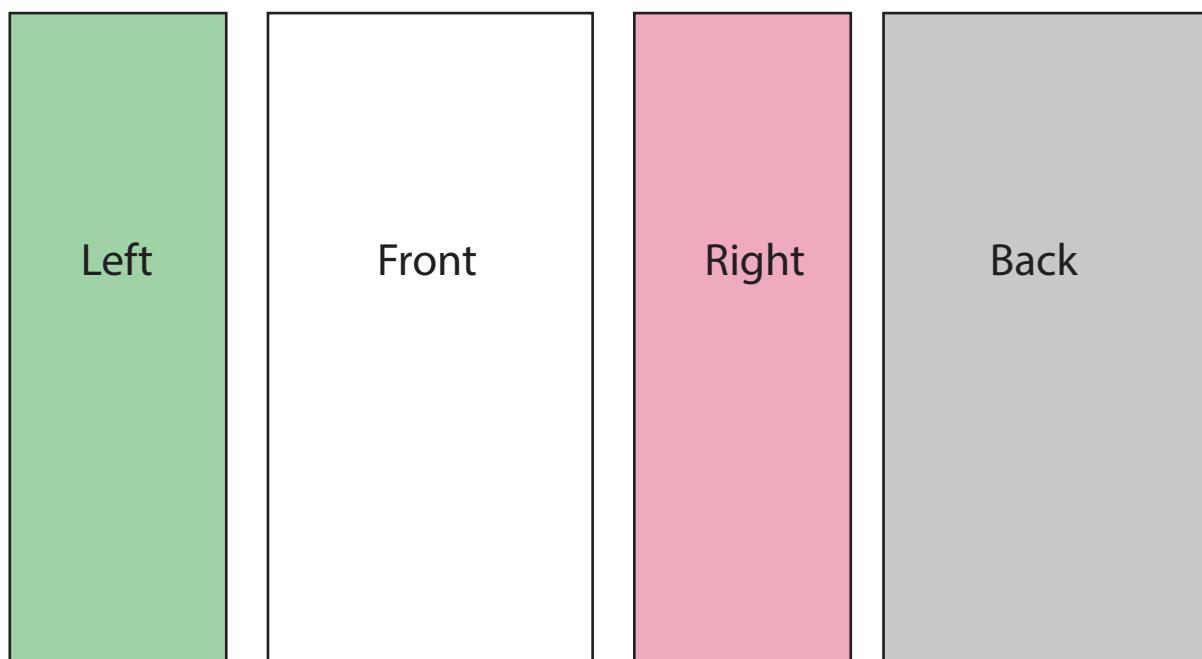


Pattern making for tactical dummies 101:

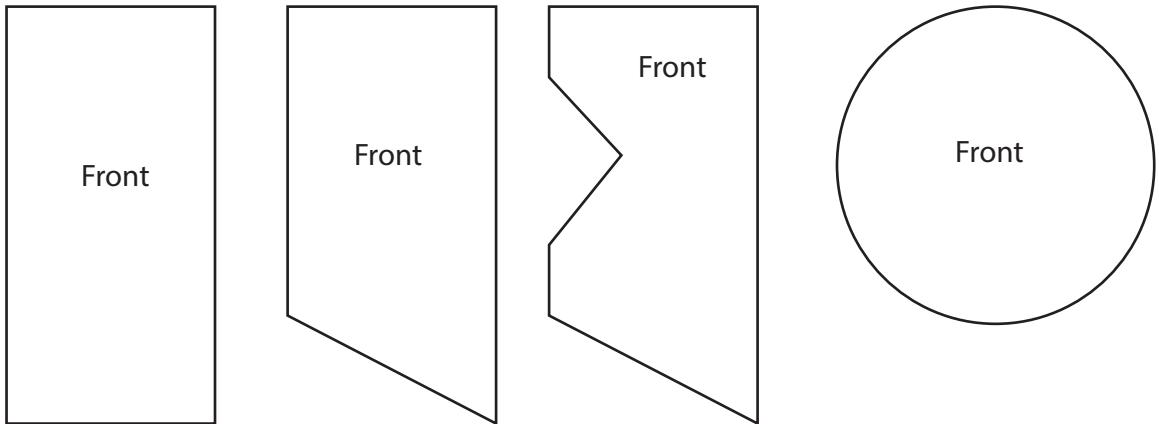
This is a theoretical lesson and includes no patterns for you to copy. This is intended to make you practice and learn instead.

This is a box. A box has 6 sides, just like a dice. Front, back, left, right, top and bottom. This box can be used as a start point for pretty much any tactical gear, be it a mag pouch, a zippered pouch or a backpack.

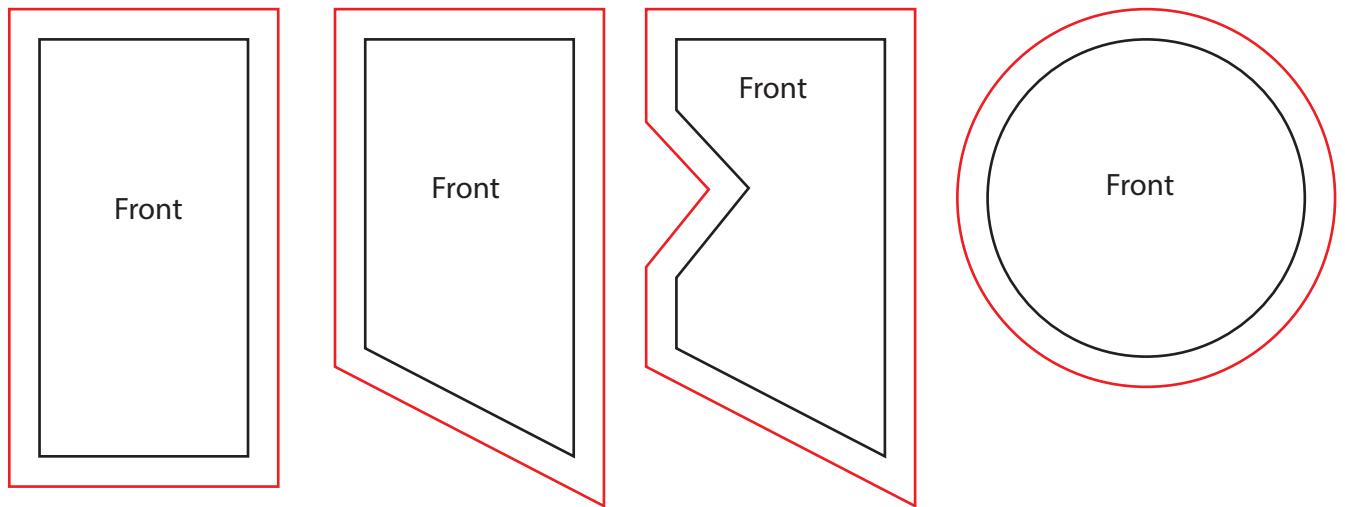
We'll use the same colors throughout the file. And I'll primarily use CM, but whatever unit you use isn't relevant.



Before we do anything, we need to align on what's what. Below are various pattern pieces. The black lines indicate the seam line; the seam line is where you connect a pattern piece to another pattern piece by sewing.

