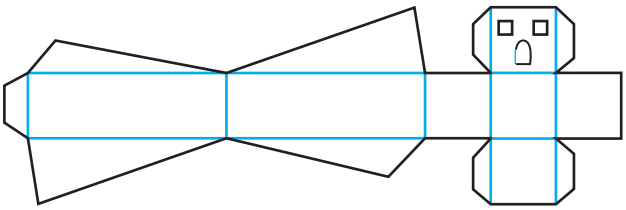
Non-Trig Trigonometry for Simple Design Solutions

Calculating angles, if you aren't confident with trigonometry, can put you off designing files with confidence. Trial and error can be tedious so here is a simple way to calculate angles .

We're going to use the example of the Fairy House file I posted a couple of days ago to demonstrate the principles.



I started with the 'cube' base. (in red in the diagram on the next page). It's in inverted commas because it's missing one of its six faces so not strictly a cube but you get the idea. Each side of the cube is 30mm square.

You can see a long rectangle (next page diagram in green) was added to the cube, it has the same width but obviously is much longer : 30 mm x 180mm.

This long rectangle, when folded half way along its length, forms the sides of the roof.. We will therefore, be working with: 180mm/ 2 = 90mm.

Now to add a pointy front facing roof we need to create a gable ~ in other words, a triangle.. We need to attach it so that it sits square on the cube and comes to a central point.

We need a triangle with two 90mm sides, and one 30mm. side (an Isosceles triangle as it has two equal sides. for information!).

It looks easy but it's not as simple as it looks to get it to sit square on the cube. Trial and error takes time and the maths involved are also trickier than you'd think. Algebraically from first principles? Very tedious. Standard mathematical formulae can confound if you haven't worked with math for some time.

Circles offer a magic and simple solution! Here's how.

We know the length to the fold line of the rectangle is 90mm. Our solution is based on the radius of a circle and it so happens that the 90mm length is the radius value we're looking for. The radius is half of the diameter so we need a 180mm diameter circle.

On most drawing packages, circles are given height and width values; they are always the same for a perfect circle and it so happens that they give us the diameter.

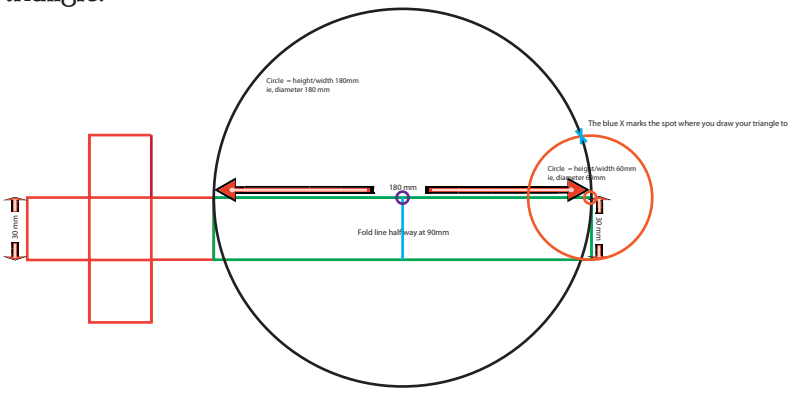
We know the width of the rectangle is 30mm. Again, we will use this value as the radius for a second circle: 2 x 30 = 60. Therefore, our second circle will be 60 mm diameter.

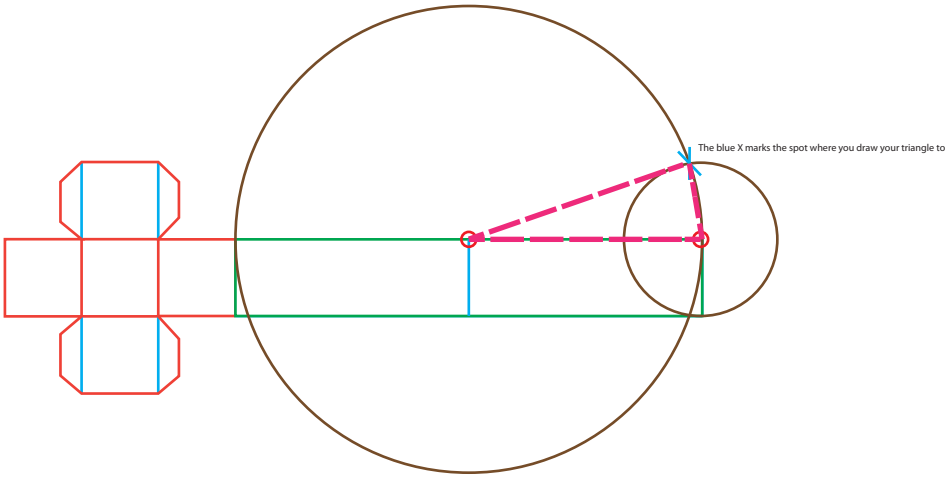
Now for the magic bit.

Get the larger of the circles and align its centre to one side of the fold line (see diagram below)

Get the smaller circle and align to the end corner of the rectangle ON THE SAME SIDE YOU ALIGNED THE FIRST CIRCLE TO.

The point where the two circles intersect (a blue 'X' marks the spot) is where we need to add the missing point of our triangle.

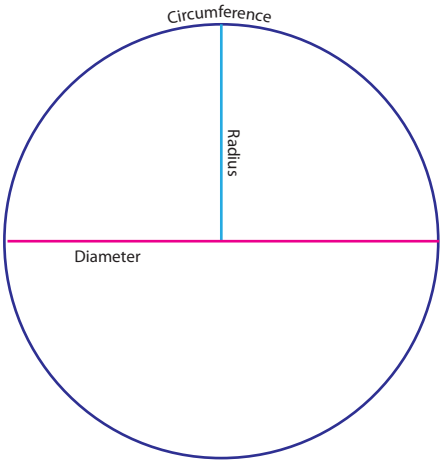




This method takes away all the trial and error (the circles do it for us). Obviously, we do the same for the other side and tabs would need to be added to them or the other end to give us something to glue and join our house bits up with but they're fairly arbitrary and you please yourself with them.

When you've done it a few times it'll become second nature and make those awkward angles a cinch to work with and help achieve professional looking results.

For Reference:



The Circumference is the outline or outer boundary of a circle

The Radius is a straight line from the centre of a circle
to the circumference

The Diameter is a line that cuts a circle in half

Useful to know is the the radius is always half the diameter, or put another way,
the diameter is always twice the radius.