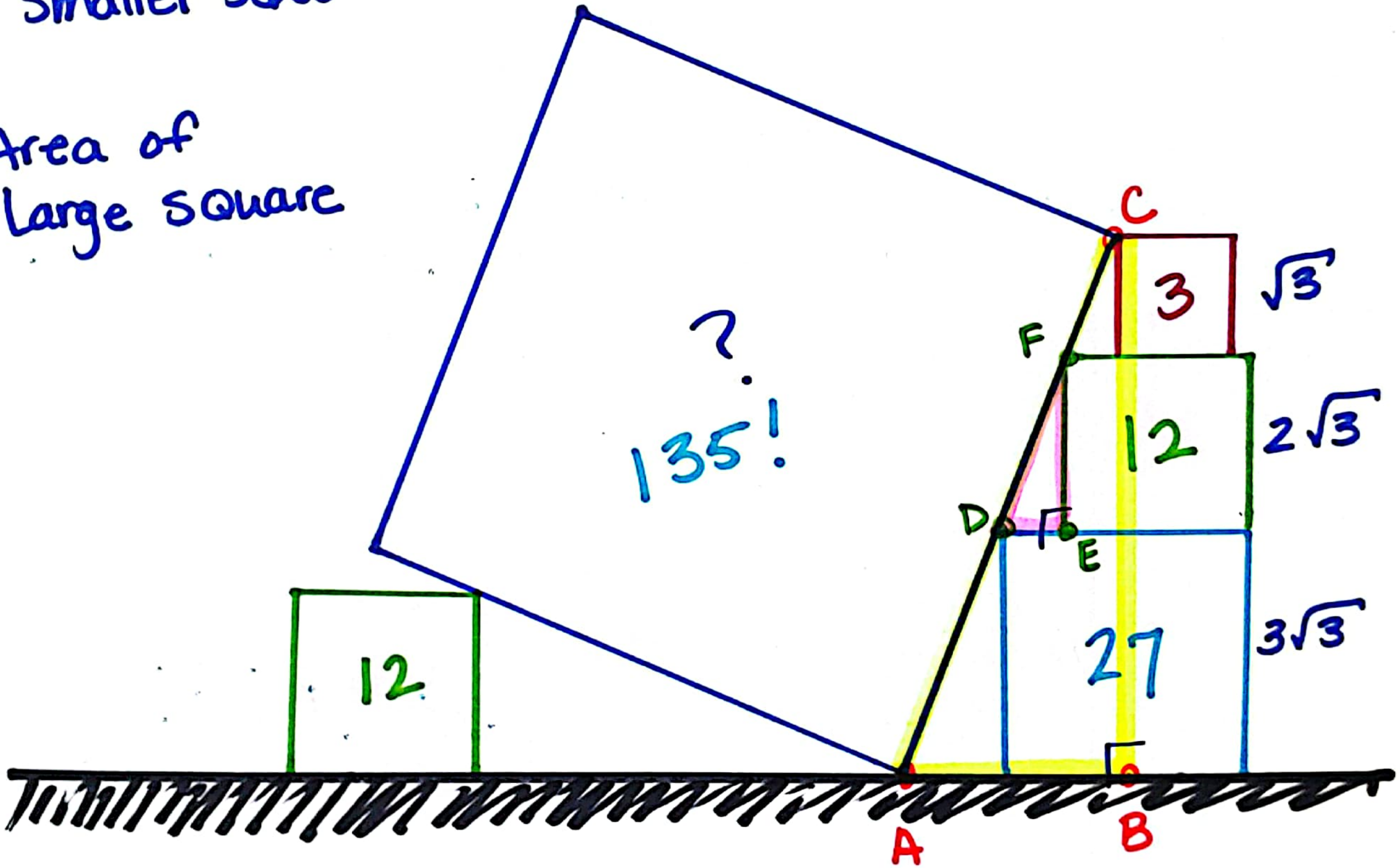
Given: Areas of smaller squares

Find: Area of large square

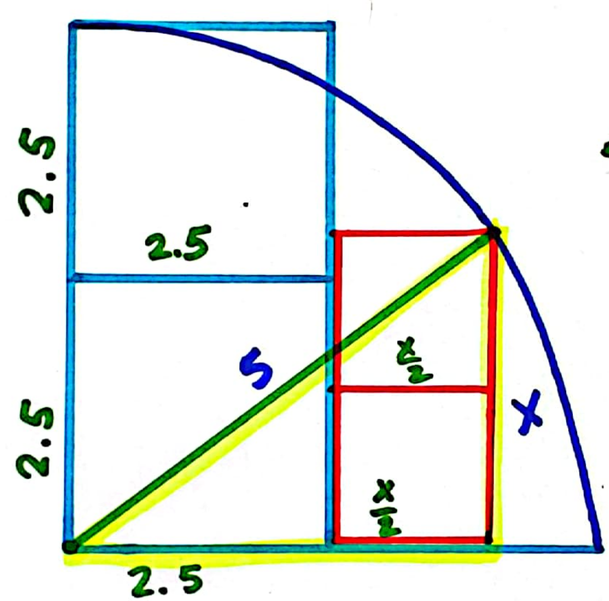


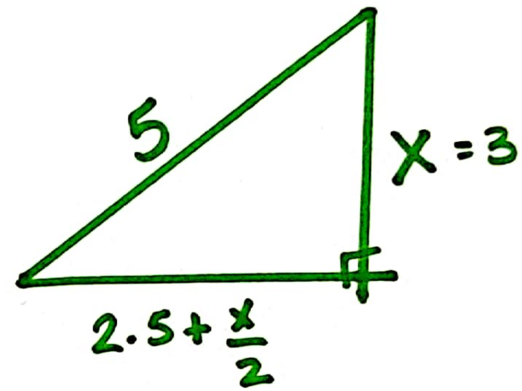
1. Find $\overline{BC}$
2. Find $\overline{EF}$ and $\overline{DE}$
3. Use Pythagorean Thm to find $\overline{DF}$
4. Using similar triangles, find $\triangle ABC$ missing sides
5. Square $\overline{AC}$ to get Large square's area

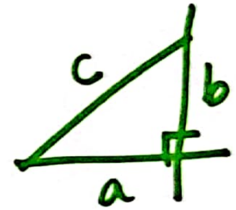
135!

Given: The radius of the quarter circle is 5.

