12th January **Higher Plus 5-a-day**

Corbettmaths

Solve the simultaneous equations

$x = 3y + 6$
$3xy = 24 - x$

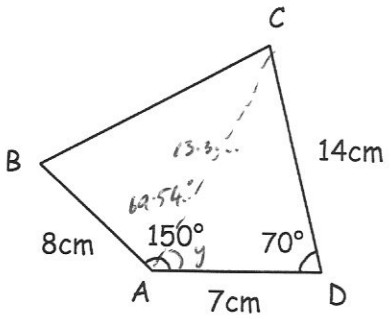
$3(3y+6)y = 24 - (3y+6)$
$(9y+18)y = 24 - 3y - 6$
$9y^2 + 18y = 18 - 3y$
$9y^2 + 18y + 3y - 18 = 0$
$9y^2 + 21y - 18 = 0$
$3y^2 + 7y - 6 = 0$
$(3y - 2)(y + 3) = 0$
$y = \frac{2}{3}$ or $y = -3$
$x = 8$ or $x = -3$

Write $x^2 + 8x + 17$ in the form $(x + a)^2 + b$

$(x+4)^2 - 16 + 17$
$(x+4)^2 + 1$

Find the coordinates of the turning point of $y = x^2 + 8x + 17$

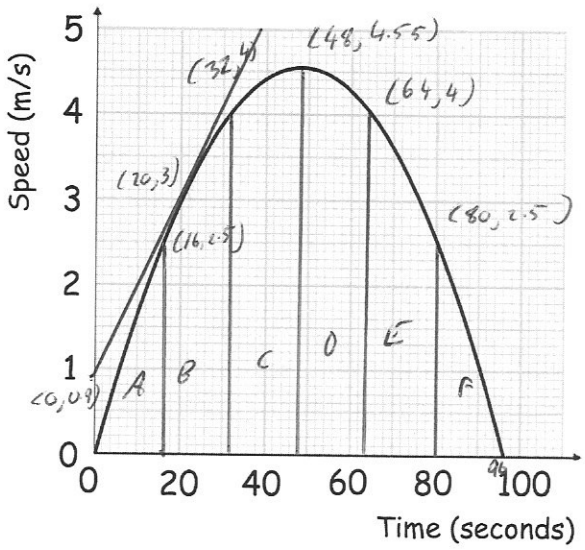
$(-4, 1)$



Calculate the length BC.

$AC^2 = 7^2 + 14^2 - 2 \times 7 \times 14 \times \cos 70$
$AC = 13.340316\,78...$ cm
$\frac{\sin \angle CAB}{14} = \frac{\sin 70}{13.3...}$ $\angle CAD = 80.456...^\circ$
$\angle CAB = 69.54...^\circ$
$BC^2 = 13.34...^2 + 8^2 - 2 \times 13.34... \times 8 \times \cos 69.54...$
$BC = 12.937$ cm

Below is the speed-time graph for the journey between two stops on a miniature locomotive



Work out an estimate of the acceleration of the locomotive at 20 seconds.

$\frac{\text{rise}}{\text{run}} = \frac{2.1}{20} = 1.05$ m/s^2

A) $\frac{1}{2} \times 16 \times 2.5 = 20$
B) $\frac{1}{2}(2.5 + 4) \times 16 = 52$

Work out an estimate for the distance travelled by the locomotive during the journey.

C) $\frac{1}{2}(4 + 4.55) \times 16 = 68.4$
D) $\frac{1}{2}(4.55 + 4) \times 16 = 68.4$
E) $\frac{1}{2}(4 + 2.5) \times 16 = 52$
F) $\frac{1}{2} \times 16 \times 2.5 = 20$

280.8 m