

Appendix I

BORDER DETAILS

If we're making a flat project with stockinette (or a stitch pattern that's based on stockinette), we'll need borders on all four sides to stop the edges from curling. Typically, we use seed stitch or garter stitch for the borders.

Seed Stitch Borders

Seed stitch usually has the same stitch and row gauges as our stockinette, and a common stockinette ratio of stitch and row gauges in worsted weight yarn is five to seven. If we get five stitches per inch, we usually get about seven rows per inch. Some knitters may get five to six; other knitters may get five to eight, six to eight, six to nine, or some other ratio.

If we want a one-inch-wide seed stitch border on all four edges of a flat item, then we must have left and right borders with the number of stitches we get per inch. But the top and bottom borders must use the number of **rows** we get per inch.

So if we get five stitches and seven rows to the inch in seed stitch and we want all four borders to be one inch wide, then we have to make the left and right borders **five stitches** wide, but we must make the top and bottom borders **seven rows** tall.

Garter Stitch Borders

Garter stitch is almost perfectly square when made with the same number of stitches and **ridges**. That means the top and bottom borders must be the same number of ridges tall as the left and right borders are stitches wide.

If we get five stitches per inch, then for one-inch borders on all four sides, we have to have five border stitches on the left and right edges, but we have to have **five ridges** (ten rows) at the top and bottom.

Issues with Garter Stitch

Garter stitch bottom borders have no issues where they connect to garter stitch left and right borders or interact with the first row of the project's main fabric. The only issue with the bottom border is making sure we do the correct number of ridges.

But garter stitch left, right, and top borders have issues that need careful handling.

Garter Stitch Left and Right Borders

Because garter stitch has more rows per inch than stockinette-based fabrics, left and right

borders of garter stitch will be shorter than the main body of stockinette projects if the central fabric and the borders have the same number of rows. That means we need to add extra rows in the left and right borders. How? With short rows.

Get Both Row Gauges

We have to make swatches of both the stitch pattern and garter stitch. In my first basket-weave hot pad, I got thirty rows in four inches of the basket-weave pattern, and I had fourteen ridges (twenty-eight rows) in three inches of garter stitch.

Small Differences Add Up

Each basket-weave row is 0.133 inches tall (four inches divided by thirty rows), but each garter stitch row is only 0.107 inches tall (three inches divided by twenty-eight rows). Yes, the difference seems small, but it adds up in a big project.

Suppose we want a blanket whose central basket-weave fabric is sixty inches long. Sixty inches of basket-weave will need 450 rows (sixty inches divided by 0.133 inches per row).

But if the garter stitch left and right borders are also 450 rows long, they'll measure just over forty-eight inches (450 rows multiplied by 0.107 inches per row). That twelve-inch difference is going to be a problem.

We can look at the problem in the other direction as well. Each inch of basket-weave has 7.50 rows (thirty rows divided by four inches). Each inch of garter stitch has 9.33 rows (twenty-eight rows divided by three inches). The difference between those two numbers means that for each vertical inch of basket-weave, we have to have almost two extra rows of garter stitch in the left and right borders to make them be the same length as the basket-weave fabric.

What Short Rows Are

Short rows are made by stopping before the end of the row, turning the work, and working back toward the beginning of the row, leaving the rest of the stitches on the current row unworked for the time being (sometimes they're called *stitches in waiting*). After working back a certain distance, the piece is turned back in the original direction.

Sometimes after the first turning we work all the way back to the beginning of the row, but in other situations, we might work only part of the way back. When we turn back to the original direction, we again might work only partway across before turning a third time, or we might work all the way to the end of the row.

Here's a chart showing *one pair* of short rows (we count the turns made, not the number of partial rows that we wind up with).