Find: Total area of the four squares?







Pythag. Thm:

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

$25 = \left(2.5 + \frac{x}{2}\right)^2 + x^2$

Quad. Eq. to get

$x = 3$, $\cancel{-5}$

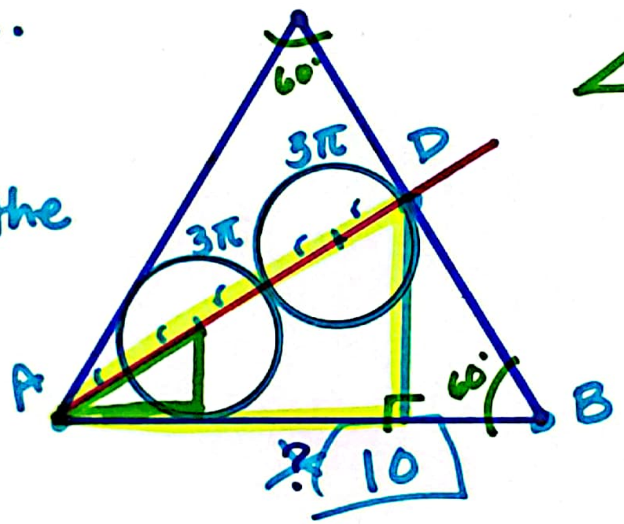
$A = L \cdot w$

$A = (2.5)(2.5)(2) + \left(\frac{3}{2}\right)\left(\frac{3}{2}\right)(2)$

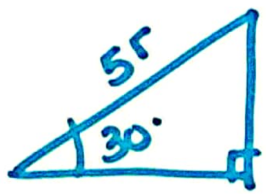
$\boxed{17}$

Given: Two circles stacked in an equilateral triangle.

Find: Length of the side of the triangle.

