \approx 6.7$ m

Both these are shorter than 7 m (our previous answer).

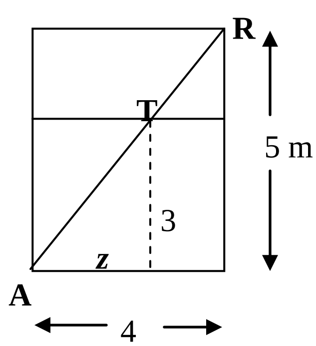
So the shortest distance is as shown on this diagram:



You should demonstrate this by showing the approximate position along the wall of the classroom (some students still won't believe you).

Extension:

1) Better pupils could find the position of **T** by similar triangles.



$\frac{z}{4} = \frac{3}{5}$

$z = \frac{12}{5}$

$z = 2.4$ m

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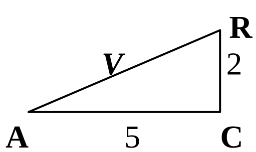
2) Find the shortest path of a flying insect (**AR**), using Δ **ACR**



$v^2 = 5^2 + 2^2$

$= 25 + 4$

$= 29$

$v \approx 5.4$ m