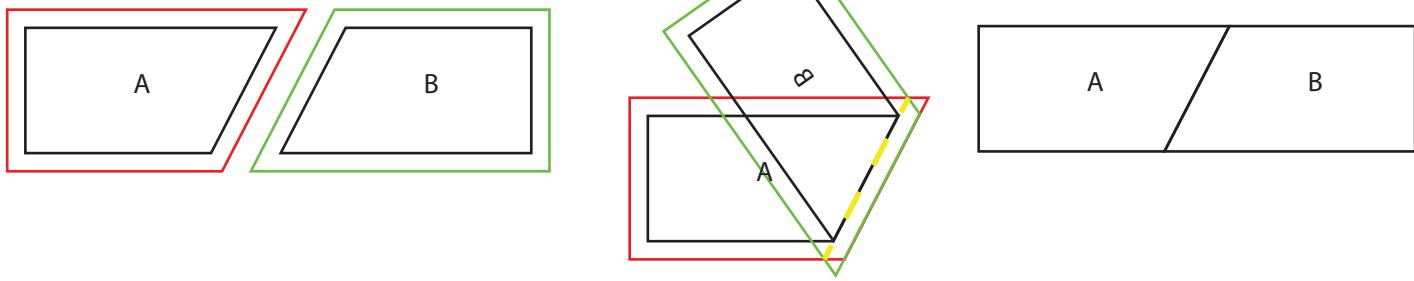


And then we have the same pattern pieces, but with seam allowance (SA) added. Simply put, you cut out along the red line, and sew along the black line. The distance of the seam line is NOT the same as the distance of the SA. This is vital to remember to avoid a lot of potential frustration.



Just as an example, if I wanted to sew A and B together, I'd have to align them as shown to the right. A is face side up, and B is face down. Notice how the seam lines are equal length, and the seam allowance doesn't match.

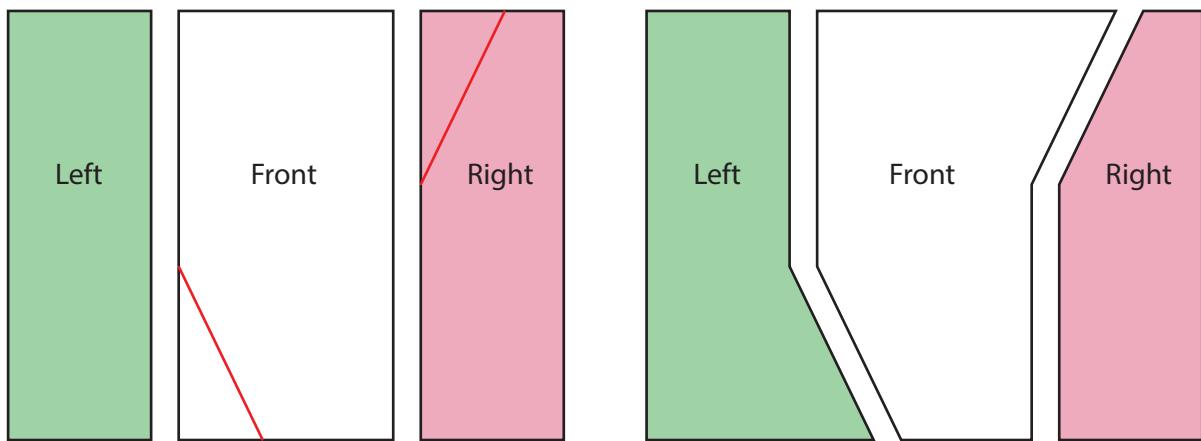
The yellow line is where you'd sew, and this would create a straight piece, the same distance as A and B sans SA.



As an example, straight line on 2 patterns that are side by side, can often be cut and merged with each other without any real effect (other than maybe increased difficulty in sewing).

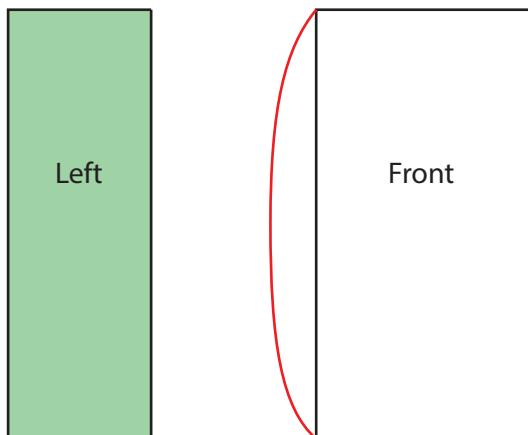
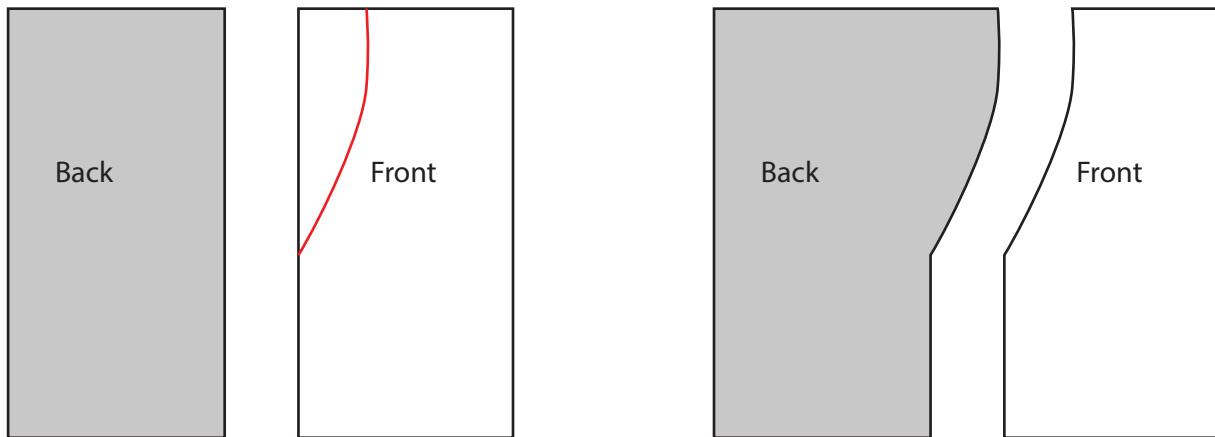
Bellow I'm going to cut the red line and add it to the opposite side, just because I can.

Doing this does not add any shape to the pieces however.



These cut lines can have any shape they'd like. Bellow you see a typical cut and merge used to create the wrap-around part on a shoulder harness on a backpack, where the back mesh wraps around to the front.

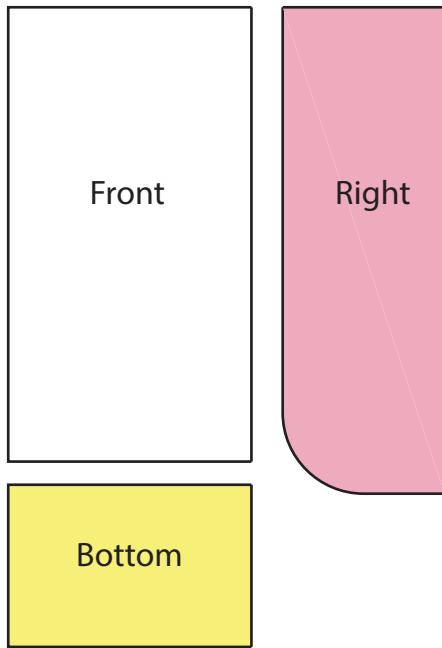
The reason this works, is that you take a shape from the front and add it to the back, without any alteration of the shape combined.



If we want to add some shape, in this example to the front, we can absolute do so. But we cannot do this without some sort of alteration of either the left or the front, because the red line that we plan to add is simply longer than the long side of the left panel. If the left is 10 cm, and the front curve is 12,5cm, we need to match these up somehow; either by increasing the height of the left edge to 12,5, or shorten the front so that they are the same length.