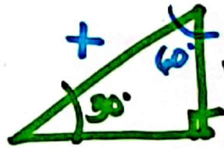


$\frac{180^\circ}{3} = 60^\circ$



$A = \pi r^2$

$3\cancel{\pi} = \cancel{\pi} r^2$

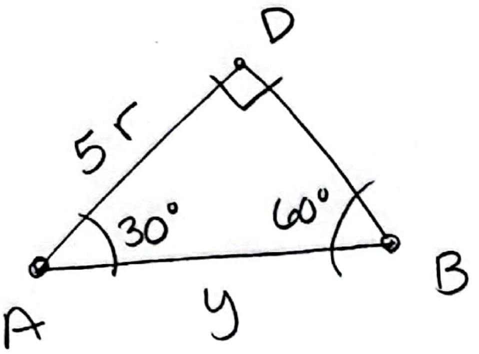


$r \rightarrow r = \sqrt{3}$

$\frac{\cancel{\sin 30^\circ} \rightarrow \frac{1}{2}}{r} = \frac{\cancel{\sin 90} \rightarrow 1}{x}$

$\frac{\frac{1}{2}}{r} = \frac{1}{x}$

$\frac{1}{2} x = r$



$$\frac{\cancel{\sin 90^\circ}^{\,1}}{y} = \frac{\cancel{\sin 60^\circ}^{\,\sqrt{3}/2}}{5r}$$

$$\frac{1}{y} = \frac{\frac{\sqrt{3}}{2}}{5\cancel{r}^{\,\sqrt{3}}}$$

reciprocal

$$\frac{y}{1} = \frac{5\sqrt{3}}{\left(\sqrt{3}/2\right)} \Rightarrow y = \frac{5\cancel{\sqrt{3}}}{\cancel{\sqrt{3}}}\cdot 2 = 10$$

so $\boxed{y = 10}$

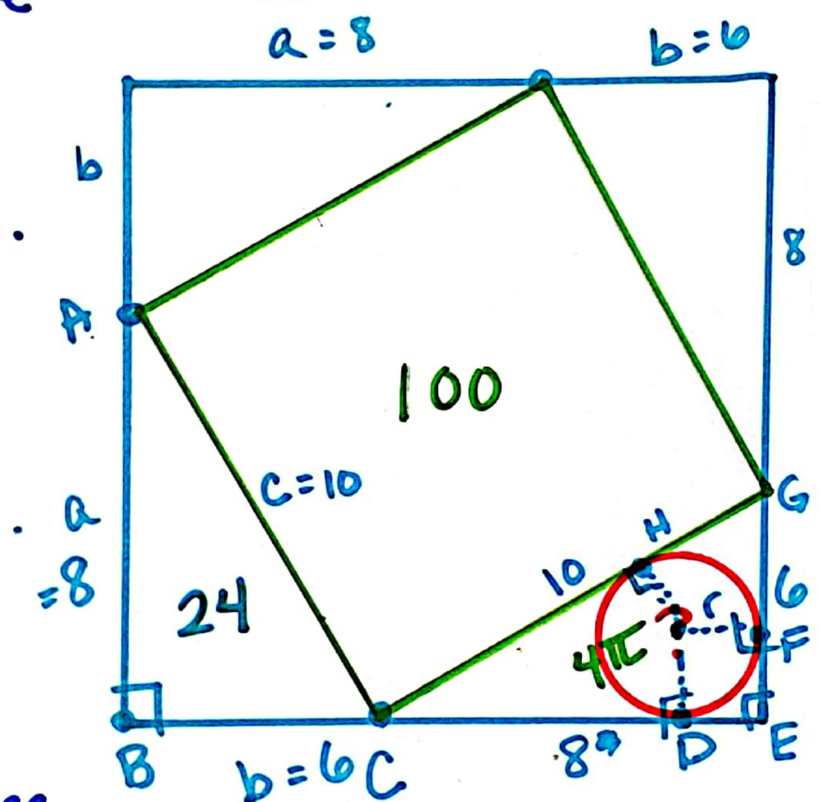
$$\boxed{\overline{AB} = 10}$$ ← one side of the triangle!

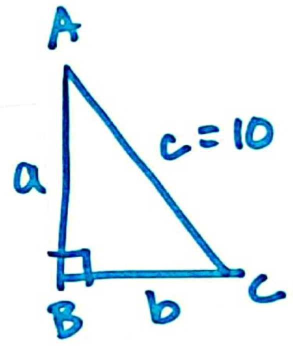
Given: the square, circle + triangle are stacked inside a large square.

