MCR3U

Quadratic Word Problems

1. Two positive numbers differ by 3. The sum of their squares is 89. Find the numbers.

2. A mural is to be painted on a wall measuring 15 m x 12 m. A border of uniform width is to surround the mural. If the mural is to cover 75% of the area of the wall, how wide must the border be, to the nearest hundredth of a metre?

3. A garden measuring 12 meters by 16 meters is to have a pedestrian pathway installed all around it, increasing the total area to 285 square meters. What will be the width of the pathway?

4. The three sides of a right triangle form three consecutive even numbers. Find the lengths of the three sides.

5. The base of a triangle is 2 cm more than the height. If the area is 5 cm2, find the length of the base, to 1 decimal place.

6. Find three consecutive positive odd integers such that the sum of the squares of the first two is 15 less than the square of the third.

7. Each side of a square house is 6 metres longer than each side of the square garage. If the combined area of house and garage is 180 m^2 , find the dimensions of the house and the garage.

8. A square swimming pool with a side measuring 16 m is to be surrounded by a uniform rubberized floor covering. If the area of the floor covering equals the area of the pool, find the width of the rubberized covering, correct to one decimal place.

9. A ladder is resting against a wall. The top of the ladder touches the wall at a height of 15 feet. Find the distance from the wall to the bottom of the ladder if the length of the ladder is one foot more than twice its distance from the wall.

10. The legs of a right triangle are 2sqrt(10) and 2sqrt(5). Find the hypotenuse.

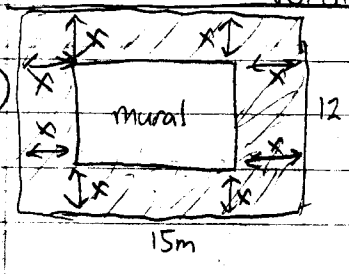
Answers

1). 5, 8 **(2).** 0.89 m **(3).** 1.5 m **(4).** 6, 8, 10 **(5).** 4.3 cm **(6).** 1,3,5 or 3,5,7 **(7).** 12m X12m, 6m X 6m **(8).** 3.3 m **(9).** 8 ft **(10).** 2 15

6

Quadratic Word Problems

2

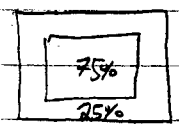


$A_{wall} = (l)(w) = (15)(12) = 180\ m^2$

If mural is 75% of the wall, then the other 25% must be the border.

$A_{border} = 25\%$ of A_{wall}
$= (0.25)(180)$
$= 45\ m^2$

ex)



$A_{mural} = A_{wall} - A_{border}$

$(12-2x)(15-2x) = 180 - 45$

$180 - 54x + 4x^2 = 135$

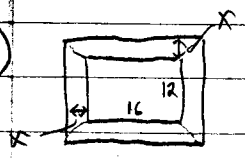
$4x^2 - 54x + 45 = 0$

$x = \dfrac{54 \pm \sqrt{(-54)^2 - 4(4)(45)}}{2(4)}$

$\cancel{x = 12.61\ m}$ $\boxed{x = 0.89\ m}$

Can't be this because x must be less than 12.

3



$A_{Total} = 285\ m^2 = (16+2x)(12+2x)$

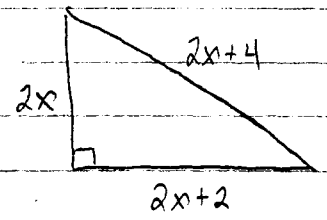
$285 = 192 + 56x + 4x^2$

$4x^2 + 56x - 93 = 0$

$x = \dfrac{-56 \pm \sqrt{(56)^2 - 4(4)(-93)}}{2(4)}$

$\boxed{x = 1.5\ m}$ & $\cancel{x = -15.5}$

(4)



- How do we make sure our number, x, is always even?
- Multiply it by 2, and it will always be even!!

(ie/ $2x$ is always even for any value of x)

- Need 3 consecutive, even numbers.