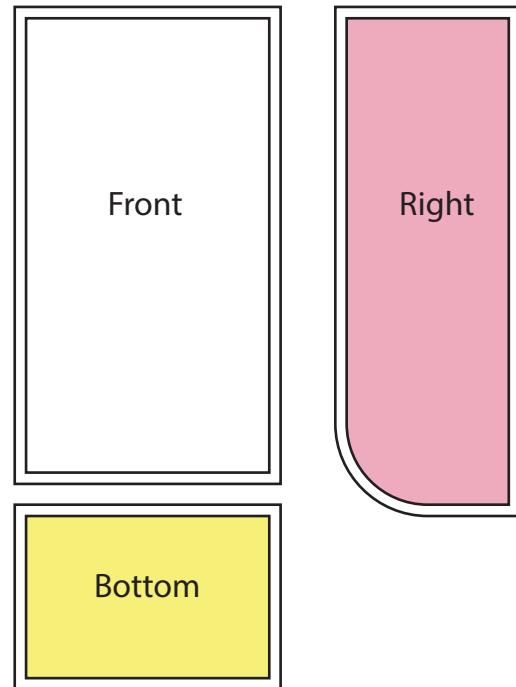
To keep up with the last example, say if we wanted to have a curved bottom on a very simple pack. My way would be to start with the right side panel and draw it up how I want it to look. To be able to create the front and bottom, I can simply measure the line with the curve, and that total gives me the total measurements of the front + bottom combined.

In my example, the curve is 80 cm, and the front is also 80 combined.



If I for some reason add SA before doing the measurements, I end up with a curve of 84 cm and the front and bottom combined is 88 cm.

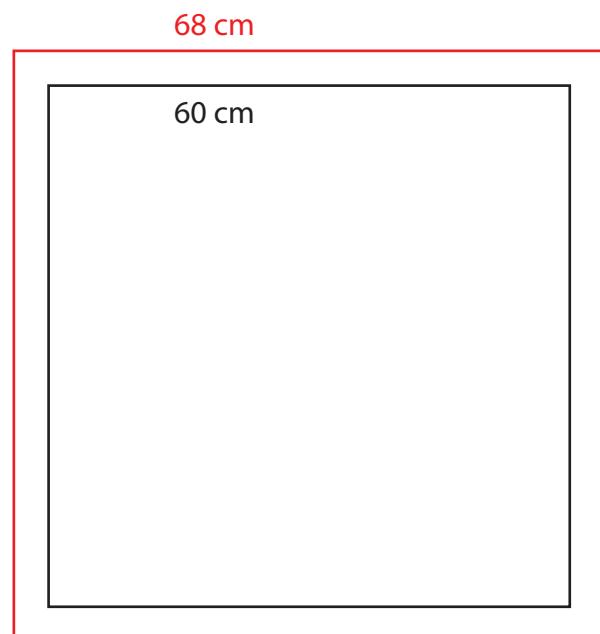
DON'T ADD SA UNTIL YOUR PATTERN PIECES ARE DONE!



A very real example is a typically 15x15 cm pouch, or 6x6". The 15x15 square has a circumference of 60 cm. With 1 cm SA added, it's 68 cm.

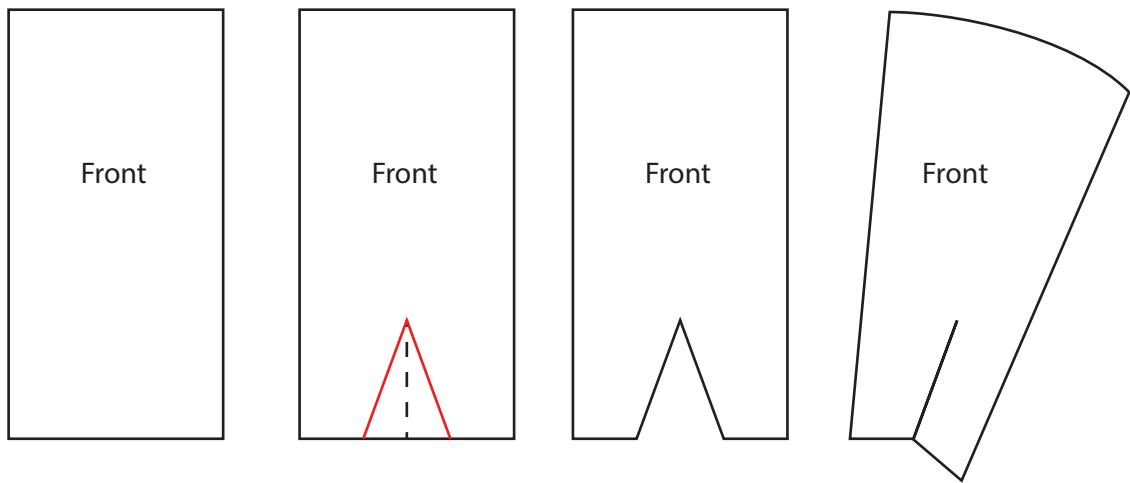
So if you try to build your spine as 68 cm instead of 60, you got 8 cm (~3") offset and it's simply impossible to sew it right.

I believe this is a reason why some people struggle with typical zipper pouches, because they measure their circumference with seam allowance (red), when what they should measure is the seam line (black) prior to adding SA.

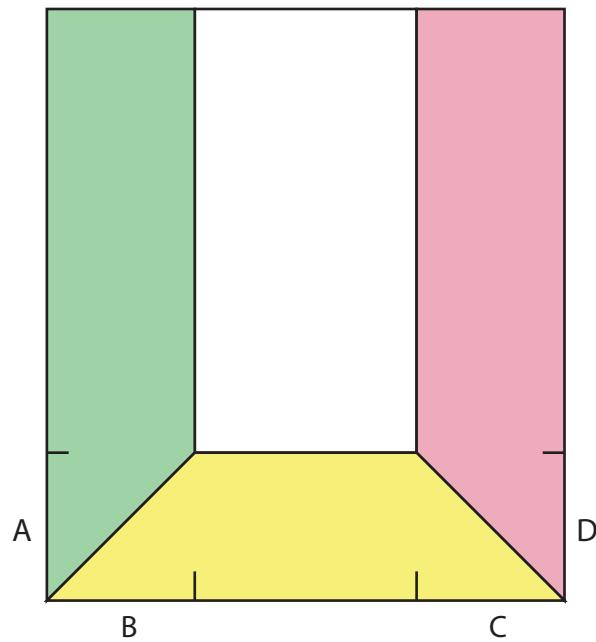


A very handy and very common tool in pattern making is a dart. A dart is basically a fold (pleat) with the material taken away. This creates volume, and you need volume to fit mags, grenades, NODs and candy inside pockets.

Bellow I've made a dart on the front panel. It's basically a pyramid with equal length arms. They need to be equal to be able to sew up correctly. Now this dart isn't super functional, but notice how I functionally removed a bit of length on the bottom, and added it towards the middle? This creates volume. Try this on a piece of paper to see the actual shape, this isn't a super accurate representation.



Here is a common technique to create a box shape like magazine pouches. Compared to the box on page 1, we've simply extended the sides and the bottom to meet up. Their original positions are marked with notches. If you take the distance from bottom corner to notch on A, and fold that distance into somewhere above the notch, and the same for B, C and D, you'll have a box shape.