Find: Area of the circle

Hint: Numbers are area of the shape.

$A_{sq} = 100 = c^2 \to 10$





$A_{triangle} = \frac{1}{2} ba$

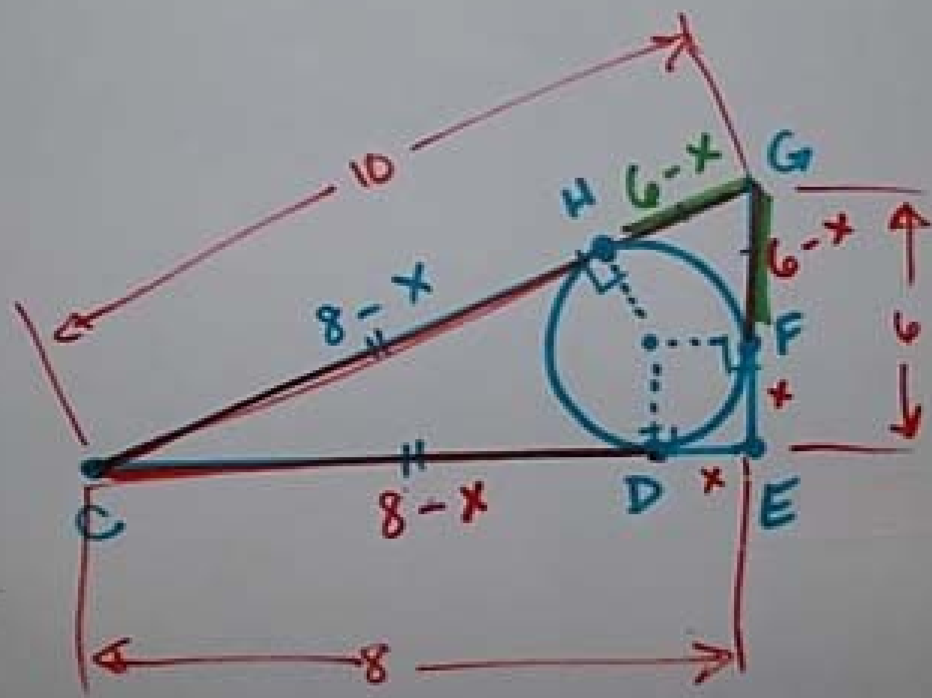
$\boxed{24 = \frac{1}{2} ab}$

$A_{\text{big sq.}} = (a+b)^2 = 100 + 4(24)$

$(a+b)^2 = 100 + 96 = 196$

$\sqrt{(a+b)^2} = \sqrt{196}$

$\boxed{(a+b) = 14}$



$$10 = 8 - x + 6 - x$$

$$\underset{-10}{10} + 2x = \underset{-10}{14} - 2x + 2x$$

$$\frac{2x}{2} = \frac{14 - 10}{2}$$

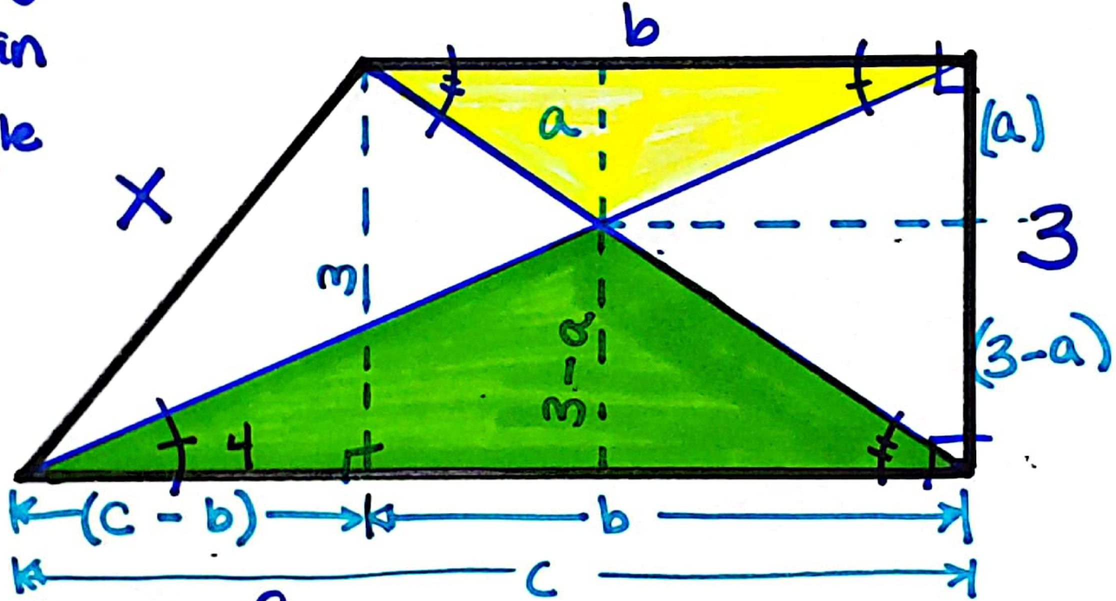
$$x = \frac{4}{2} = 2$$

$$A = \pi r^2 = \pi(2)^2$$

