

Reminders

- ① Exam #1 is due 03/14 at 11:59 pm (this Sunday!)
- ② on Sunday we lose 1hr of sleep.

Today: §12.3 Area of Triangles.

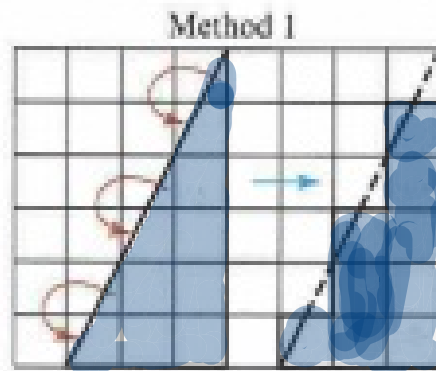
Ways to Find Area on a grid

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Side note

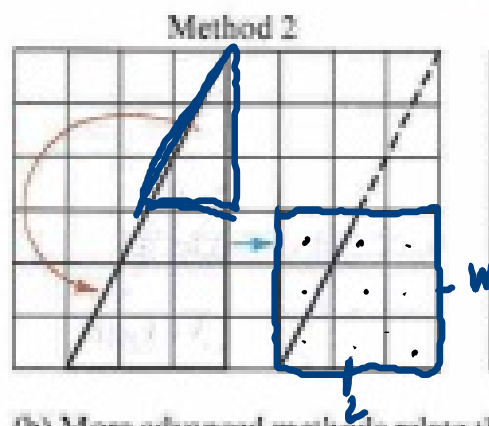
Know Area of a rectangle is

$$A = L \cdot w$$



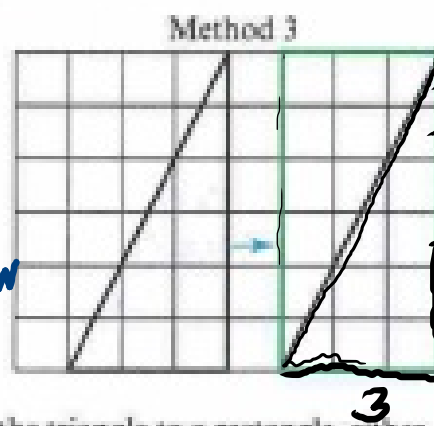
(a) A primitive way to determine the area is to move small pieces and count the total number of squares.

9 # of \square



(b) More advanced methods relate the triangle to a rectangle, either by moving a big chunk or by embedding the triangle in a rectangle. These methods lead to the triangle area formula.

9 # of \square



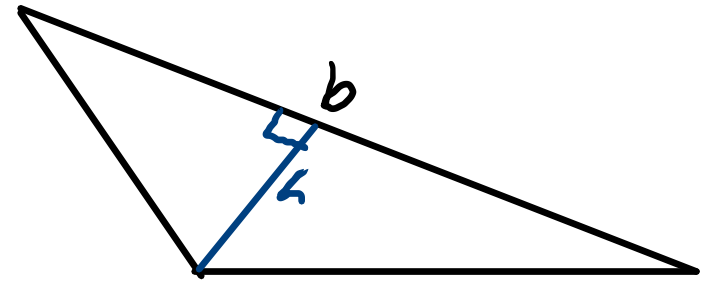
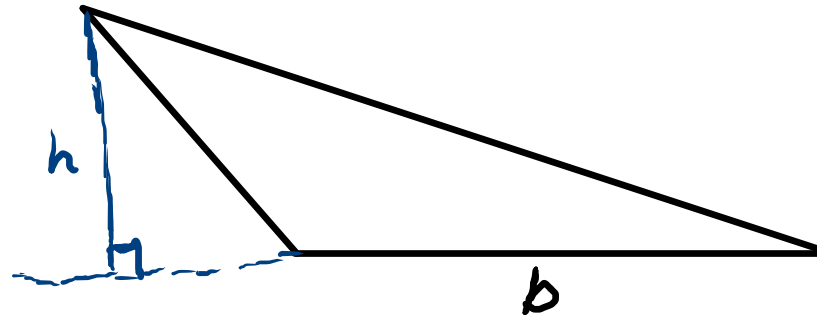
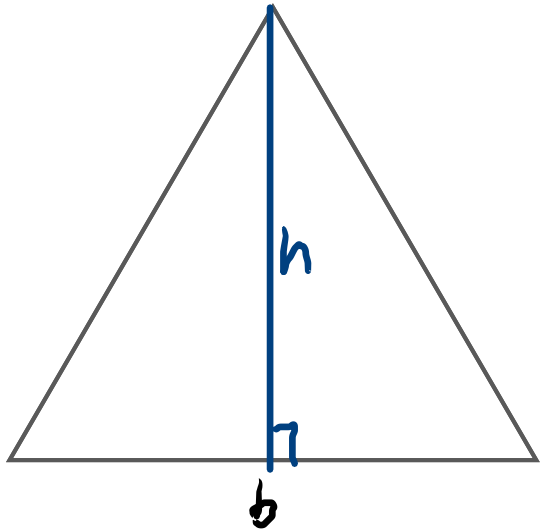
$$6 \rightarrow A = 6 \cdot 3 = 18$$