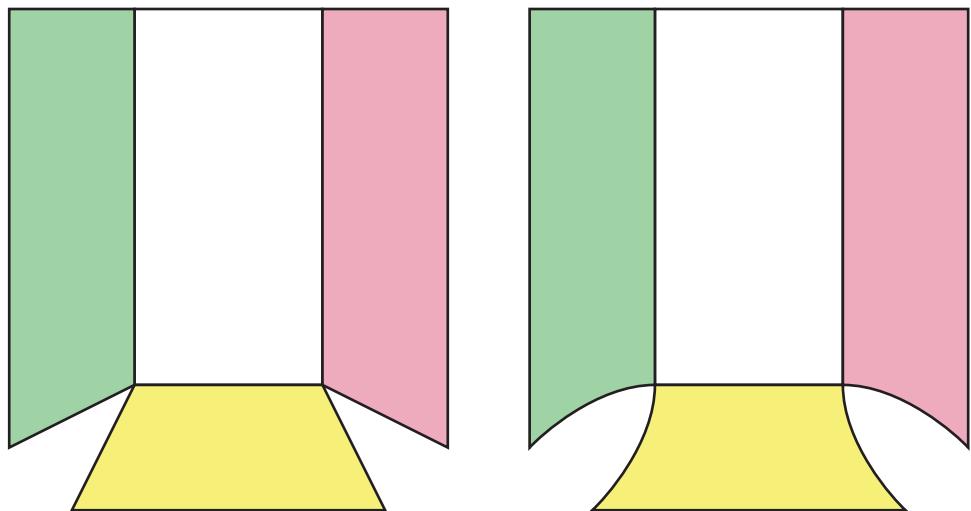
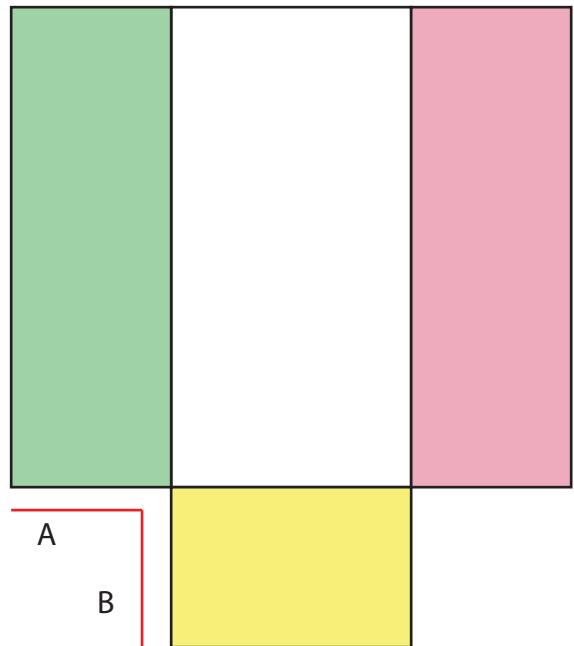
The reason for showing this prior to actually showing the most common dart in tactical gear, is that you need to know that a fold and a dart is basically the same thing. The difference is that in a fold you don't actually remove anything, but with a dart you remove material- yet you end up with the same shape.

Here it is. The most common dart in tactical gear. By sewing A and B together, you create volume. And since the dart is 90 degrees, I hope you can understand that you end up with a sharp corner.

If the dart is 45 degrees, you'd end up with a wide base and slanted walls. If only the sides were angled at 45 degrees, you'd need a longer bottom.

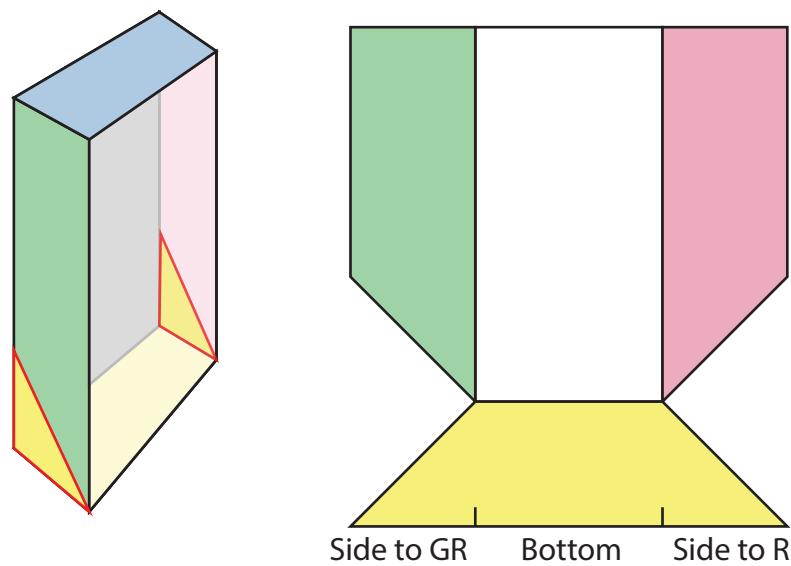
If the dart is curved, you'd get a curved corner.

If you don't understand what's going on here, I'd recommend that you print this page and simply make paper cutouts and tape them together.



The ever so popular Crye Precision pouch which you've probably already copied by now, is simply moving the dart so that it wraps the bottom onto the side panels.

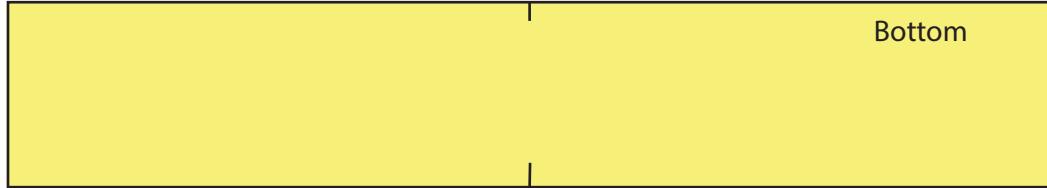
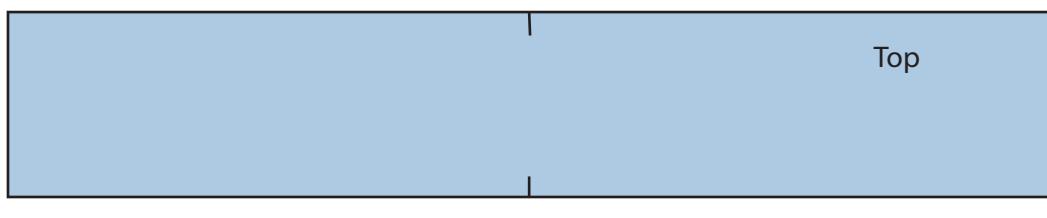
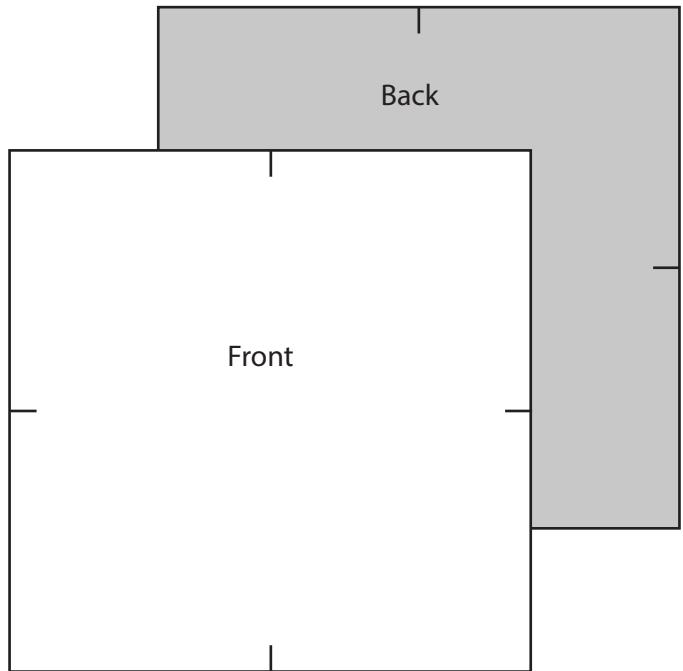
It's pretty simple when you think of it as a box that you cut up in different ways to make it into a flat piece of cardboard.



