Exercise 2.8

1. One side of a rectangular park is $(x + 2)$ m long and the other $(x - 2)$ m wide. Find an expression for the length of the diagonal, leaving your answer in surd form.

$a^2 = b^2 + c^2$

Pythagoras Theorem

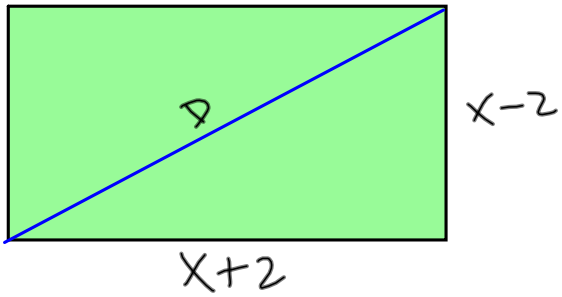
$D^2 = (x-2)^2 + (x+2)^2$

$= x^2 - 4x + 4 + x^2 + 4x + 4$

$= 2x^2 + 8$

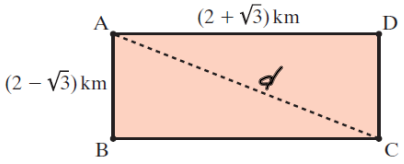
$= 2(x^2 + 4)$

$D = \sqrt{2(x^2+4)}$



2. (a) Find the length of the diagonal [AC] of the rectangular field ABCD.

(b) One runner completes a full circuit ABCDA on a path, at a rate of 1.5 ms^{-1}.
A second runner runs from A to C and then back to A across the field at a rate of 1.4 ms^{-1}.



(i) Express, in surd form, the difference in the distances travelled by the two runners.

(ii) Calculate the time difference between the two runners, correct to the nearest second.

(a) $d^2 = (2+\sqrt{3})^2 + (2-\sqrt{3})^2$ Pythagoras

$d^2 = 4 + 4\sqrt{3} + 3 + 4 - 4\sqrt{3} + 3 = 14$

$\Rightarrow d = \sqrt{14}$

(b) 1st runner $l_1 = 2-\sqrt{3} + 2+\sqrt{3} + 2-\sqrt{3} + 2+\sqrt{3} = 8$

(i) 2nd runner $l_2 = \sqrt{14} + \sqrt{14} = 2\sqrt{14}$

difference: $l_1 - l_2 = 8 - 2\sqrt{14}$

(ii) D / S × T

time = distance / speed

$t_1 = 8 / 1.5 = 5.33$ seconds

$t_2 = 2\sqrt{14} / 1.4 = 7.48$ seconds

time difference $= 7.48 - 5.33 = 2.15$ secs