Area of \triangle is half of \square

$$A_{\triangle} = \frac{1}{2} \cdot 18 = 9$$

To get the Area of a Triangle need two things:

- ① Base: Can be represented by any of its three sides.
- ② Height: Is a line segment that is
 - ① Perpendicular to the base.
 - ② Connect the base, or extension of the base, or to the vertex of the Δ that is NOT on the base.



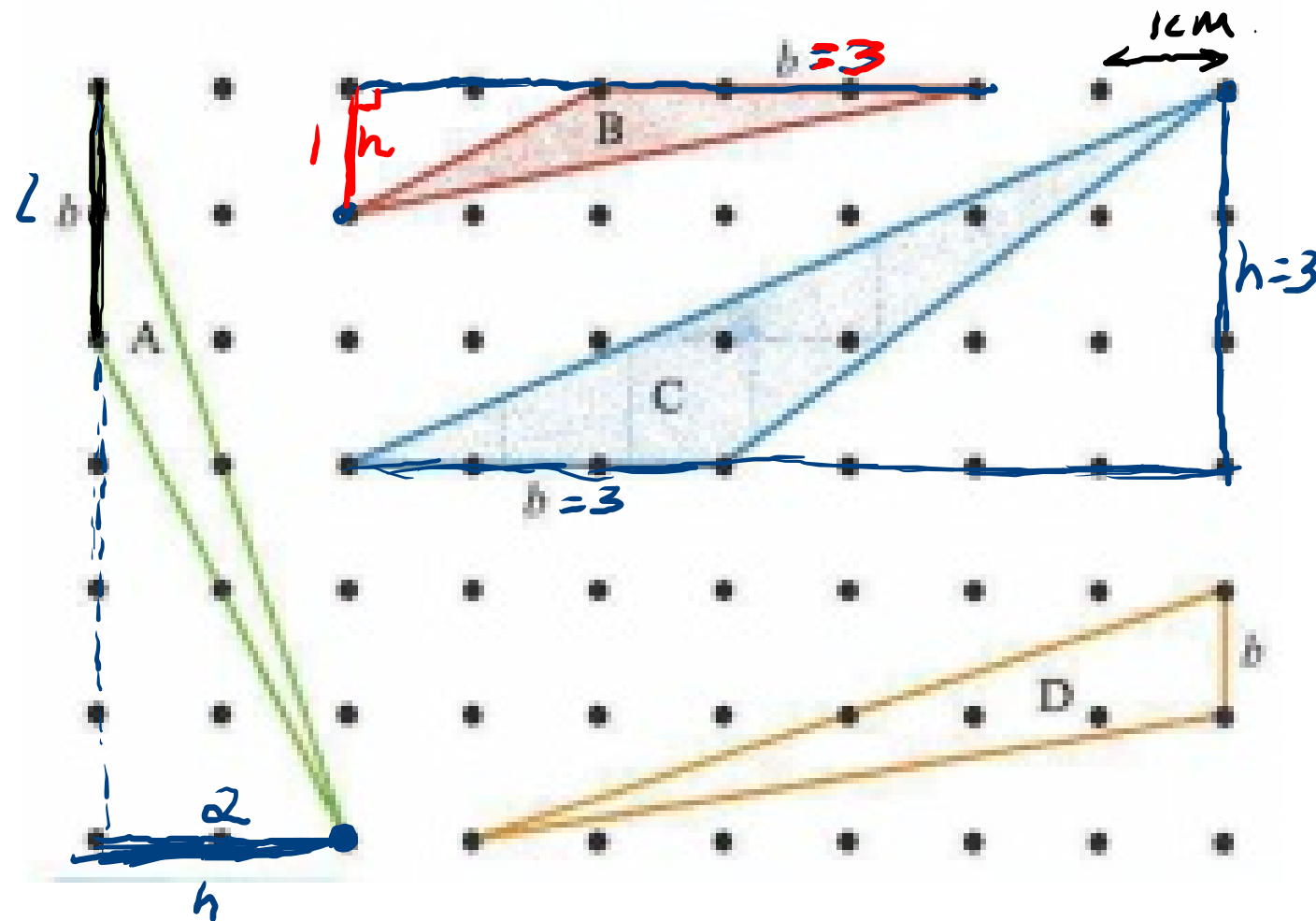
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$$A = \frac{1}{2} b \cdot h$$