Back to our 15x15, we're going to cover how to add a spine with a zipper, just so that we can get a bit more advanced later. It has a circumference of 60 cm, so no matter how many pieces we want our spine to have, we need to end up with 60 as our final number on the length, and the width doesn't matter.

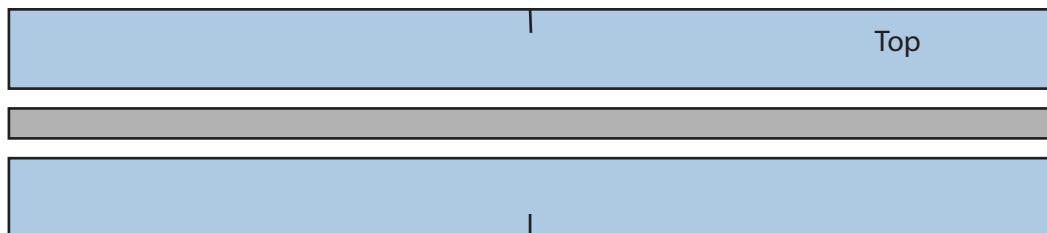
We're going to say that they are 30 each, so that the zipper starts and stops on the middle of the front and back panels.

Notice the notches added, they are handy guides to align your work. I like to notch the center anyway, and did it on all sides. In this example, the center will align with the center on the top and bottom, and the seam that connects top and bottom aligns with the sides.



Let's pretend our spine is 8 wide. That means that each side + the visible area of the zipper needs to be 8 as well. I like to use a 16mm visible zip, because that allows me to use 8mm SA and simply cut the piece in half and sew in the zipper (as long as you use a P16 (32mm overall width) zip).

If you are not happy with 16mm visible, then simply do a test and see how much you want. That should be the width of your grey pattern. Just make sure to adjust your SA to however much you remove.

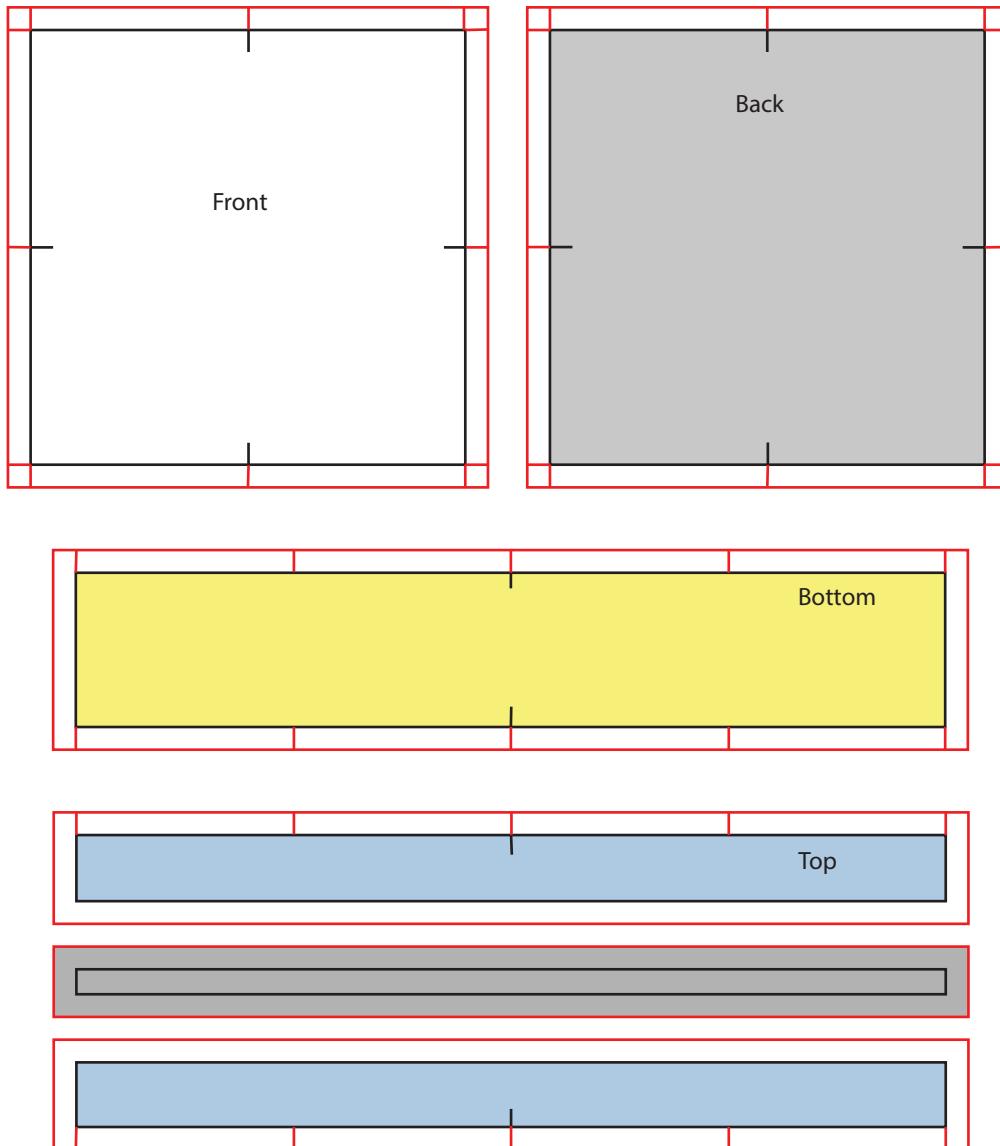


So here is the full pouch, with SA and notches added. A keen eye will see that I notched the SA too, which is really where you add your notches. I also notched the corners and where the corners hit the top and bottom, and this is because this is a right angle cornered pattern, you need to be really accurate when sewing.

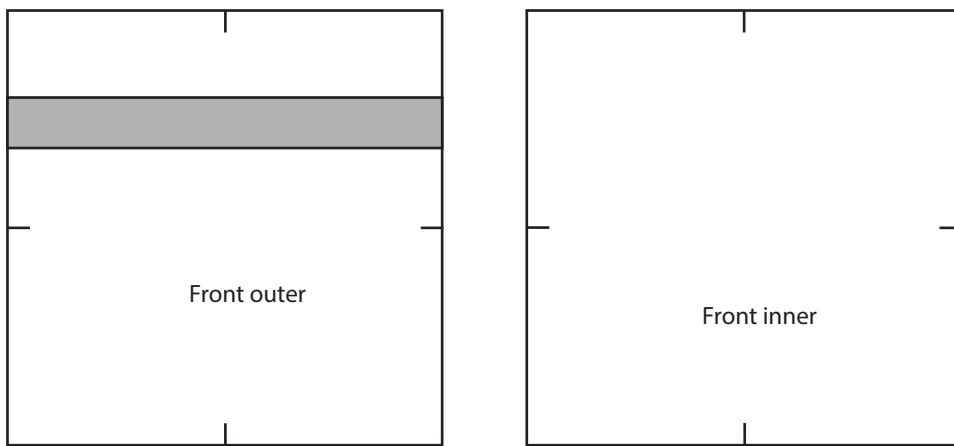
The “seam allowance” on the zipper isn’t seam allowance at all. The red outline just represents the total width of the zipper and the black represents the visible part on the finished assembly.