$$\boxed{A = 4\pi}$$

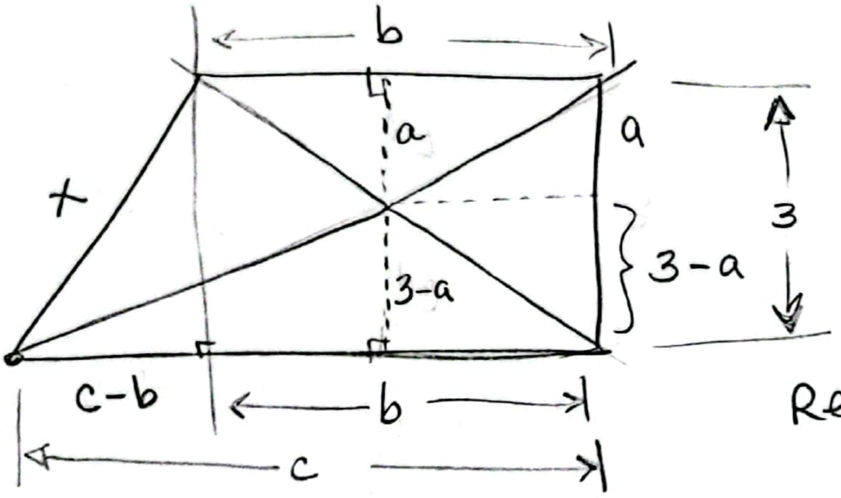
Given: Right-angled trapezium;

Green triangle area is 6 more than yellow triangle area.



Find: Length x of sloping side.

$\boxed{x = 5}$



① $A_y + 6 = A_g$

$A_y = \frac{1}{2}ab$

$A_g = \frac{1}{2}(3-a)c$

$\frac{1}{2}ab + 6 = \frac{1}{2}(3-a)c$

Rewrite: $ac = 3c - ab - 12$

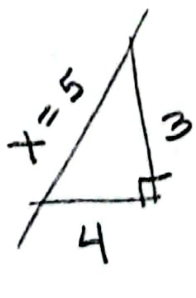
② Similar Triangles (green + yellow):

$\frac{b}{a} = \frac{c}{3-a} \Rightarrow ac = b(3-a) = 3b - ab$

③ $3b - \cancel{ab} = 3c - \cancel{ab} - 12 \leftarrow$ (① + ② together)

