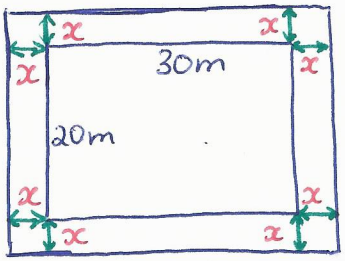
MPM2DG **Steps to Problem Solving**

1. Accept and understand the importance of the problem. Become a student of the problem.
2. Read the problem (at least two times). Determine the key pieces of information.
3. Choose a strategy (draw a diagram, make a table, make a list, try a simpler case, try a special case, work backwards, try algebra, look for a pattern.)
4. Look back.

Problem 1:
Carina works at the Botanical Gardens and is planning a new rectangular rose garden 20 m by 30 m. She plans to build a walkway, with a uniform width, all around the garden. Her budget is \$6000 and she knows it will cost \$10/m^2 to construct the walkway. How wide can the walkway be? [Answer: 5 m]



let x represent the uniform width of the walkway

① Find how much area we can afford

$\frac{\$6000}{\$10/m^2} = 600m^2$

② Find the expression for area that involves x

③ Equate the two expressions for same area

$(30+2x)(20+2x) - 600 = 600$

$600 + 60x + 40x + 4x^2 - 600 = 600$

$4x^2 + 100x - 600 = 0$

$4(x^2 + 25x - 150) = 0$

$4(x+30)(x-5) = 0$

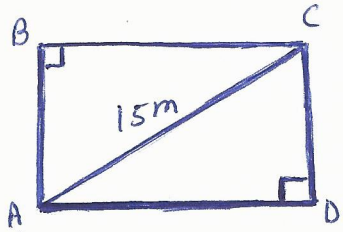
$x+30=0$ or $x-5=0$

$x = -30$ not possible as width >0 $\quad x = 5$

Answer: $x = 5$ m.

Problem 2:
Nancy walks 15 m diagonally across a rectangular field. She then returns to her starting position along the outside of the field. The total distance she walks is 36 m. What are the dimensions of the field? [Answer: 12 m by 9 m]

length, width



In $\triangle ABC$: $AB + BC + 15 = 36$, $AB + BC = 21$
(AB: width, BC: length; BC = x)

let x represent the width of the rectangle,
let $21 - x$ represent the length

How do we come up with an equation involving x?
We can use what is always true in a right-angled triangle.

$x^2 + (21-x)^2 = 15^2$

$x^2 + 441 - 42x + x^2 = 225$

$2x^2 - 42x + 441 - 225 = 0$

$2x^2 - 42x + 216 = 0$

Solve by factoring (always common factor first, if possible!)

$2(x^2 - 21x + 108) = 0$

$2(x-12)(x-9) = 0$

$2 \neq 0$, $x-12=0$ or $x-9=0$

$x = 12$ or $x = 9$

$21 - x = 9$ or $21 - x = 12$

Answer: The dimensions of the field are 9m by 12m.

Check: (optional)

LS	RS
9^2+12^2	15^2
$81+144$	225
225	225 ✓

and $9+12+15 = 36$m ✓