2. Show the heights of the triangles in Figure 12.25 that correspond to the bases that are labeled b . Then determine the areas of the triangles.

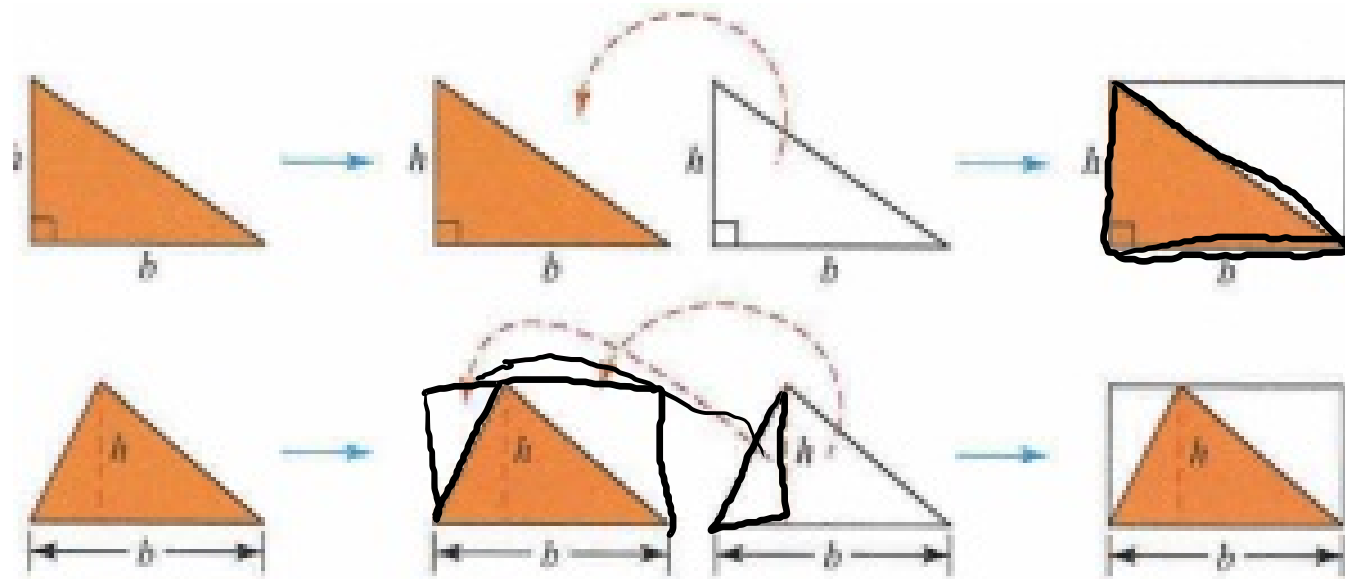
$$\begin{aligned} \Delta B &= A = \frac{1}{2} B \cdot h \\ &= \frac{1}{2} (3) (1) = (1.5) (1) = \underline{1.5 \text{ cm}^2} \end{aligned}$$

