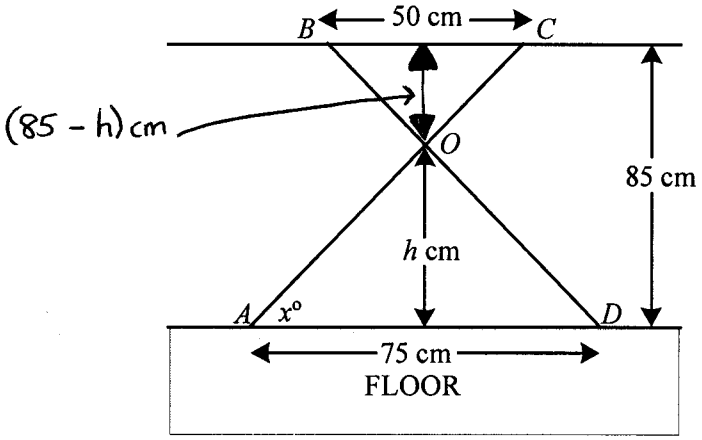
10-4-10 Easter Revision: Targeting grades A and A*

Day 6: Solve problems involving similar triangles

11. The diagram shows a simplified ironing board.



The feet A and D are 75 cm apart.
The supports at B and C are 50 cm apart.
The legs AC and BD are equal in length and are pivoted at O.
BC is parallel to AD.
The height of the ironing board above the floor is 85 cm.

(a) Use similar triangles to calculate the height, h cm, of O above the floor.

remove brackets

$\frac{75}{h} = \frac{50}{85-h}$ $\quad 6375 - 75h = 50h$

multiply up denominators

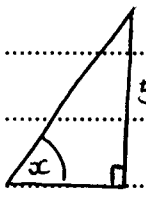
$6375 = 125h$

$75(85-h) = 50h$ $\quad 51 = h$ $\quad$ divide by 125

(3)

height = 51 cm.

(b) Calculate the value of x, the angle between AC and the floor.



Know opp and adj, so use tan: $\tan x = \frac{\text{opp}}{\text{adj}}$

$\tan x = \frac{51}{37.5}$ $\quad x = \tan^{-1}\left(\frac{51}{37.5}\right)$

$x = 53.7°$ to 1 d.p. (3)

(c) Calculate the length of AC.

Alternatively here you could have used Pythag since you now know the height of the smaller triangle, is 34cm

Find length AO using Pythag: $37.5^2 + 51^2 = AO^2$ $\quad \sqrt{4007.25} = AO$

Since OAD and OCB are similar, $\frac{AO}{AD} = \frac{CO}{CB}$

$\frac{\sqrt{4007.25}}{75} = \frac{CO}{50}$ (3)

$\frac{50\sqrt{4007.25}}{75} = CO$

$AC = AO + CO$

$= 105.5\text{cm}$ to 1 d.p.