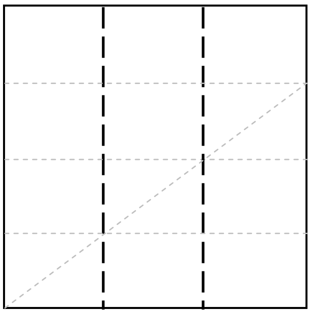
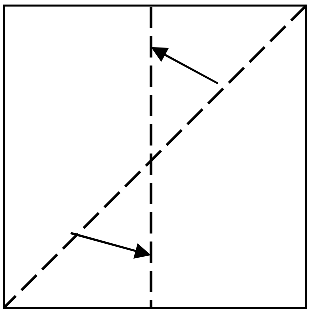
Answers

Problem 1

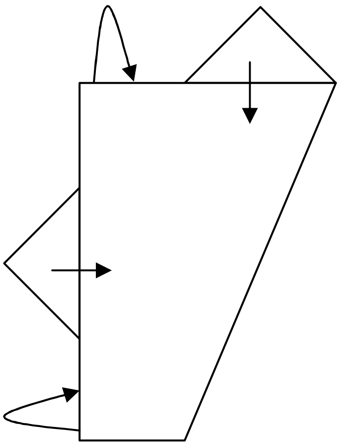


First fold the sheet in four. Then, fold diagonally over three of four parts. The two points where the lines intersect are the points where you should fold the sheet in three.

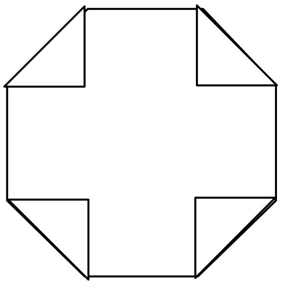
Problem 2



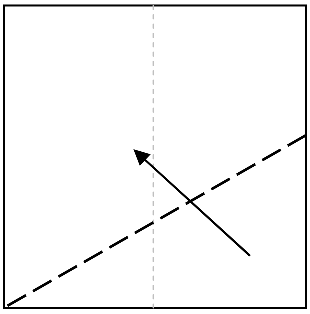
First, fold in half, both from the centers and diagonally. Then, fold the diagonals towards each other.



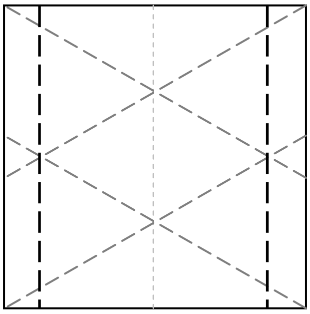
Fold the corners along the edges, then unfold the sheet.



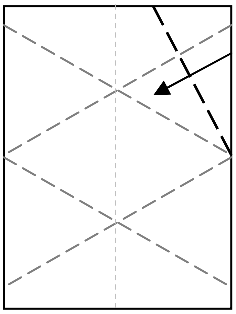
Problem 3



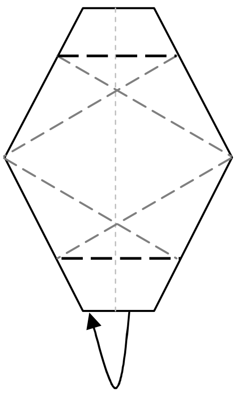
First we need to fold a paper sheet, preferably square, in half. Then, we fold the bottom right corner to the fold line, so that a fold line runs from the bottom left corner. Do the same for the other corners.

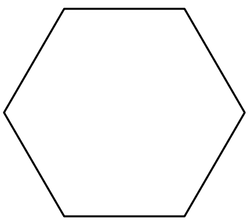


Fold or cut from the sides at the point where two lines intersect.



For every corner, fold the side to the fold line that lies on the same point (preferably to the back).





Finally, fold the top and bottom at the start of the folding lines.