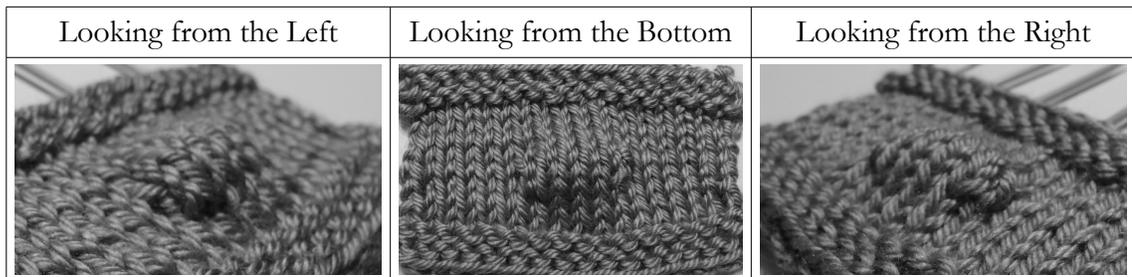
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How do we interpret the chart?

On rows one and two we work all the way across and all the way back in the normal way. On row three, however, we stop short of the end, working only as far as stitch L, leaving stitches M through R unworked. Then we turn the work.

On row four, we work stitches L through G. Then we turn the work again, leaving stitches F through A unworked. On row five we work all the way to stitch R at the end of the row, and on row six, we work all eighteen stitches.

The key thing to notice here is how the center of the swatch has more rows than the left and right edges. These extra rows make a sort of bump or blister in the fabric.



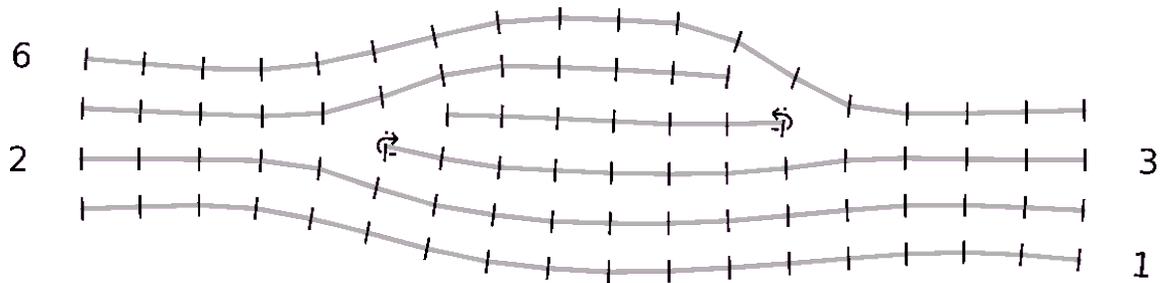
As we move vertically up through all six chart rows, stitches A through F have only been worked four times: they are only four rows tall. The same thing is true of stitches M through R. Those stitches are also only four rows tall.

But the central area, stitches G through L, is six rows tall, because there is one extra row, row four, and two partial rows, rows three and five.¹

The [stitch map](#) also shows the bubble effect (if you click the link, change the “Vertical repeats” to one).

In the example chart and in the stitch map, the two partial rows and the extra row have been numbered. Sometimes we need these rows to remain unnumbered, as we’ll see in the rest of this discussion.

¹ Short rows usually cause holes at the turning points, which can be hidden with various techniques. For our purposes, we’re ignoring that issue.



For short rows in garter stitch left and right borders, we'll almost always work just the right border's stitches at the beginning of the row, turn and work back to the right edge, then turn and work all the way across the piece to the left edge. We turn and work just the left border's stitches, turn and work back to the left edge, then turn and work across the entire piece to the right edge. In this way we have two extra rows just in the garter stitch left and right borders.

Using Short Rows on Garter Stitch Left and Right Borders

Since we get two extra rows' worth of stitches every time we do a pair of short rows, how can we use them on the left and right borders of a project like the basket-weave hot pad?

Using my gauges, where the basket-weave had 7.5 rows per inch while the garter stitch had 9.33 rows per inch, we can say that the difference, 1.83 rows, is close enough to two rows per inch that we won't bother doing any more arithmetic.

So we need to tweak the basket-weave hot pad chart to put two extra rows in the left and right borders for every 7.5 rows of the basket-weave pattern. Note that we don't have to start thinking about short rows until after we've worked 7.5 basket-weave rows, since the left and right borders' rows mesh perfectly with the bottom border before that point.