Before sewing, cut the notches (the red part) almost all the way into the seam line (black). Start from a center, align the notch on the top and front, and sew to the corner notch. Now you can turn the front, which would “break” the top where the notch is, and now you make sure the side notch is aligned and you keep sewing. Do this until you’ve gone all around and you got a perfectly sewing, hard cornered zippered pouch.

Quite frankly, curved corners is a lot easier to sew with an ok result... But practice hard corners and you start to figure out how you can manipulate fabric with something as simple as a notch.

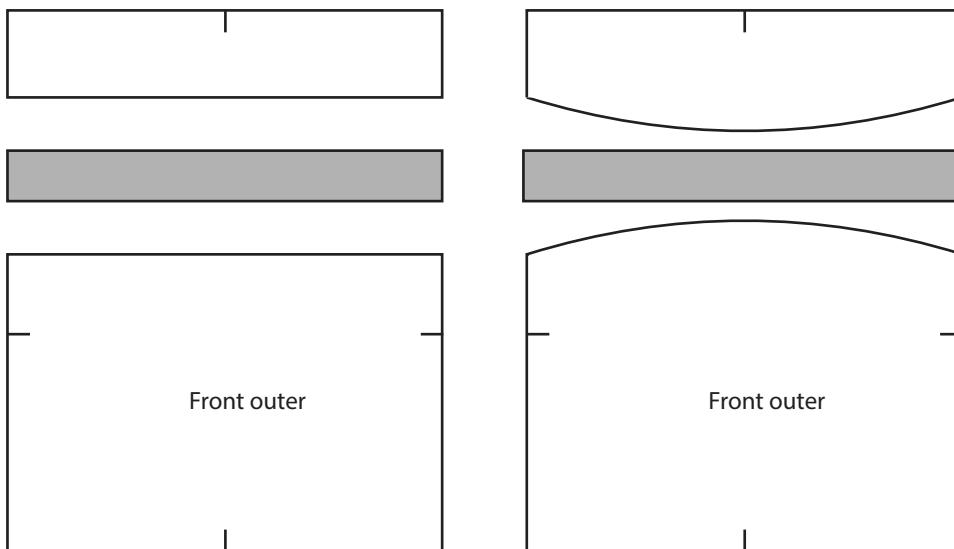


One of my pet peeves is zippers on the front of zipper pouches. Typically it's just an outer layer with a zip, and a inner layer. It's completely flat, so the actual space in the pouch is nothing. You can maybe cram a laminated cheat sheet in there if you're really angry. A simply thing to do, is to give the outer panel some volume, making it much more useful.



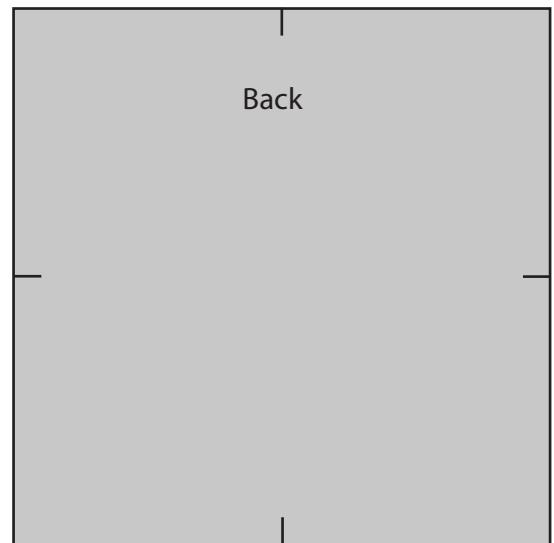
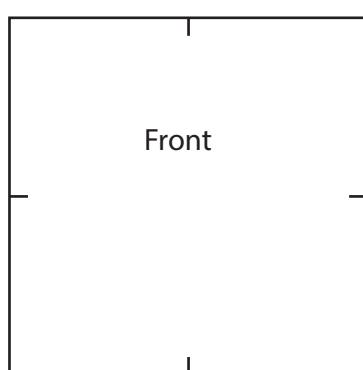
It's a very simple solution. By adding a identical curve on on the top and bottom between the zipper, we create volume. The overall circumference is still identical, but there is a bit of volume around where the zipper is and the zipper length has increased by a bit. It doesn't have to be much, but it adds a bit more utility to the traditional design.

If the curves were the opposite direction, you remove space. The magic of pattern making.

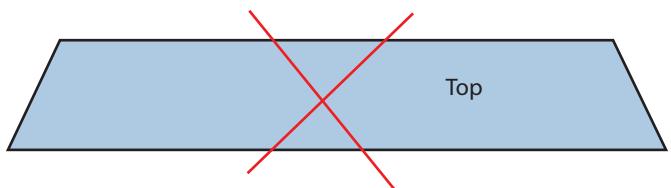


Now we're going to use darts to create a shape that isn't a 90 degree corner. Our start is a 15x15 back and a 10x10 front, this means that the walls cannot be straight. This example isn't very pretty, but you could always soften out the angles or make it into a curve. The process is the same however.

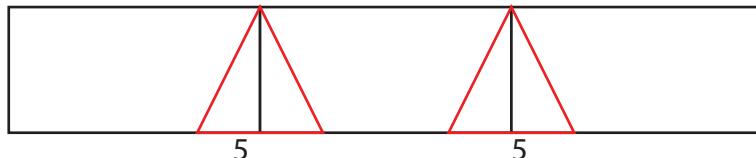
We remember that our circumference of the back is 60, and we find out that it's 40 on the front, because we measured them correctly. In this example we're going to work on half, a piece that is 30 and 5 wide.



We need to get to a place where our piece has 1 long side that is 30, and one shorter side that is 20, because it's half the circumference. If we just angle it, it's going to be incorrect because the angled sides won't be 5, they'll be longer which will create an unflattering shape to put it mildly.



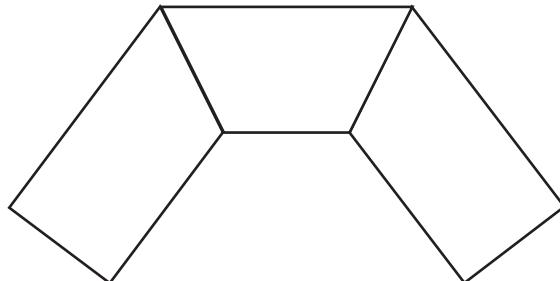
To get the shape we want, we'll add 2 darts to the top. By adding these darts, we basically outline a space that will be closed when we sew it. But we're not going to sew them, we are going to split and merge the pattern pieces so that we have 1 shape with the darts already closed. To go from 30 to 20, we need to remove 10 cm from our 30 strip, and since we have 2 darts they need to be 5 wide each.



We can then cut away the inside of the dart, and merge the pieces together.