$2x$ is even, $2x+2$ is consecutive & even, $2x+4$ is as well!

$$c^2 = a^2 + b^2$$
$$(2x+4)^2 = (2x)^2 + (2x+2)^2$$
$$4x^2 + 16x + 16 = 4x^2 + 4x^2 + 8x + 4$$
$$\cancel{4x^2} - \cancel{4x^2} - 4x^2 + 16x - 8x + 16 - 4 = 0$$
$$-4x^2 + 8x + 12 = 0$$
$$-\cancel{4}(x^2 - 2x - 3) = 0$$
$$x^2 - 2x - 3 = 0$$
$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(-3)}}{2(1)}$$
$$x = \frac{2 \pm 4}{2}$$
$$\boxed{x = 3} \quad \& \quad \cancel{x = -1}$$

$\therefore$ Sides are

$$2x = 2(3) = \boxed{6}$$
$$2x+2 = 2(3)+2 = \boxed{8}$$
$$2x+4 = 2(3)+4 = \boxed{10}$$

Hilroy

(6) $(\quad)^2 + (\quad)^2 = (\quad)^2 - 15$

must be consecutive, positive, ~~odd integers~~

$2x+1$ will always be odd.

Let $2x+1$ be the first number
Let $2x+3$ be the second number.
Let $2x+5$ be the third number.

$(2x+1)^2 + (2x+3)^2 = (2x+5)^2 - 15$

$4x^2+4x+1+4x^2+12x+9 = 4x^2+20x+25-15$

$4x^2+\cancel{4x^2}-\cancel{4x^2}+4x+12x-20x+1+9+15-25=0$

$4x^2-4x=0$

$x^2-x=0$

$x(x-1)=0$

$x=0$ & $x=1$

$\Downarrow$ $\Downarrow$

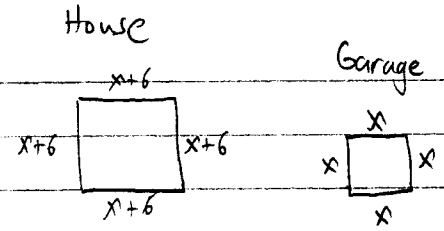
$2x+1=\boxed{1}$ $\quad$ $2x+1=\boxed{3}$

$2x+3=\boxed{3}$ & $2x+3=\boxed{5}$

$2x+5=\boxed{5}$ $\quad$ $2x+5=\boxed{7}$

$2x$

7



$A_{house} + A_{Garage} = 180\ m^2$

$(x+6)^2 + x^2 = 180$

$x^2 + 12x + 36 + x^2 = 180$

$2x^2 + 12x - 144 = 0$

$x^2 + 6x - 72 = 0$

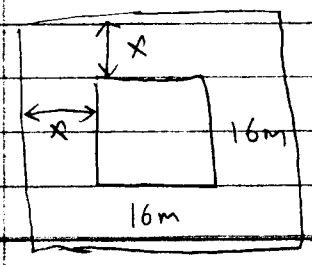
$x = \dfrac{-6 \pm \sqrt{6^2 - 4(1)(-72)}}{2(1)}$

$x = 6\ m$ & $\cancel{x = -12}$

$\therefore$ Garage is $\boxed{6m \times 6m}$

House is $(x+6) \times (x+6) = \boxed{12m \times 12m}$

8



$A_{pool} = A_{cover}$

$(16)(16) = (16+2x)(16+2x) - (16)(16)$

$256 = \cancel{256} + 64x + 4x^2 \cancel{-256}$

$4x^2 + 64x - 256$

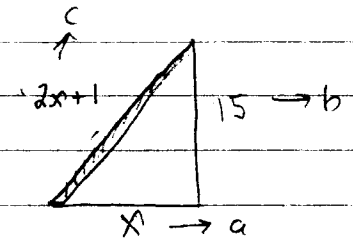
$x^2 + 16x - 64 = 0$

$x = \dfrac{-16 \pm \sqrt{(16)^2 - 4(1)(-64)}}{2(1)}$

$\boxed{x = 3.3\ m}$ & $\cancel{x = -19.3}$

Hilroy

(9)



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

$(2x+1)^2 = x^2 + 15^2$

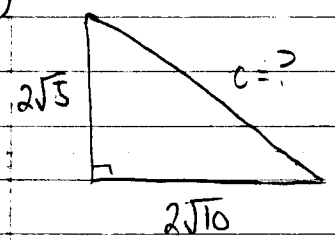
$4x^2 + 4x + 1 = x^2 + 225$

$3x^2 + 4x - 224 = 0$

$x = \dfrac{-4 \pm \sqrt{(4)^2 - 4(3)(-224)}}{2(3)}$

$\boxed{x = 8 \text{ feet}}$ & $\cancel{x = -9.33}$

(10)



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

$c^2 = (2\sqrt{5})^2 + (2\sqrt{10})^2$

$c^2 = (4)(5) + (4)(10)$

$c^2 = 60$

$c = \sqrt{60}$

$c = \sqrt{4}\sqrt{15}$

$\boxed{c = 2\sqrt{15}}$