$$\begin{aligned} \underline{\Delta A} \\ b &= 2, h = 2 \\ A &= \frac{1}{2} (2) (2) \\ &= 1 (2) = \underline{2 \text{ cm}^2} \end{aligned}$$



$$\begin{aligned} \Delta C: A &= \frac{1}{2} B \cdot h \\ &= \frac{1}{2} (3) (3) \\ &= \frac{1}{2} (9) = 9/2 \text{ cm}^2 \\ &= \underline{4.5 \text{ cm}^2} \end{aligned}$$

The Reason why Area of Δ is $\frac{1}{2}bh$.



$$A = bh$$


$$\text{Area of } \square = 2 \cdot \text{Area } \Delta$$

$$bh = 2 \text{ Area } \Delta$$

$$\boxed{\frac{1}{2}bh = \text{Area } \Delta}$$

Examples.

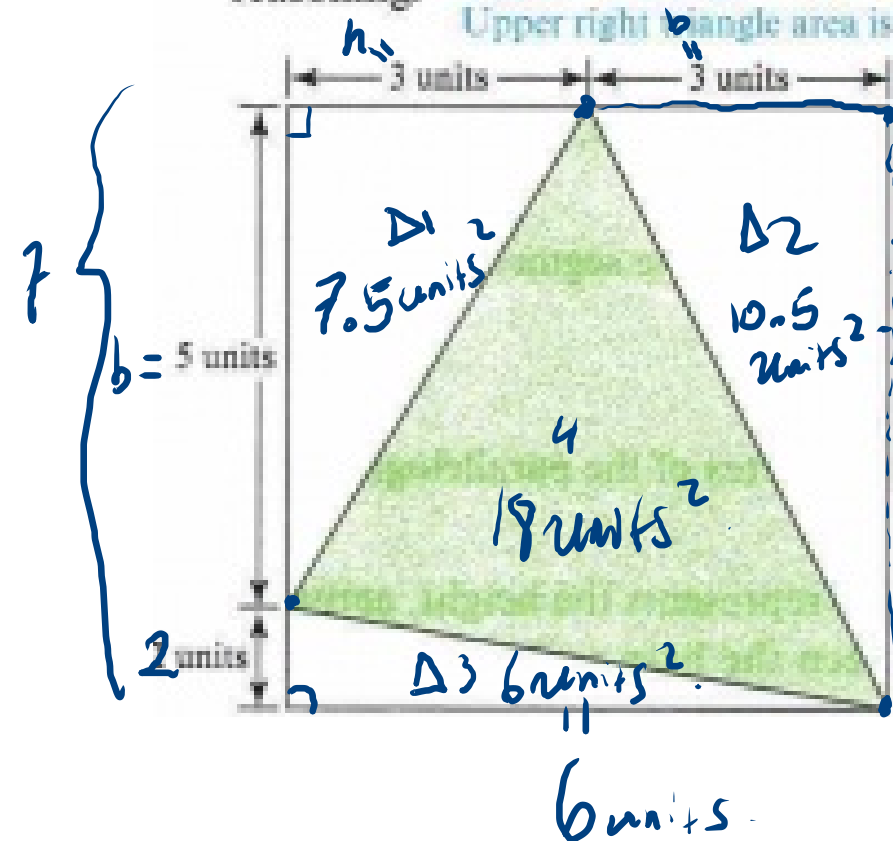
P 543 Problem 8

8.  Determine the area of the shaded triangle that is inside a rectangle in Figure 12.36. Explain your reasoning.

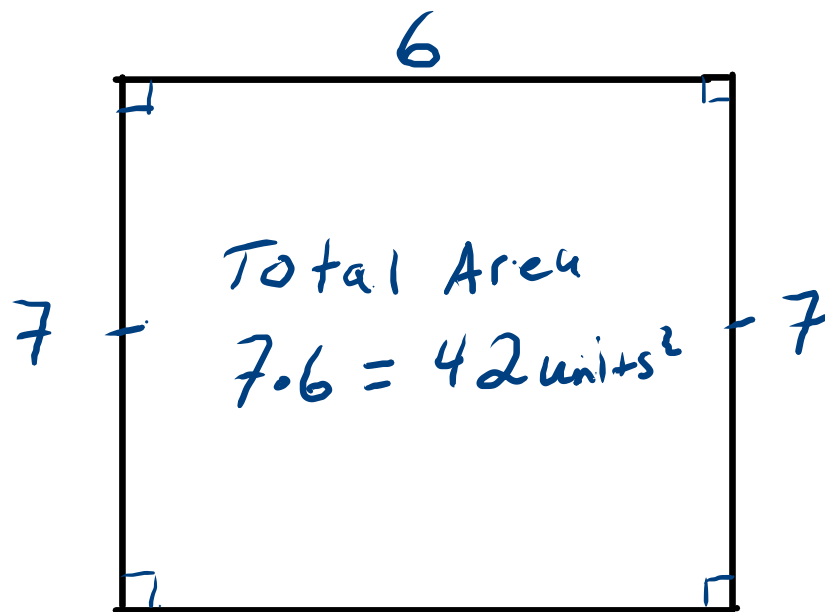
Upper left triangle area is $\frac{1}{2}(3 \cdot 5) = 7.5$.

Upper right triangle area is $\frac{1}{2}(3 \cdot 7) = 10.5$.

Lower left triangle area is $\frac{1}{2}(2 \cdot 6) = 6$.
Entire rect. Area is $6 \cdot 7 = 42$.
Area of middle triangle then is $42 - 7.5 - 10.5 - 6 = 18$ sq. units.



Big Picture.