$\frac{3b}{3} = \frac{3c-12}{3} \Rightarrow b = c - 4$

④ so then $(c-b) = 4$



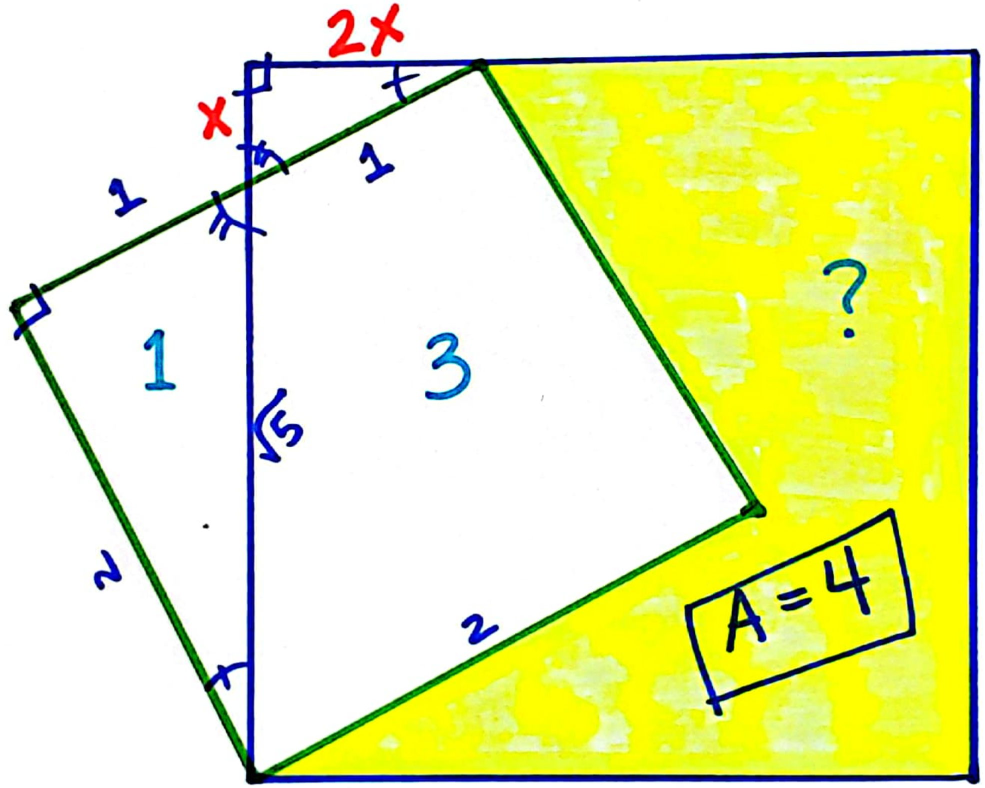
$x^2 = 3^2 + 4^2$

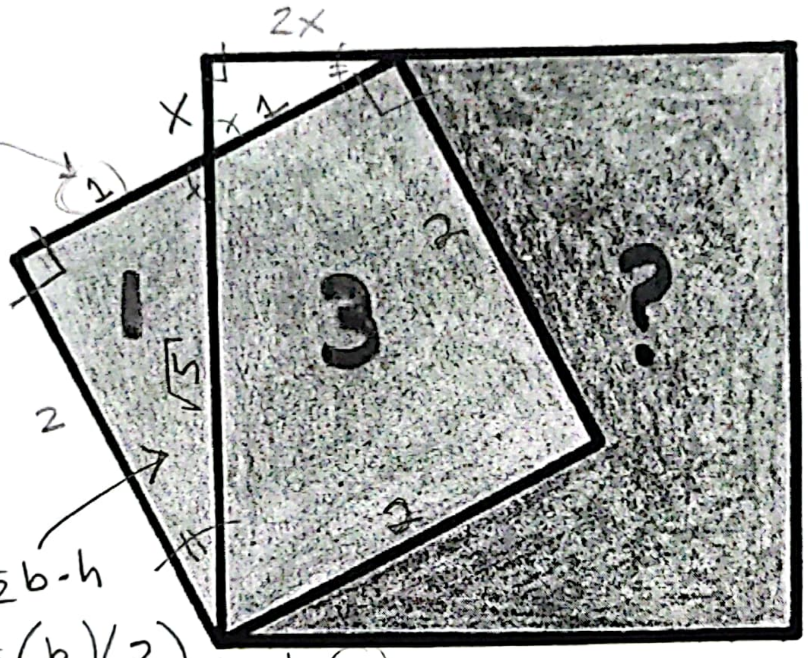
$x^2 = 25$

$\boxed{x = 5}$

Given: Two squares.

Find: Shaded area.





① $A = 1 = \frac{1}{2} b \cdot h$

$1 = \frac{1}{2}(b)(2)$ so $b = 1$

Two squares. What's the missing area?