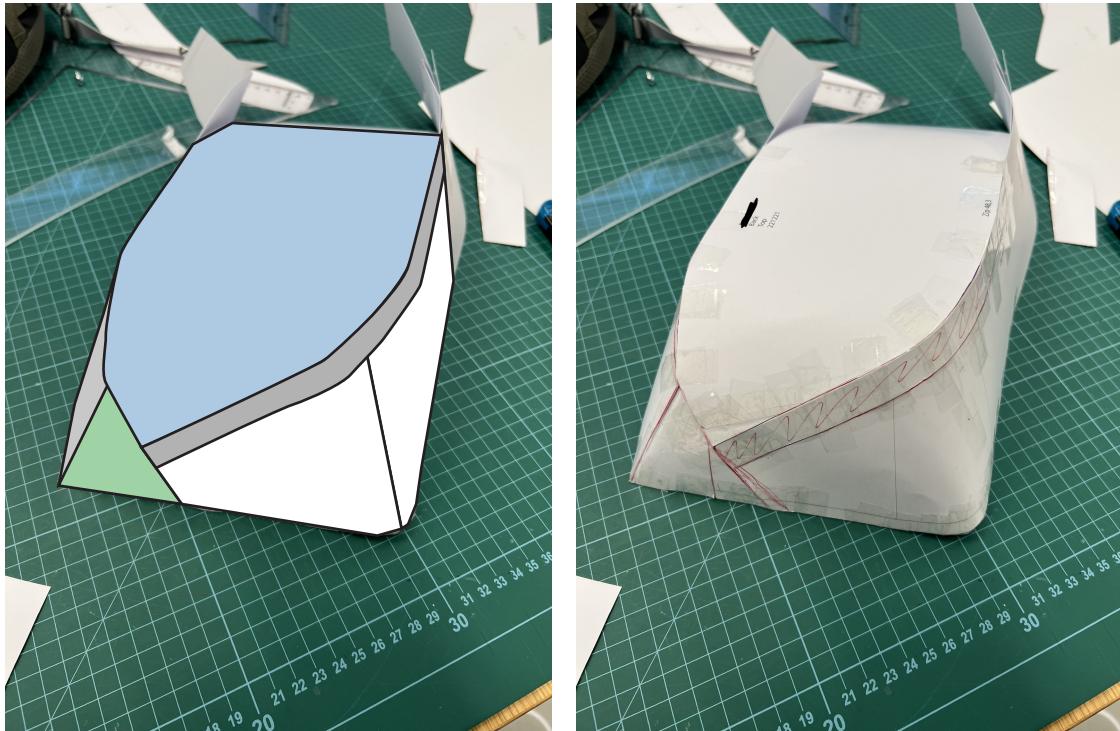
We now have a single pattern piece that is 30 on one side, and 20 on the other side, thus creating a slanted corner. Duplicate it to have a top and bottom spine.



This process I can guarantee you is a lot easier by folding paper or using a digital pattern making software. I prefer hands on with paper during the initial shape creation personally.

While these slanted sides might look nice, they aren't always the easiest to work with when it comes to adding a zipper. Below is an example of a paper pattern built using the example on the previous page, but with a straight top+front line to make it easy to add a zip. While I can't and won't share the exact pattern, a key to understanding is that the zipper is straight on the left+front panel, and angled only on the top panel.

Notice also how the zipper connects to the side+rear panel at 90 degrees. That's something you should aim for, because it's much easier to get a properly aligned zip without having to introduce angled zip ends.



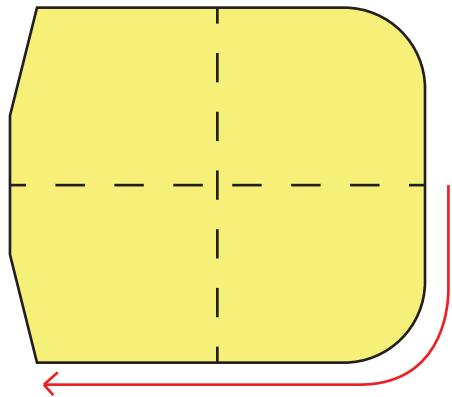
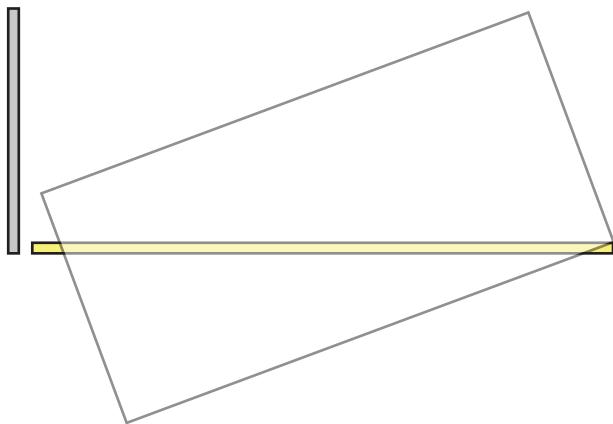
There really is no short-cut in making patterns, except to practice and get better. A good place to start to get the feeling is Pete Hills mini backpack paper models; <https://tinyurl.com/57e87ejp> It physically visualizes how darts and shapes create volume.

I find the most important part of making paper patterns is simply trial and error, combined with know-how of how it's efficient to build products. It's hard to transfer all of this in a PDF. A smart start point for pouches since the back or bottom typically has the PALS grid and connection, means we can start with a completely flat piece and work up from there. For a backpack, this might mean that you need to physically build a backpanel with shape already added if you want it to conform to the human body.

I mark out the center of my bottom, this allows me to align everything and also means that I only have to make half a pattern which can be mirrored instead of trying to create something symmetric as a whole.

From the first pattern piece, I then add additional pieces of paper which are positioned, folded, has darts made or simply cut to fit. Depending on what I want to achieve I sometimes have to tape from the outside or inside. A good thing to keep in mind, is that any zipper pattern should have the width of the finished visible zip, and it should always be straight.

I also recommend slightly thick paper, because typical printer paper is abit too flexible.

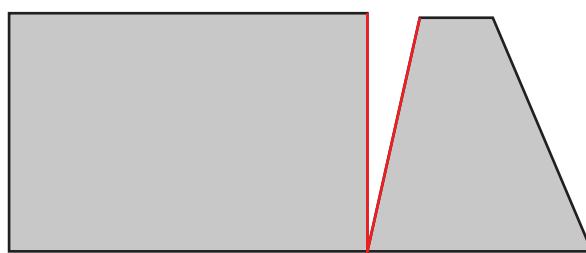
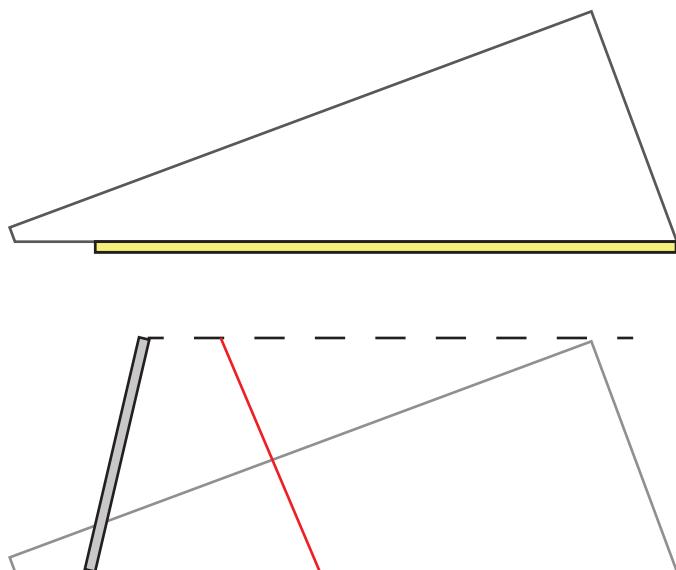


Starting from whatever shape the bottom is, I take a rectangle and attach it to the center front. I want to keep the top of the rectangle straight, because I know a zip is going there. So I know I'm never cutting any shape into that top line.

