Appendix E

DO CHARTS LIE?

If you counted the number of public-side knit symbols in the shoulder-shaping charts in part three's "Bottom-Up Shaping," you may have noticed they weren't quite accurate. Let's take a closer look.

Designed Shoulder Shaping

The written-out instructions for "The Basic Vest" in the size small have us bind off three stitches at the beginning of the eight shoulder rows. In "Bottom-Up Shaping," the bind-offs were represented with this chart.

We know that at the end of each row, we will have three fewer stitches than we started with. But consider that after we finish binding off three, we already have one stitch on our working needle. If we then try to work **all** the knit symbols shown on each row, we have a problem. Because we actually worked **four** stitches to bind off just three, there is one more knit symbol in each chart row than we have in actual stitches on our source needle once we have bound off the third stitch.

On row B1, for example, the chart technically shows "BO 3, K62." But we can actually knit only sixty-one, because the sixty-second stitch was worked to bind off the third stitch.

Smoothed Shoulder Shaping

The smoothed shoulder shaping chart shown in part three's "Optional Shaping Tweaks" added a decrease at the end of each row before a row that started with bind-offs, then bound off one less stitch on the following row.

Let's count the number of knit symbols in each row, figuring out the instructions exactly according to the symbols shown in the chart.

For private-side row B, the chart tells us to purl sixty-four stitches (stitches seventy-eight through fifteen inclusive), then do a P2tog for a directional purl decrease. Since we need two stitches to do a P2tog, we're already in trouble, because purling sixty-four and doing a single decrease means we ought to have started row B with sixty-six stitches. We had only sixty-five. By the chart, we finish row B with sixty-five stitches, the sixty-four we purl and the single stitch that results from the P2tog.

On row B1, we bind off two, knit sixty-one (symbols seventeen through seventy-seven inclusive), then SSK. But to work row B1 this way, we need three stitches to bind off two, the sixty-one in the middle, and two more at the end for the decrease. That means we ought to have started row B1 with sixty-six stitches, but we just saw we start it with only sixty-five because row B as charted ended with sixty-five.

We can continue in this fashion, and we'll see that the number of knit symbols simply isn't right on rows B2 through B7.

Fully Written-Out Instructions

Let's work the problem the other way, starting with the number of stitches we have as we begin row B and figuring out how many we'll work between the bind-offs and the decrease on each row. When we do a single decrease, we use two stitches from the source needle and give one stitch to the working needle. Binding off two means we use three stitches from the source needle and give one stitch to the working needle.

For the smoothed shoulder shaping, we can summarize stitches used and stitches made. The table looks tricky, but each column details the stitches used and made as we work across each row.

	A	B	C	D	E	F	G
	Row Starts With	BO Uses	Dec Uses	Central Stitches (=A−B−C)	BO Gives	Dec Gives	Row Ends With (=D+E+F)
B	65	–	2	63	–	1	64
B1	64	3	2	59	1	1	61
B2	61	3	2	56	1	1	58
B3	58	3	2	53	1	1	55
B4	55	3	2	50	1	1	52
B5	52	3	2	47	1	1	49
B6	49	3	2	44	1	1	46
B7	46	3	2	41	1	1	43
B8	43	3	–	40	1	–	41

Let's write out these instructions in the typical form, using the values in column D as the number of knit or purl stitches in the middle of each row.

Smoothed Shoulder Shaping for Size Small Vest Back

On final WS row before starting shoulder BOs, P63, P2tog. (64 sts)
Row B1 (RS): BO 2, K59, SSK. (61 sts)
Row B2: BO 2, P56, P2tog. (58 sts)
Row B3: BO 2, K53, SSK. (55 sts)
Row B4: BO 2, P50, P2tog. (52 sts)
Row B5: BO 2, K47, SSK. (49 sts)
Row B6: BO 2, P44, P2tog. (46 sts)
Row B7: BO 2, K41, SSK. (43 sts)
Row B8: BO 2, P40. (41 sts)

Now let's chart these instructions. Technically speaking, and in yarn of course, the first stitch bound off on each row will be the stitch that we're left with after doing the decrease at the end of the previous row. That's why the symbols are in slightly different positions than in the original version of the chart.