② Similar Δ's : Area = 1 & white Δ

$$\frac{\sqrt{5}}{1} = \frac{1}{x} \rightarrow x = \frac{1}{\sqrt{5}}$$

area of white Δ: $\frac{1}{2}(x)(2x)$

$$= \frac{1}{2}(2)\left(\frac{1}{\sqrt{5}}\right)^2 = \frac{1}{5} = A_{white}$$

③ Large square side $= \sqrt{5} + x = \sqrt{5} + \frac{1}{\sqrt{5}}$

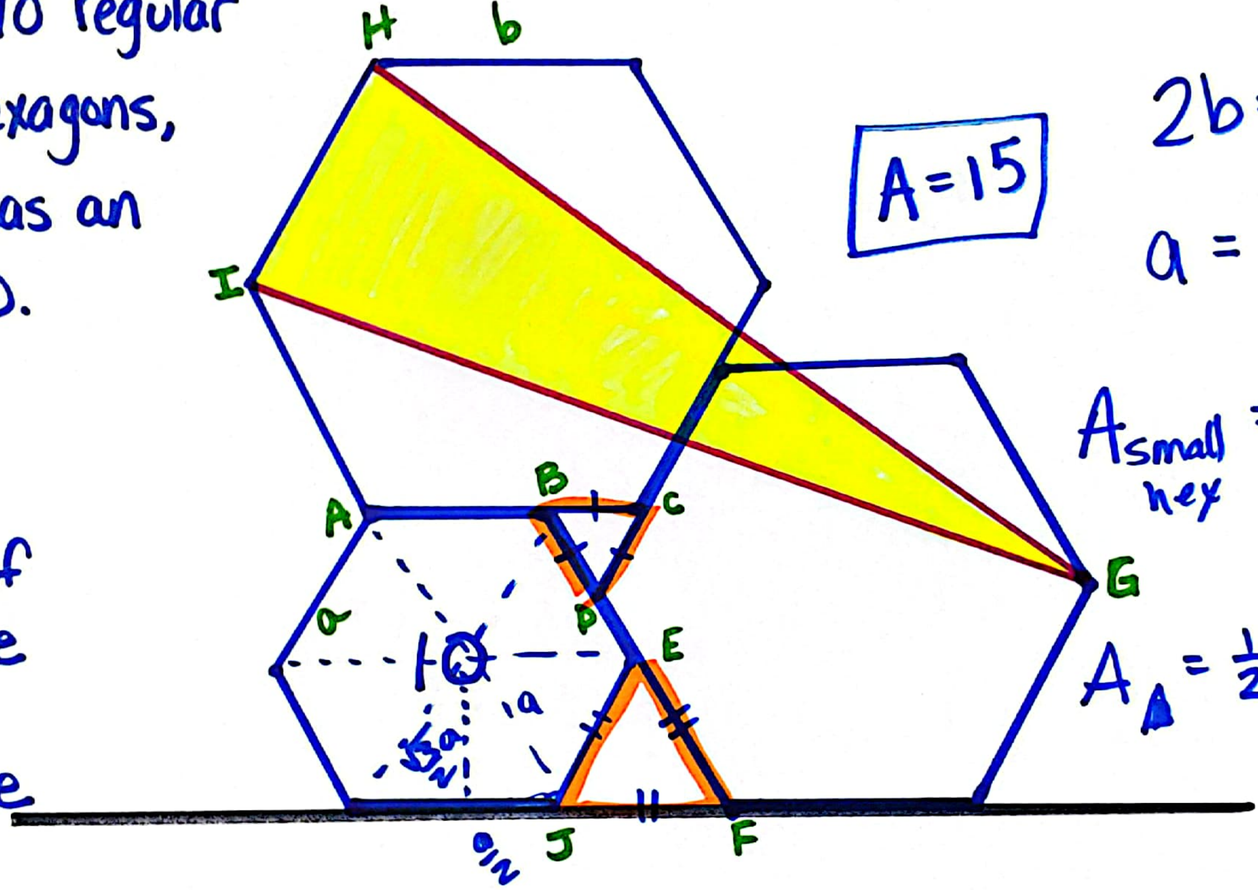
total Large sq. area $= \left(\sqrt{5} + \frac{1}{\sqrt{5}}\right)\left(\sqrt{5} + \frac{1}{\sqrt{5}}\right)$

$$= 5 + 2 + \frac{1}{5} = 7\tfrac{1}{5}$$

④ $A_{blue} = 7\tfrac{1}{5} - 3 - \frac{1}{5} = \underline{\underline{4}}$

Given: Two regular identical hexagons, the third has an area of 10.

