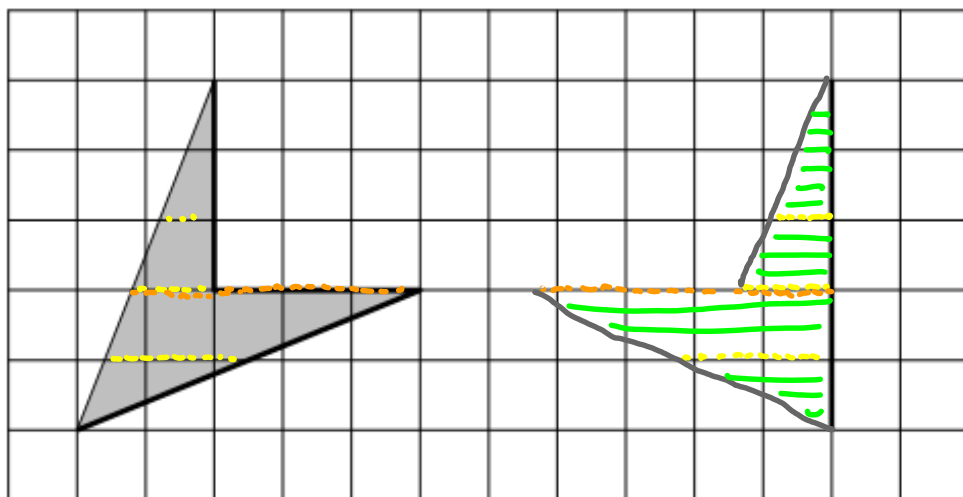
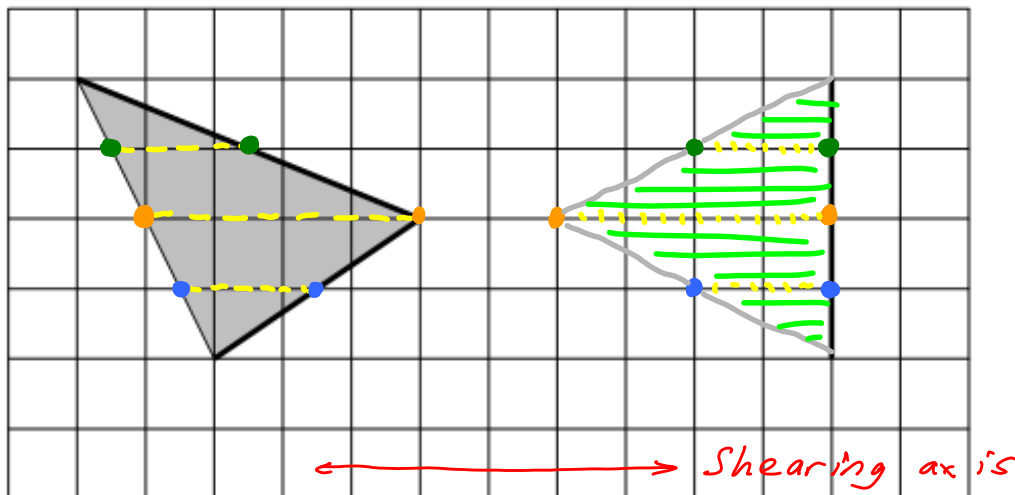


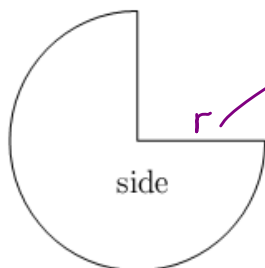
Show your work in all problems.

1. Shear the following two shapes horizontally, so that after shearing the dark edges become the given vertical dark line segments.

During shearing lengths of cross-sections parallel to shearing axis are preserved.



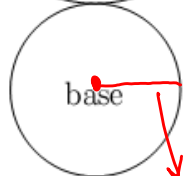
2. A cone is to be made from a circle of radius 5 (for the base) and a three-quarter circle for the remaining part. Find the height of the cone. Hint: first find the radius of the three-quarter circle.



radius larger than 5

$$\text{Circumference of base} = 2\pi \cdot 5 = 10\pi$$

$$\text{Length of } \frac{3}{4} \text{ circumference} = \frac{3}{4} 2\pi r$$

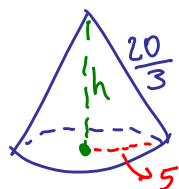


Since we get a cone, the two lengths should match:

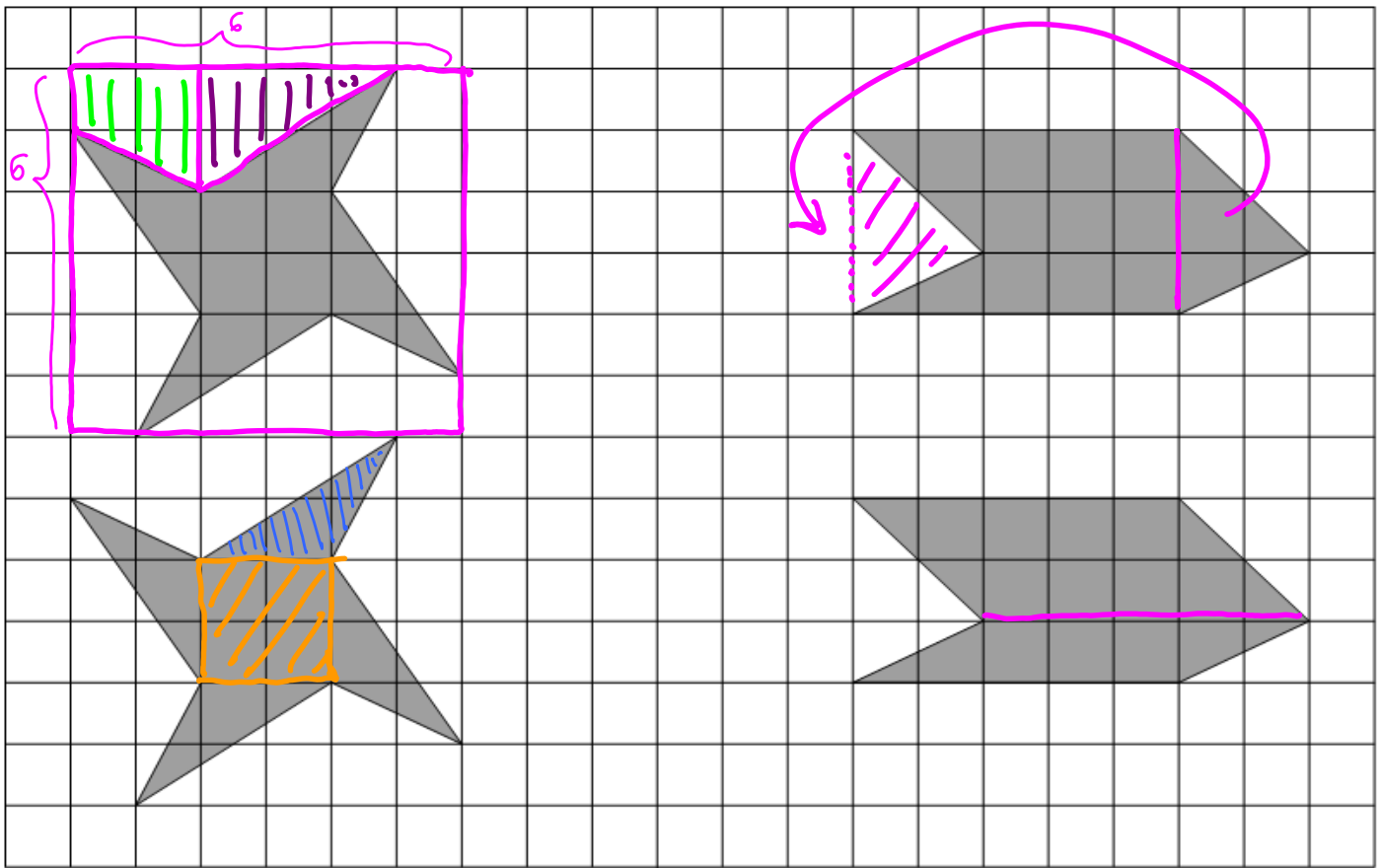
$$10\pi = \frac{6}{4} \pi r \rightarrow r = \frac{40}{6} = \frac{20}{3}$$

$$h^2 + 5^2 = \left(\frac{20}{3}\right)^2 \rightarrow h^2 = \frac{400}{9} - 25$$

$$h = \sqrt{\frac{400}{9} - 25}$$



3. Compute the areas of the following shapes in two different ways.



Method 1:

$$6 \times 6 - 4 \times \left(\frac{(1+2)}{2} \cdot 2 + \frac{3 \cdot 2}{2} \right)$$

area of big square area of trapezoid area of triangle

Method 2:

$$2 \times 2 + 4 \times \left(\frac{2 \times 2}{2} \right)$$

Method 1:

cut & rearrange to get
a rectangle
area = 5×3

Method 2:

cut into two parallelograms
 $5 \times 2 + 5 \times 1$