If we count the number of knit symbols on each row, we get the exact number in column D of the table for all nine rows. However, row B8 shows only forty stitches remaining (stitches sixty-five through twenty-six inclusive), and we know we are supposed to have forty-one. (We start the shoulder shaping with sixty-five stitches and bind off twelve on each shoulder, which leaves forty-one.)

If we count the empty locations and bind-off symbols on each row, we see that row B has no symbol at location fourteen, which corresponds exactly with the loss of one stitch in the decrease. Row B1, though, isn't quite right, as we know that we end the row with sixty-one stitches on our working needle (we decreased two and bound off two of our original sixty-five), but the chart shows that five stitches, not four, are missing: at locations fourteen, fifteen, sixteen, seventy-seven, and seventy-eight.

Does row B2 have the correct amount of area showing where stitches are now missing? We end with fifty-eight stitches on our needle (three decreased and four bound off out of

the original sixty-five). So we should have seven empty stitch locations, but the chart indicates eight missing stitches: four at each edge.

What if we just count the total number of stitches on each row, based on where the symbols start and end? Row B has symbols in sixty-four stitch locations, so that's right. Row B1 goes from stitch location fifteen through location seventy-six. Inclusively, that's a total of sixty-two stitches. But the rewritten instructions say (and we already know) that we have only sixty-one stitches at the end of row B1. This result isn't totally unexpected, as we already saw there weren't enough "no stitch here" spots on row B1. The remaining rows will be wrong as well.

Evaluation

The first chart in this section gives a much more accurate impression of the finished shaping. The final chart is absolutely correct in representing what we do with needles and yarn. But it doesn't look any smoother than the designed shaping chart did, which defeats to a certain extent the purpose of charting in the first place.

Use Different Decrease Symbols?

Perhaps we should use decrease symbols that are two stitches wide.

Is this version better? It seems like the stitches that have been eliminated at the end of each row are less clear than they were before. This chart does, though, have the correct number of empty locations (when we include those filled with the bind-off symbols) at the ends of each row, except for row B. Row B1 has four empty locations, corresponding to the sixty-one stitches it should have when it's done, row B2 has seven empty locations, and so on through row B7. But row B8 is missing a stitch, as it runs only from locations twenty-six through sixty-five inclusive.

Use the Special Bind-Off Symbols?

There are symbols in the knitting font designed to indicate binding off, simply because of that whole "we have to work one more stitch than we bind off" situation. Let's try using those symbols instead of the ones we've been using.

Row B still shows as one stitch shorter because of the decrease done at the end, so let's see what happens on row B1 with the more representative bind-off symbols.

The symbols combine to show with the two complete arches (from the middle of location fifteen through the middle of location seventeen) that two stitches have been decreased. The partial arch on the left half of the symbol at location seventeen reminds us that we worked three stitches, even though we only bound off two. We still have the fifty-nine stitches that we knit in the middle (eighteen through seventy-six inclusive), and we do an SSK at the end as before.

We have the correct amount of empty space, as long as we realize we don't count the symbols at locations fifteen and sixteen. If we count the number of locations that indicate the presence of an actual stitch, we have stitches running from seventeen through seventy-seven inclusive, which is sixty-one. That matches the table and the rewritten instructions.

Let's swap in the bind-off symbols in the whole chart.

The two and a half arches at the beginning of each row now show that we've bound off two stitches and have a third stitch already worked. We have the correct number of knit symbols in the center of each row. And the decrease at the end of each row is where the first stitch is bound off at the beginning of the next row. We also have the correct amount of space to indicate stitches that no longer exist.

If we count the innermost half arch, the knit symbols, and the decrease symbol on each row, we will see that we have the proper number of stitches as indicated by the table and the corresponding written-out instructions. Even on row B8, since we count the half-arch symbol on the right half of location sixty-six as the stitch that remained when we bound off the first two, we have stitches from locations sixty-six through twenty-six inclusive, which is—drum roll, please—forty-one. Yippee!

Why Does the Chart Lie?

Part of the problem is that we're forcing all the symbols into a grid. The grid then makes it

easy for us to count how many locations have symbols. But the symbols stay rigidly in place, especially compared to how real stitches move around and lean over when we bind off, decrease, and increase.