Problem 4

To solve the problem, we first need to look at the Mathematical background. We know that the short width (represented by 1) devided by the height (represented by x) is the same as half the height devided by the width. However, it is also the same as the height devided by twice the width:

$$\frac{1}{x} = \frac{0.5 \cdot x}{1} = \frac{x}{2}$$

Next, we need to solve the equation.

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

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

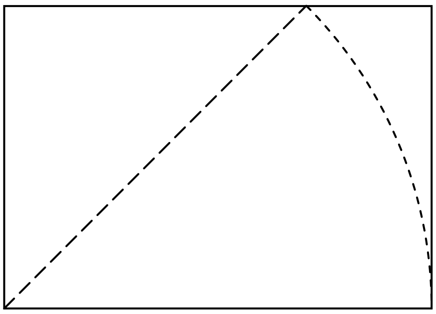
$$2 = x^2$$

$$x = \sqrt{2}$$

So, basically, for each width, the height is the square root of two. If you remember the Pythagoras theorem, you should know that:

$$\sqrt{1^2 + 1^2} = \sqrt{2}$$

where 1 is the width. So, by knowing that, if we would make the biggest possible square on one side, and we took the diagonal folding line for that square, it should be as long as the height of the sheet of paper.



To test this, you just need to fold the long side to the diagonal folding line.

Problem 5

First, we need to check the Mathematical background for this. As hinted, the base equation is:

$$\frac{1}{x} = x - 1$$

where 1 stands for the short side, and x the long side. The best thing to do is to solve the equation. To make it simpler, we first need to transform it into a '*0 =*' function.

$$\frac{1}{x} = x - 1$$

$$1 = x^2 - x$$

$$0 = x^2 - x - 1$$

But how do we solve this formula? For this, we need the quadratic formula:

$$f(x) = ax^2 + bx + c$$

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

So, in this case we have:

$$a = 1, b = -1, c = -1$$

$$x = \frac{- -1 \pm \sqrt{(-1)^2 - 4 \cdot 1 \cdot -1}}{2 \cdot 1} = \frac{1 \pm \sqrt{5}}{2}$$

The $\pm$ means that there is a solution for both a + and a -. Since 1 minus something is always smaller than one, we won't be needing that, seeing as the longer side has always a bigger length than one (when we assume that the shorter side has a length of one). Now we only need to simplify the equation.

$$\frac{1 + \sqrt{5}}{2} = 0.5 + \frac{\sqrt{5}}{2}$$

However, this can be simplified even more. We now only look at the $\frac{\sqrt{5}}{2}$ part. We can write this as:

$$\frac{5^{\frac{1}{2}}}{2} = 5^{\frac{1}{2}} \cdot 0.5 = 5^{\frac{1}{2}} \cdot 0.25^{\frac{1}{2}}$$

as $\sqrt{x} = x^{\frac{1}{2}}$. Since we know that:

$$a^x \cdot b^x = (ab)^x$$

we can shorten it to:

$$1.25^{\frac{1}{2}} = \sqrt{1.25}$$

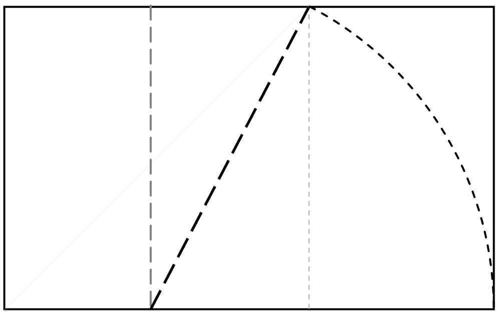
With this, we can combine this with our previous equation:

$$0.5 + \frac{\sqrt{5}}{2} = 0.5 + \sqrt{1.25}$$

Finally, we can rewrite this as:

$$0.5 + \sqrt{1^2 + 0.5^2}$$

Here we can see the Pythagoras theorem, where we have a side of one and a side of a half. So this means that the longer side should be a half plus the diagonal side of a triangle with sides one and one half:



You can check this on every remainder when you cut out the biggest possible square from the side.