And of course we can't do anything every 7.5 rows, so we have to do the short rows after either seven or eight basket-weave rows.

The First Set of Short Rows

We'll work seven basket-weave rows, then add short rows in the left and right borders. Note that the short rows are not numbered, because the row numbers indicate the **project** row numbers, in case we need to refer back to the written-out instructions.

Let's use a different charting technique than we did in the example short-row chart.

Other Row-Gauge Examples

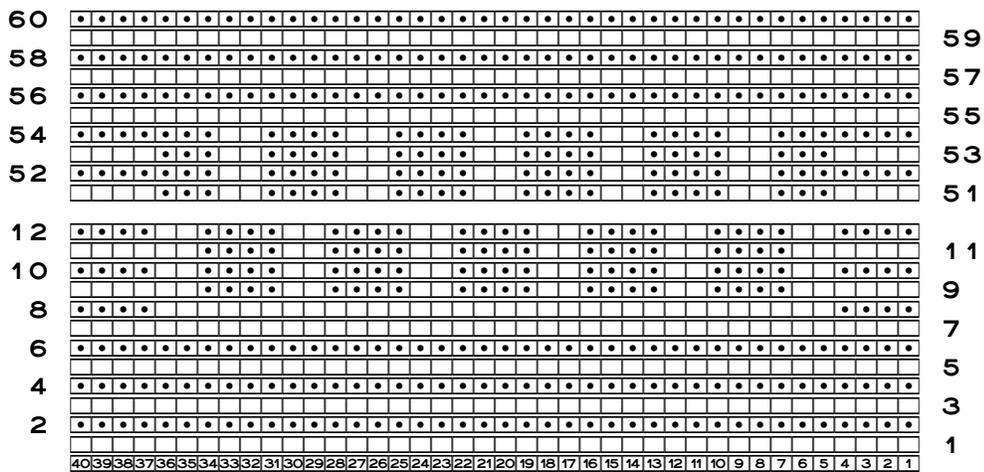
In the basket-weave hot pad, my gauge numbers worked out pretty nicely. For every inch of basket-weave, I needed to add a pair of short rows in the left and right borders. Technically, I needed to add only 1.83 garter rows every 7.5 basket-weave rows, but knitting is stretchy and squashy, and the numbers worked out close enough.

Suppose our main fabric has nine rows per inch and our garter stitch has twelve rows per inch. We can't do three extra rows of garter stitch per nine rows of our main fabric, because we only get an even number of short rows at a time. But if we multiply both row gauges by two, we have eighteen and twenty-four rows per two inches. Since the difference is now six rows, we'll need to do a pair of short rows three times in every eighteen rows of the main pattern. We would therefore work short rows in the garter stitch left and right borders for every six rows of the main pattern.

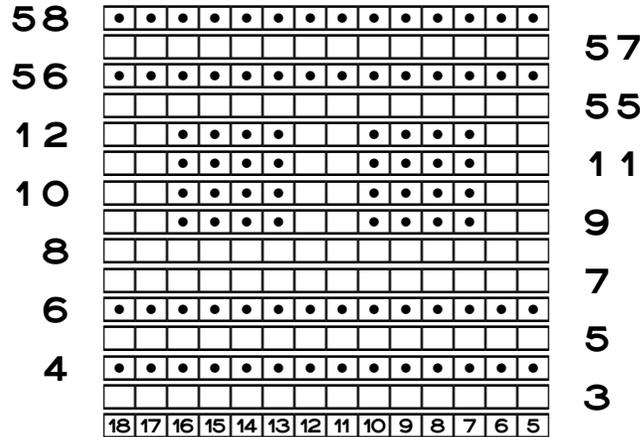
What if we have gauges of seven pattern rows and twelve garter rows per inch? The difference is five, and again, we can't get an odd number of short rows. Multiply both row gauges by two: fourteen and twenty-four. The difference is now ten, so we need to do ten short rows in every twenty-four pattern rows to make up for the tighter garter stitch row gauge. Five sets of short rows will give us the extra ten rows of garter. How frequently do we make a pair of short rows? Five times in fourteen rows, so every three pattern rows we do short rows in the left and right borders. Yes, five doesn't go into fourteen evenly, but again, knitting is forgiving, so the proportions will probably work out fine. We can always—*cough*—swatch to be sure.