Think about how a decrease worked a stitch or two from the end of a row makes the end stitches lean instead of remaining straight up and down. But in the grid-based charts used in this book, we either have a rectangular symbol or we have a blank space. All the symbols have horizontal and vertical edges, which make square corners.[1] In that sense, the charts don't exactly match the work. Because of this limitation, some knitters might like **JC Briar's stitch maps** better.

Let's see what the stitch maps of the designed and smoothed shoulder shaping look like. If you've not worked with stitch maps, here's a quick summary of what they show.

- Each row is numbered, but instead of using our B through B8, the rows are labeled zero through eight; row zero is our foundation row B, and we can mentally put a B before the rest of the row numbers.

- A vertical line indicates a public-side knit stitch, so on private-side rows, we of course must purl.

- An X is a stitch that's been bound off.

- Pale-gray horizontal lines running through the symbols show all the stitches on a given row. (Showing these lines is optional, but they're useful when we're learning to read stitch maps and, for some of us, when we're trying to work from them.)

- The number of stitches remaining after we complete a row is shown in parentheses at the end of each row. (Showing end-of-row stitch counts is optional.)

The first stitch map shows the **designed shoulder shaping**, binding off three stitches at the beginning of all eight shoulder rows. Note that the edges curve a bit, because the stitch map is trying to show how the fabric will actually respond to the various knitting operations. It finishes row eight (our row B8) with forty-one stitches, which is exactly right.
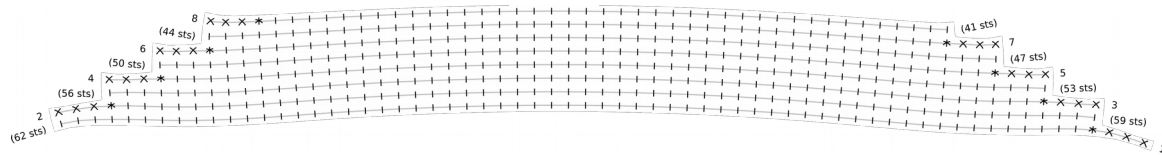
What's cool about a stitch map is that when we bind off, there's a special symbol used automagically for that extra stitch we always have to work. We can see that the bound-off stitches are each shown with an X. But that extra stitch, the fourth one we work to bind off the third stitch, is shown with an asterisk. That exactly represents what's going on.

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[1] The only symbols that have a diagonal edge are the ones for Jolie Elder's 3-into-2 decreases.

The stitch map of the **smoothed shoulder shaping** curls quite a bit more because it now responds to the decreases at the ends of rows zero through seven (our rows B through B7), which can pull the fabric in several directions.


We see two Xs and an asterisk at the beginning of rows one through eight (our rows B1 through B8), with the asterisk representing the extra stitch we must work to bind off the second stitch. Note that at the end of row eight (our row B8), we have the correct result of forty-one stitches remaining.

This stitch map also has symbols that look like Xs with one of the upper arms broken off (or a simplified lowercase Greek lambda λ and its mirror-image). Those two symbols represent the decreases, with the intact long arm showing which way each decrease leans.

Improving the Grid Charts

Let's fold, OK, steal the idea of the special symbol for the extra stitch needed for binding off and put those new symbols into both shoulder shaping charts.

For the designed shoulder shaping, we change the symbol after the final bound-off stitch from an ordinary knit to something—nearly anything—else. From among the many symbols with geometric shapes, let's use a symbol with—*cough*—a star in it.

The star tells us that we don't count that stitch as one of the stitches we have to work to **finish** the row. Instead, the **additional** stitches we work once we complete the bind-offs are now accurately shown by the number of knit symbols.

Let's do the same thing in the smoothed shoulder shaping chart with the exact number of knit symbols, which we charted after we figured out exactly how many stitches the bind-offs and decreases used. Note that we actually have to **add** the star symbol after the second bound-off stitch on each row, **not replace** an existing knit symbol in those locations. That's because we knew beforehand from the table exactly how many knit symbols each row needed, so that's how many were already in the chart.