$$\Delta_1 = A = \frac{1}{2} B h = \frac{1}{2} (5)(3) = \frac{1}{2} (15) = 7.5$$

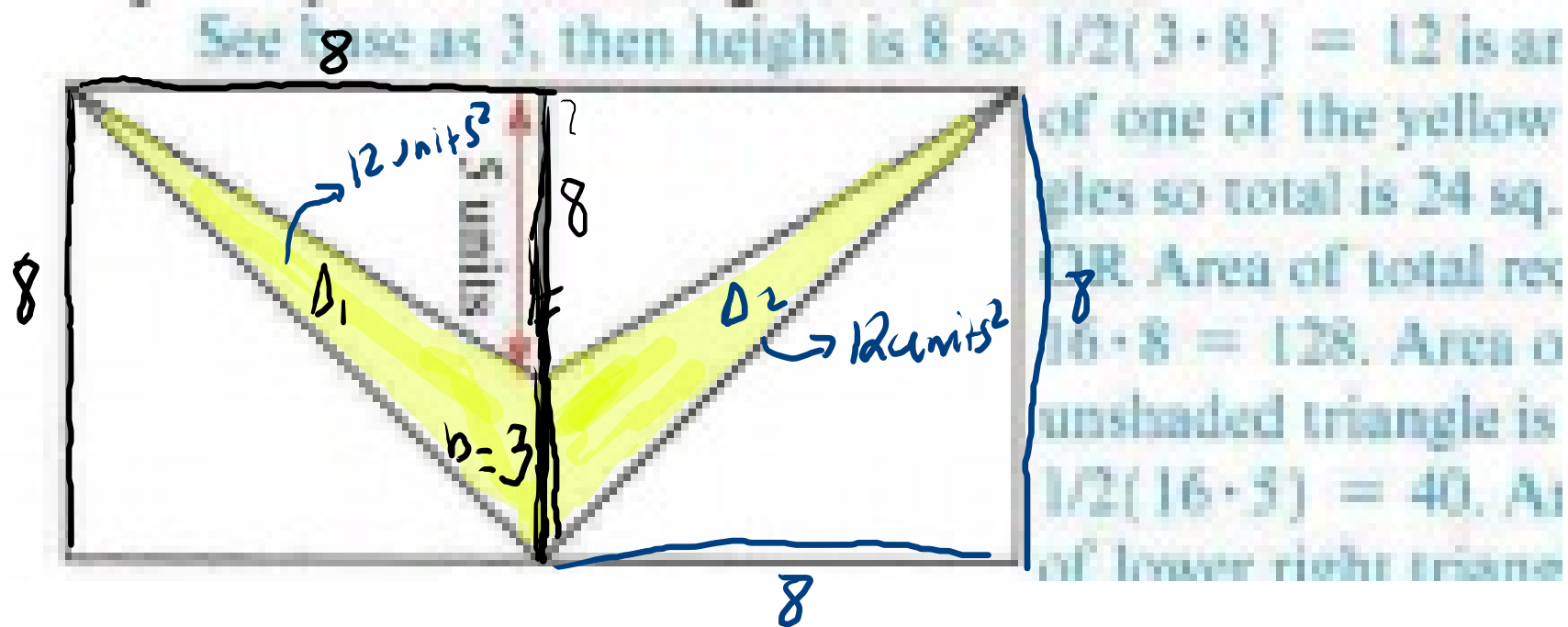
$$\Delta_2 = A = \frac{1}{2} B h = \frac{1}{2} (3)(7) = \frac{1}{2} (21) = 10.5$$

$$\Delta_3 = A = \frac{1}{2} B h = \frac{1}{2} (6)(2) = \frac{1}{2} (12) = 6$$

Next: Total Area $- \Delta_1 - \Delta_2 - \Delta_3 : 42 - 7.5 - 10.5 - 6 = \boxed{18 \text{ units}^2}$

Problem 9

9.  Determine the area of the shaded shape in Figure 12.37 in two different ways. The entire figure consists of two 8-unit-by-8-unit squares. Explain your reasoning in each case.