Garter Stitch Top Borders

Staying with the basket-weave hot pad, here are the bottom and top of the full chart from "Tweaking a Chart" in part two.



Let's cut this chart down, so we can concentrate on how the top and bottom borders butt up against the rows of stockinette fabric below and above the purl blocks. We'll keep only two purl blocks from a single row of blocks in the center of the chart. Let's also cut the top and bottom borders to just two ridges instead of three (even one ridge would be sufficient for demonstration purposes), just so the charts, swatches, and photos can really focus on what happens in the experiments we're about to do.



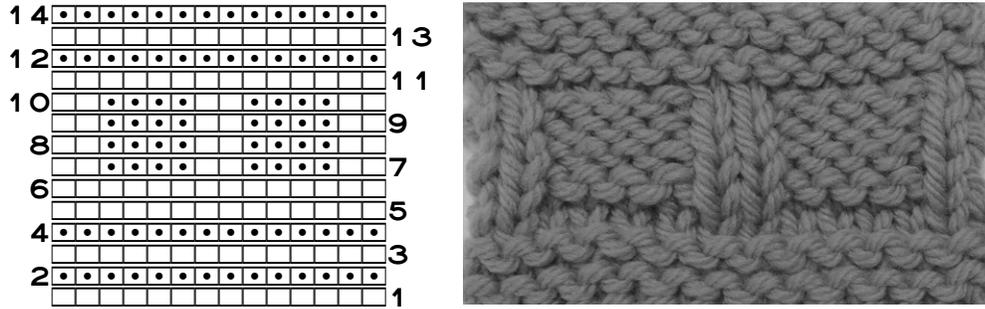
Three Experiments

We'll look closely at the stockinette between the top of the row of blocks and the bottom of the garter stitch top border. The next three charts are essentially the same as both the full project chart and the simplified chart above: we have a garter stitch bottom border, two rows of stockinette, a row of purl blocks, and an increasing number of rows of stockinette between the tops of the blocks and the garter stitch top border.

We'll renumber the rows for clarity and delete the boxed stitch labels, since we don't need them.

One Row of Stockinette

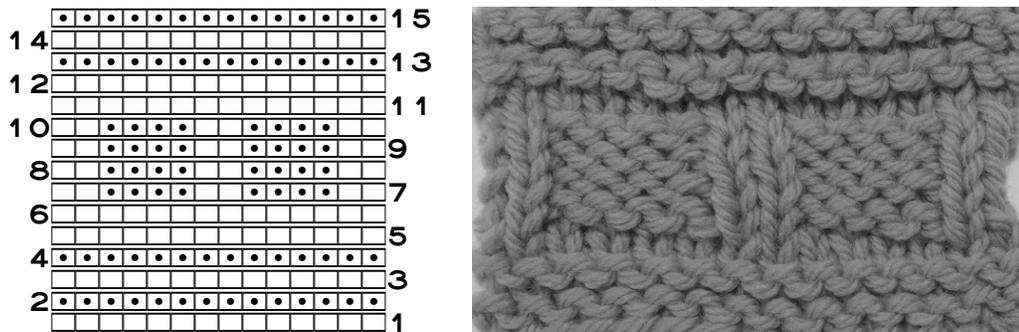
We **intend** the last public-side knit row, now row eleven, to be the last row of stockinette stitch in the main fabric, but what actually happens **in yarn** is that the last public-side knit row will be almost completely hidden by the first public-side purl ridge of the garter stitch top border (now row twelve).



In the swatch, we see the same issues that we saw with the full-size basket-weave hot pad. The distance between the bottom border and the bottom of the blocks is a bit bigger than the distance between the tops of the blocks and the top border. So let's add a second stockinette row above the blocks.

