Today, a father is 2 years older than triple his son's age. Five years ago, the product of their ages was 420. How old is the father now?

② Unknowns $\boxed{\text{ages}}$

② 2 Timelines

	Present	Past (−5)
Dad's age	$3x+2$	$3x-3$
Son's age	$x = \underline{15}$	$x-5$

$(3x-3)(x-5)=420$

$3x^2-18x+15=420$

$-420\quad -420$

$\dfrac{3x^2-18x-405}{3}=\dfrac{0}{3}$

$x^2-6x-135=0$

$(x+9)(x-15)=0$

$x+9=0$ or $x-15=0$

$x=-9$ Reject $\qquad x=15$

Answer:

$3(15)+2$

$45+2$

47 yrs old

Today, a mother's age is two years more than double her son's age. In ten years, the product of their ages will be 2040. How old are they today ?

	Present	Future (+10)
Mother's age	$2x+2$	$2x+12$
Son's age	$x = 24$	$x+10$

$(2x+12)(x+10) = 2040$

$2x^2 + 32x + 120 = 2040$

$ -2040 \quad -2040$

$\dfrac{2x^2 + 32x - 1920}{2} = \dfrac{0}{2}$

$x^2 + 16x - 960 = 0$

$(x+40)(x-24) = 0$

$x+40 = 0$ or $x-24 = 0$

$x = -40$ Reject

$\boxed{x = 24}$

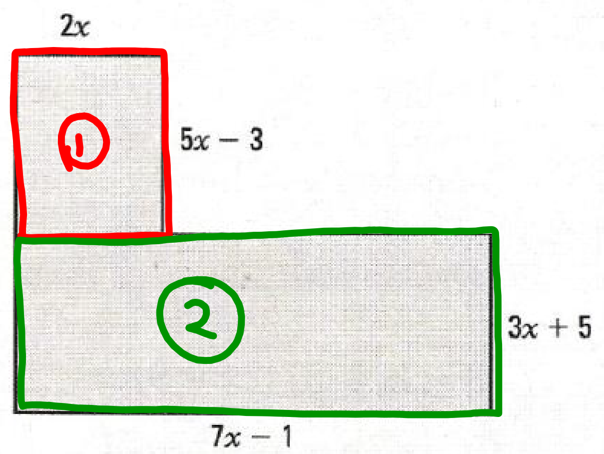
Answer:

Son: 24 yrs old

Mom: 50 yrs old

The Quadratic Formula

The area of this figure is equal to $103.75cm^2$.
Determine the numerical length of each side.



$$2x(5x-3)+(3x+5)(7x-1)=103.75$$

$$(10x^2-6x)+(21x^2-3x+35x-5)=103.75$$

$$31x^2+26x-5=103.75$$

$$-103.75 \quad -103.75$$

$$31x^2+26x-108.75=0$$

$$31x^2 + 26x - 108.75 = 0$$

$$m \times n = -3371.25$$
$$m + n = 26$$

The quadratic formula provides a solution to any quadratic (second-degree) equation of the form...

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Example:

$$ax^2 + bx + c = 0$$

$$\underset{a}{31}x^2 \underset{b}{+26}x \underset{c}{-108.75} = 0$$

$$x = \frac{-26 \pm \sqrt{26^2 - 4(31)(-108.75)}}{2(31)}$$

$= 14161$

$= 62$

$$x = \frac{-26 \pm \sqrt{14161}}{62} \quad = 119 \quad \Rightarrow \frac{-26 \pm 119}{62}$$

1

$$x_1 = \frac{-26+119}{62}$$

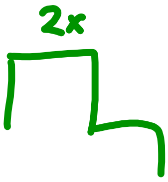
$$x = \frac{93}{62} = 1.5$$

2

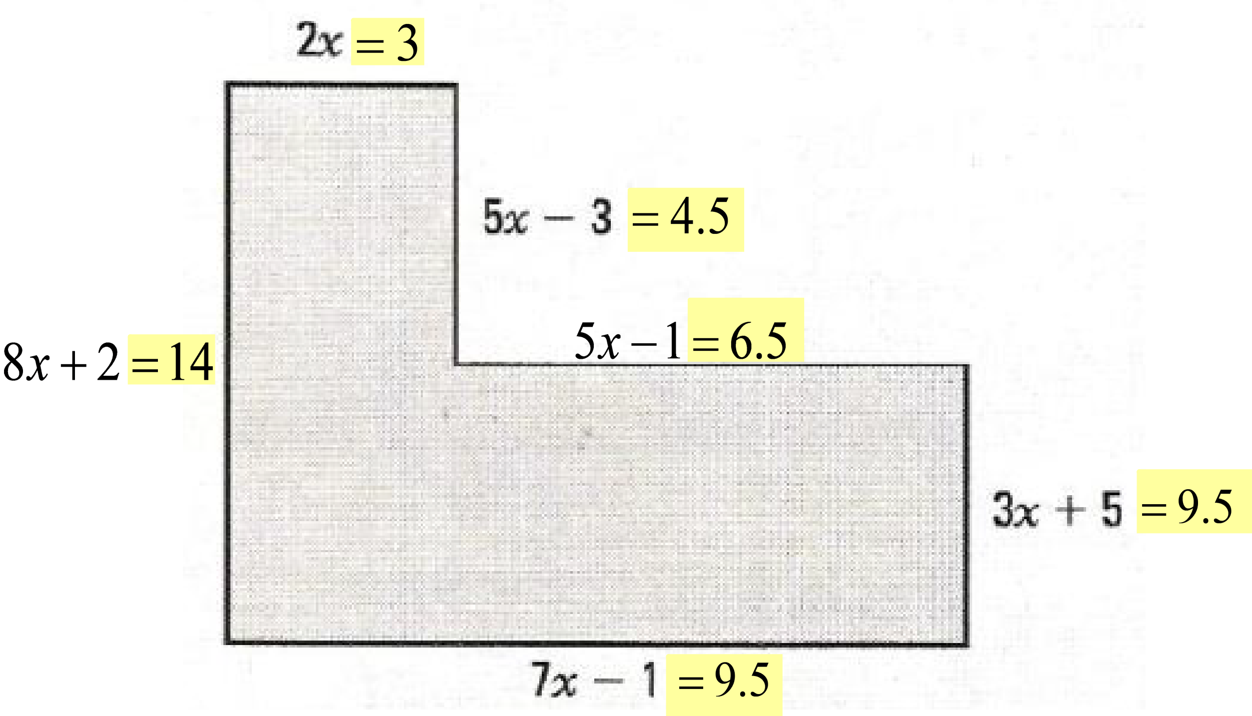
$$x_2 = \frac{-26-119}{62}$$

$$x = \frac{-145}{62} \approx -2.34$$

Reject



$$\therefore x = 1.5$$


$2x = 3$
$5x - 3 = 4.5$
$5x - 1 = 6.5$
$8x + 2 = 14$
$3x + 5 = 9.5$
$7x - 1 = 9.5$

Example:

Solve $\overset{a}{15}x^2 \overset{b}{\underline{-2}}x \overset{c}{-8} = 0$ using quadratic formula

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(15)(-8)}}{2(15)}$$

$= 4 - 4(15)(-8)$

$$x = \frac{2 \pm \sqrt{4 + 480}}{30}$$

$$x = \frac{2 \pm \sqrt{484}}{30}$$

$$x = \frac{2 \pm 22}{30}$$

$$x = \frac{2+22}{30} = \frac{24}{30} = \frac{4}{5} \quad \text{or} \quad x = \frac{2-22}{30} = \frac{-20}{30} = -\frac{2}{3}$$