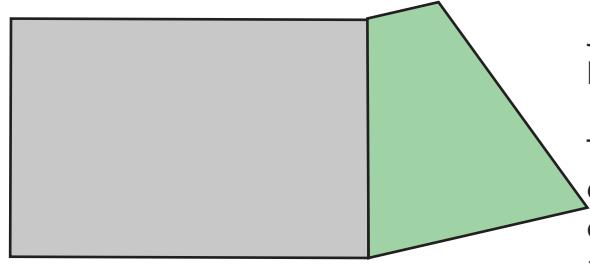
I then curve it around the bottom while trying to get an angle I like, taping it down as you go. I then mark out (on the inside, along the bottom) what needs to be cut off (red), remove the tape and cut it. I then tape it back down.

After the front is done, I do roughly the same to the back wall. If you want to keep them at the exact same height, my recommendation is to add something to the inside that is the height you want; you can tape the top the walls onto that thing and now you're sure it's equal in height on the front and back despite being different angles. But they don't have to be equal either, if you don't want to.

I know I want to get to the red line since I want my zipper to meet at 90 degrees, but it simply isn't possible with just taping down the piece; We need a dart to deal with the corner so that our wall will keep the slant.

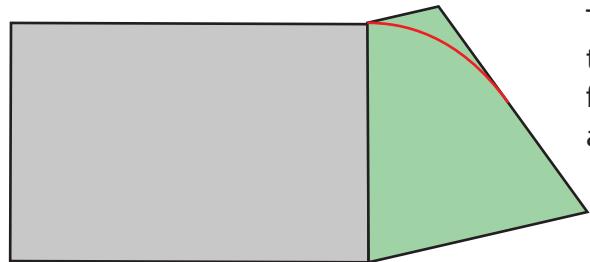


Adding a dart where one line is straight down, and the other is the angle of the desired slant of the back wall, will give us a great start point. You might have to add more paper to the top of the green portion for it to have the right height, because things disappear when we dart things.

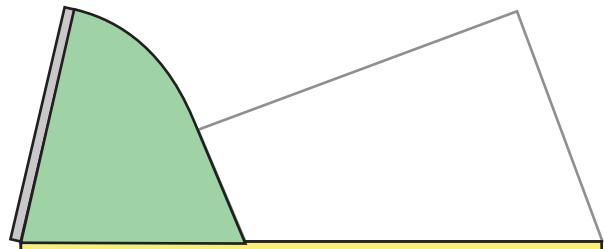
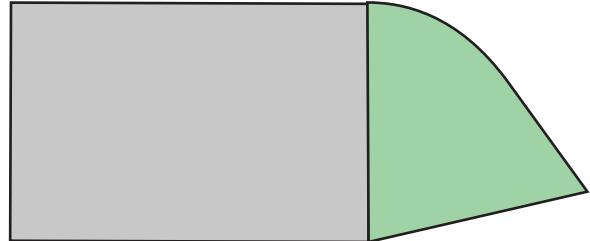


Join the two pieces from the previous step together and you have roughly a shape as on the left.

Tape together the front, back and bottom to check that everything lines up. Trim any excess. If you have gaps, tape on a small piece of paper and draw a line; take that apart and trim; tape back together.

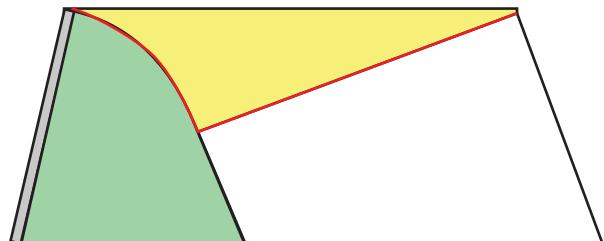


The last step is now to add the top. You might notice that the shape between the front and back wall isn't really sew friendly. To fix this, simply draw out a line with a soft curve and trim it.



Start by doing some guess-work on what the distance between the front and back walls are, cut out a piece with that distance, but keep at least 1 side completely straight. Try out what you think is correct, and repeat until happy. Align that side of the top to the centerline on the front and back wall.

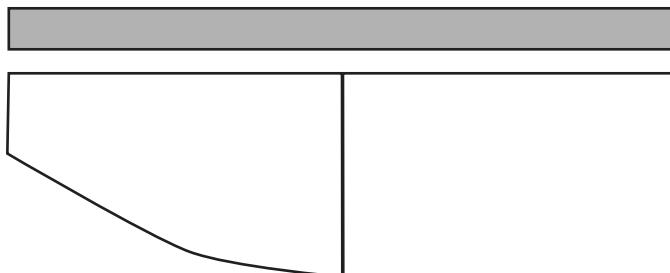
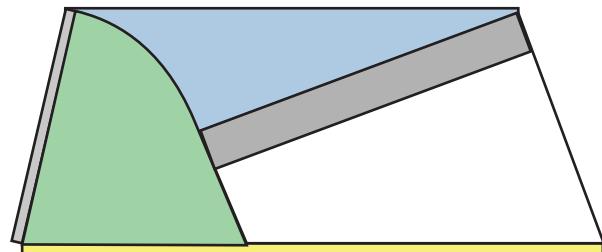
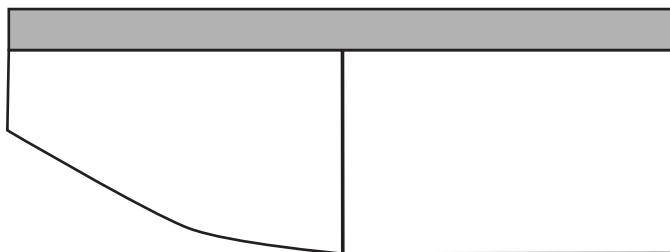
Remove the bottom, and flip it so that it sits on the top. Start from the center, start to tape down any lines that are straight on both the front and back.



When everything straight is taped, tuck the top on the inside of the front and back walls, flip it around and draw a line on the outside. Trim and tape down; if any gaps are present, add more paper and repeat. If it's too big, trim. Tape it down and add the bottom back. Now you should have a box, with slanted corners and a non-square top.

Now that your box is done, we can add details and whatever we like. I'll add the zip just because we didn't already add it, and it's very easy.

Bellow is our front piece. It has a straight top line, so I just off-set the topline the distance that I want my zip to be visible, using the same technique as the previous zipper example.



If the top line of the front panel was curved, it needs to be made differently, from the start. Basically you set the curve you want, then tape a straight pattern piece onto that curve, then align the lid to that zip; that means it will have equal lengths on both sides and work fine. Slightly more advanced, but still within your skills if you managed this.

The pouch is now finished. Take apart all the pieces, trace them onto some clean paper and add seam allowance before cutting and sewing. I typically scan them and digitally refine them, making sure all lines match up, then add SA.

Hopefully these ramblings can inspire you to attempt to do some pattern making that is a bit outside your comfort zone or just gained a tiny bit of knowledge. Don't go add shapes to all kinds of stupid stuff just because you can, but sometimes changing the angle of a zippered pouch gives you better access, or a better fitting product overall. Or your packs will have smoother running zips or more interesting shape. And/r production time is decreased.

It's important to **ALWAYS** have sewability, cutting efficiency and material use in mind when creating patterns. The paper example above is much easier to sew than a traditional front, back and spine pouch, which means it's faster to produce- and it has a better access. While it won't have as efficient material use, the speed and function outweighs the negatives in my opinion.

For the non-dummies version of pattern making, I recommend watching a few draping tutorials (because you can drape a magazine, helmet or radio) and basic pattern making tutorials on Youtube or enrolling in a basic pattern making course at your local school. While creating a shirt or dress might not feel super tactical, it's still all the same techniques applied in a different product.

As always, knowing is half the battle.