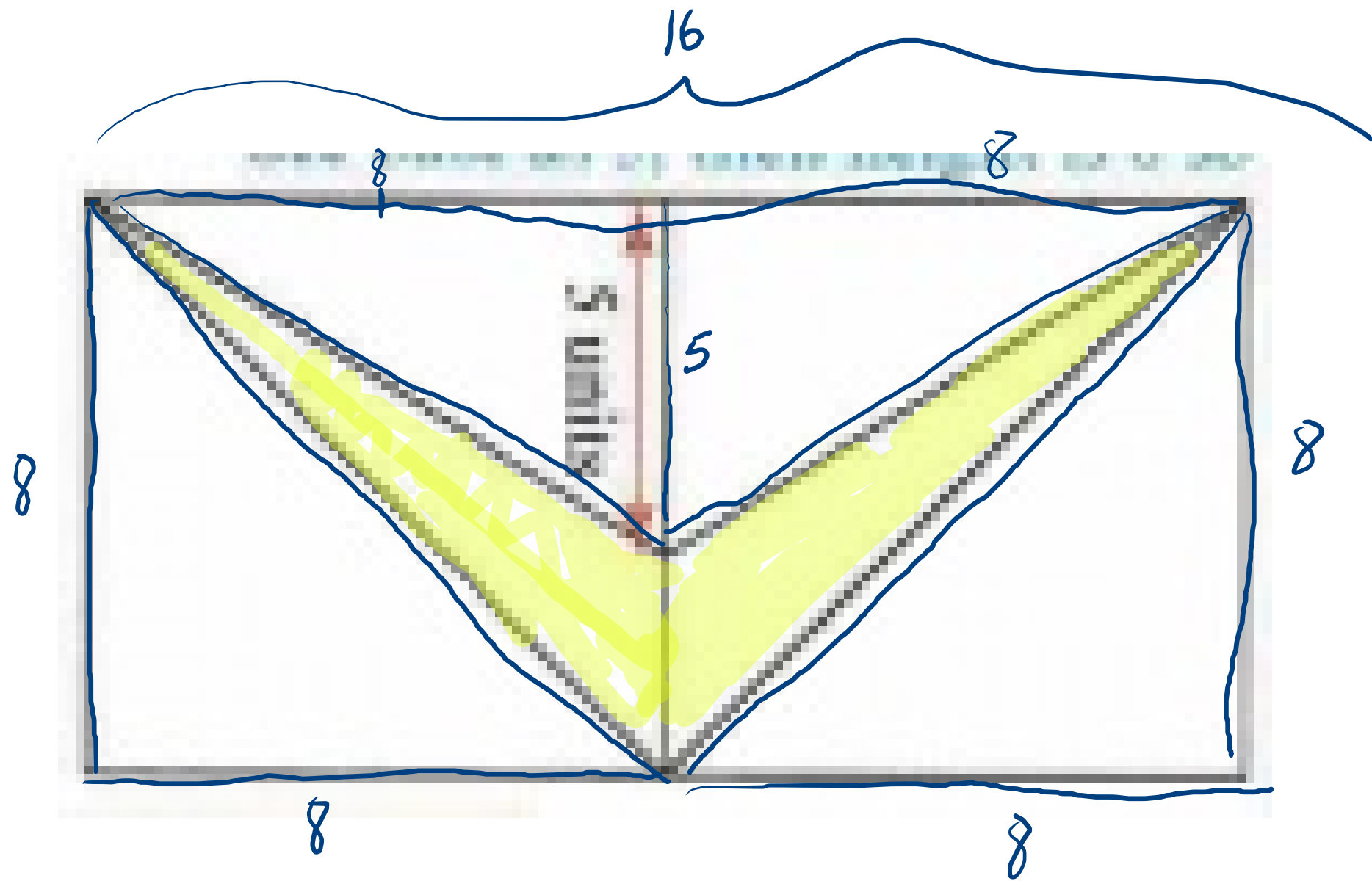
Area of Δ_1 : $A = \frac{1}{2} Bh$

$$\frac{1}{2}(3)(8)$$

$$\frac{1}{2}(8)(3)$$

$$(4)(3) = 12 \text{ units}^2$$

Total Area: $12 + 12 = 24 \text{ units}^2$



10. Determine the area of the shaded triangle in Figure 12.38 in two different ways. Explain your reasoning in each case.