Find: Area of the large shaded triangle



$\boxed{A=15}$

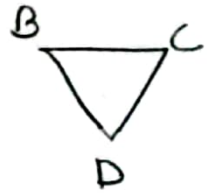
$2b=3a$

$a=$

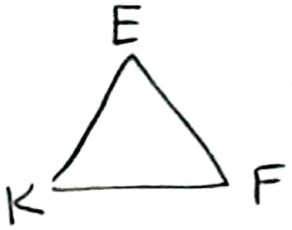
$A_{\text{small hex}} = \frac{3\sqrt{3}}{2}a^2=10$

$A_{\triangle}=\frac{1}{2}b\cdot h$

$4\left(\frac{\sqrt{3}}{2}\right)b$

① Triangle  is equilateral

so $ABC = ABD$ and $ABF = 2b$

② Triangle  is equilateral

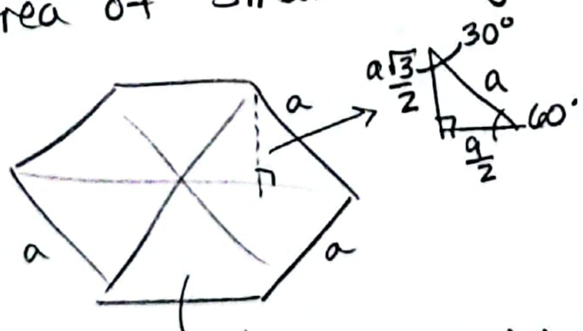
so $ABF = ABEK = 3a$

③ $2b = 3a \rightarrow b = \frac{3}{2}a$

④ for Area: $b^2 = \left(\frac{3}{2}a\right)^2 = \frac{9}{4}a^2$

area scale factor $\Big\}$ $\frac{9}{4} \rightarrow 10\left(\frac{9}{4}\right) = \frac{90}{4} = \frac{45}{2}$

Area of small hexagon: $A = \frac{1}{2}(b)(h)(6)$



6 equilat. triangles

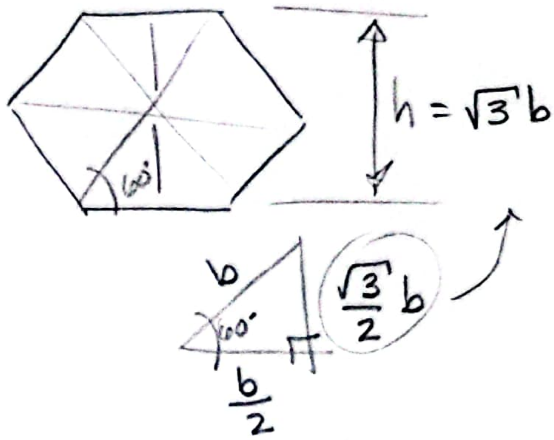
$A = \frac{1}{2}(a)\left(\frac{\sqrt{3}}{2}a\right)(6)$

$A = \frac{3\sqrt{3}}{2}a^2$ for whole hexagon

$A = 10 = \frac{3\sqrt{3}}{2}a^2$

solve for a

(5) $A_{\text{big } \triangle} = \frac{1}{2} bh$ $\qquad h = 2(\sqrt{3}\, b)$



$A = \frac{1}{\cancel{2}} b(\cancel{2} \sqrt{3}\, b)$

$A_{\triangle} = \sqrt{3}\, b^2$

find a: $10 = \frac{3\sqrt{3}}{2} a^2 \rightarrow \frac{20}{3\sqrt{3}} = a^2$

$a = \sqrt{\frac{20}{3\sqrt{3}}}$

$b = \frac{3}{2} a = \frac{3}{2} \sqrt{\frac{20}{3\sqrt{3}}}$

$A_{\triangle} = \cancel{\sqrt{3}}\, \frac{\cancel{9}^{3}}{\cancel{4}} \left(\frac{\cancel{20}^{5}}{3\cancel{\sqrt{3}}} \right) = \underline{\underline{15}}$