Chart (rows labeled with flat symbol ♭):

```
♭8   ∩∩★
                                                            ★∩∩   ♭7
♭6      ∩∩★
                                                          ★∩∩     ♭5
♭4    ∩∩★
                                                        ★∩∩       ♭3
♭2  ∩∩★
                                                      ★∩∩         ♭1
♭
    78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14
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On row B1, we have symbols representing actual stitches we'll have on our working needle in locations seventeen through seventy-seven, which is sixty-one stitches. That matches what we have in the table. The rest of the rows show the correct number of symbols for actual, existing stitches as well, including row B8, where we finish the back neck with the required forty-one stitches.

On the other hand, this "smoothed" shaping chart still doesn't look as smooth as the "incorrect" one we had initially.

Lesson Learned

> When we bind off a few stitches at the beginning of a row, we need to remember that the stitch immediately following the last bound-off stitch has **already** been worked. If we want the rest of the chart row to be absolutely accurate, we need to use a special symbol to represent that extra stitch. If we're not so picky about what the chart actually shows, we have to mentally subtract one to match the number of stitches that will remain on the source needle, especially if the rest of the row contains any kind of stitch pattern, rather than being just plain stockinette or garter.

We Have Choices

To some knitters, stitch maps make more sense because they try to replicate the stitches' reactions to the surrounding decreases, bind-offs, increases, and cast-ons. This ability is especially useful when we're trying to design (or even just chart), for example, a lace stitch pattern. The stitches will lean left and right when stitches are added or taken away around them, and a lace stitch map looks remarkably like what we get in yarn (once we get used to looking at them).

Other knitters don't fuss over these issues, so they're happy with grid-based charts.

And regardless of our normal preference, we might well want to use both stitch maps

and grid-based charts in the same project, depending on the needs of the various bits and pieces.

Concentrate on the Chart's Intent

Some situations just don't work quite right when we try to show all the stitches exactly. We saw one tweak we can use to fix one kind of inaccuracy: represent with a different symbol the extra stitch used in binding off. But in lots of charts, the central stitches in one sense don't matter at all.

Suppose the designed shoulder chart had been presented this way:

♭ 8	∩∩∩		
		∩∩∩	♭ 7
♭ 6	∩∩∩		
		∩∩∩	♭ 5
♭ 4	∩∩∩		
		∩∩∩	♭ 3
♭ 2	∩∩∩		
		∩∩∩	♭ 1
♭			
	78 77 76 75 74 73 72 71 70 69 68 67 66 65	27 26 25 24 23 22 21 20 19 18 17 16 15 14	

Does ignoring the entire center of the chart make it easier to understand what we're trying to do? Many of us would think so. (And some of us would like the bigger font too!)

The most important thing that the designed shoulder shaping chart is **really** trying to show, and what the truncated chart is emphasizing, is that for eight rows, we bind off three stitches, then work evenly to the end of the row. The simplified chart makes us concentrate on the beginning of each row, where the real action is occurring.

For the smoothed shoulder shaping chart, the only symbols that really matter are again those at both ends of the rows.

| | | 78 | 77 | 76 | 75 | 74 | 73 | 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | |

Chart (read with row labels ♭8, ♭7, ♭6, ♭5, ♭4, ♭3, ♭2, ♭1, ♭; stitches numbered 78–65 on the left panel and 27–14 on the right panel).

As we're working the shoulders, this chart simply tells us

On the final WS row before starting the shoulder shaping, * work to the last 2 sts, dec, turn, BO 2, and rpt from *, omitting the dec at end of row B8.

For both versions of the shoulder chart, and plenty of other project charts, the only thing all the central symbols are really doing is spreading the important symbols apart.

Stitch and Row Proportions

Another way charts lie is how they show the stitch-to-row ratio. Used as is, the knitting font will almost certainly make the chart a different height than the corresponding finished object will be in yarn. We can, however, manipulate the font vertically so that we can match our row gauge, just as we can change the font size to match our stitch gauge.[2]

Full details for forcing our charts to match both our stitch and row gauges are given in the appendix "Designing by Charting."

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[2] Well, in fabrics that are essentially stockinette; charting garter stitch is a whole different issue and one without a good solution, even in stitch maps, because of the substantial difference in how garter stitch is much more compressed vertically than stockinette.