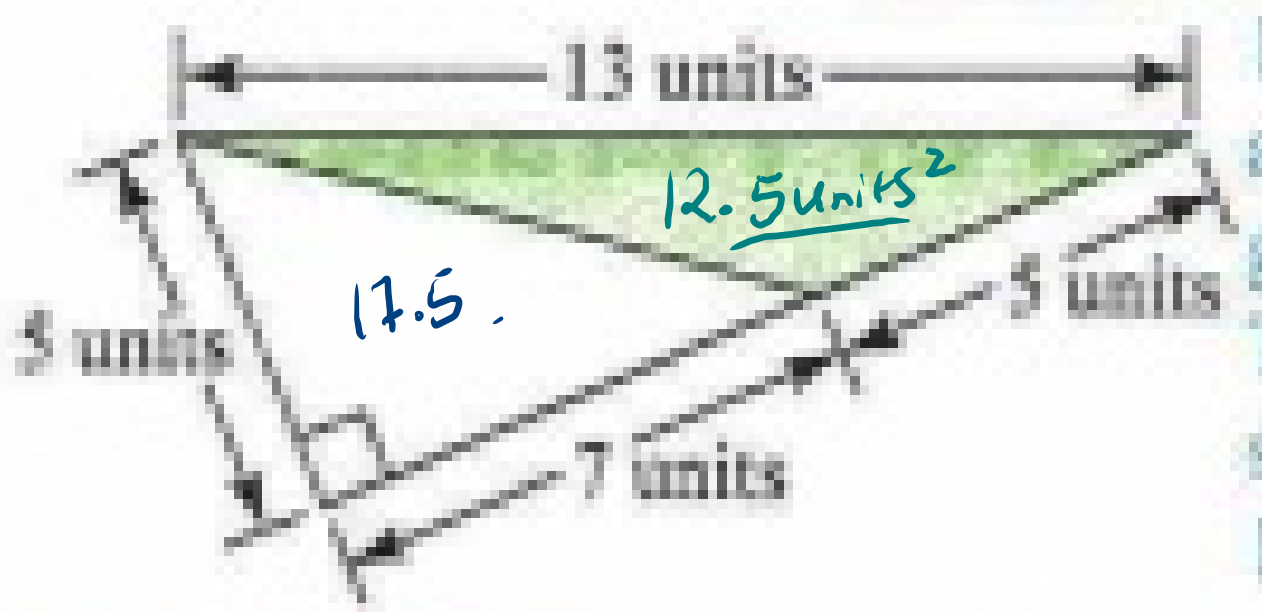
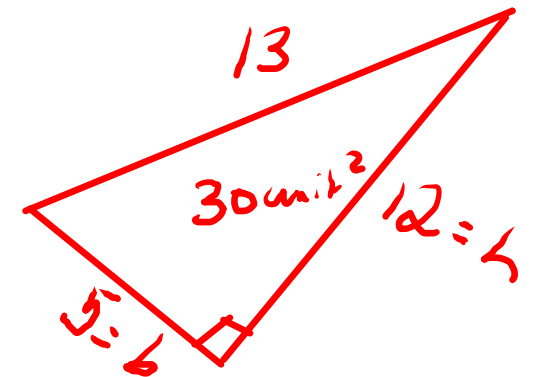
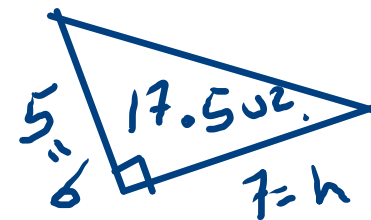
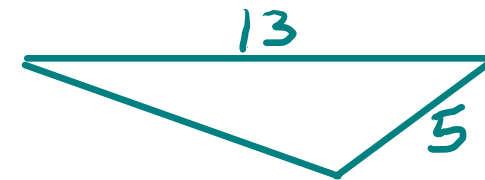


Figure 12.38 Determining the area of the shaded triangle.

Area of Δ

$$30 - 17.5 = 12.5 \text{ units}^2$$

Three Δ 's



$$\begin{aligned} \text{A of Big } \Delta &= \frac{1}{2} B h = \frac{1}{2} (5)(12) \\ &= \frac{1}{2} (60) \\ &= 30 \text{ units}^2 \end{aligned}$$

Area of baby Δ :

$$\frac{1}{2} (5)(7) = \frac{1}{2} (35) = 17.5 \text{ units}^2$$