Two Rows of Stockinette

In the next chart, I copied and pasted row eleven, then fixed the row numbers. As we saw in "Tweaking a Chart," we could not add this second row of stockinette **and** make the left and right borders mesh perfectly with the top border. But there's one significant thing to note about this chart. The garter stitch top border is now made by **purling** rows twelve through fifteen, not knitting them.³ That switch is what caused the left and right borders to not mesh with the top border when we tried to tweak the chart in part two.

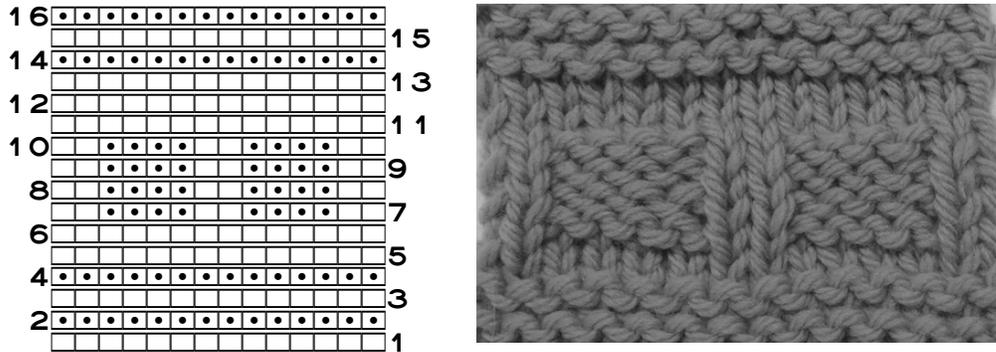


In the swatch, the gaps between the blocks and the borders look like they're the same size, which is good. But again, we wouldn't have been able to make the left and right borders mesh properly with the top border, because we'd be knitting the first and last four stitches of the top border while purling all the central stitches.

³ Remember from "Basic Knitted Fabrics" that we can make garter stitch by knitting every stitch of every row or by purling every stitch of every row.

Three Rows of Stockinette

Let's do one more experiment, adding a third row of stockinette above the purl blocks.



Now the top gap looks a bit bigger than the bottom one.

Emphasize What's Happening with a Second Color

Let's work these three charts again, using a different color for the basket-weave in rows five through eleven of the first chart, rows five through twelve of the second chart, and rows five through thirteen of the third chart.

One Row of Stockinette	Two Rows of Stockinette	Three Rows of Stockinette

Typically we make garter stitch by starting on the public side with a knit row, then knit back on the private side, which makes a purl ridge on the public side. As we see in all three of the two-color swatches, the first row of stockinette in row five, just above the bottom border, looks just as we expect it to. We see two ridges of garter stitch below it, and both rows below the purl blocks are visible, though as with the single-color swatches, the blocks' bottom rows of purl stitches partly hide the stockinette row below them.

When we look at the top border, though, what happens in a single color is highlighted and magnified by working the border in a different color from the basket-weave.

In each swatch, the first private-side garter stitch top border row is the line of dark

stitches just above the purl blocks. The line of light stitches above each of those lines is what we **intend** to be the last public-side knit row above the blocks.

In each chart, the top border's first public-side purl ridge hides the last public-side knit row above the blocks. In the first swatch, the single stockinette row above the blocks has almost disappeared. In the second swatch, we see only about a row and a half above the blocks. The third swatch shows about two and a half stockinette rows below the top border.

The Takeaway

The thing we learn from these swatches is that the first private-side knit row of a garter stitch top border is going to hide the public-side knit row below it. The two-color swatches make that quite clear.

Even though **in the chart** it looks like we extended the **stockinette** portion by adding rows above the purl blocks, what happens **in yarn** is that the row below the first public-side purl ridge winds up being part of the first row of the garter stitch top border.

If we have only one knit row between two purl rows, it will be almost invisible. That's the essence of garter stitch as a fabric; what we mainly see are the purl ridges (unless we vertically stretch the fabric a bit).

To however many knit rows we want to be visible between purl ridges, we must add one extra public-side knit row, because the knit row immediately below a purl ridge will be mostly hidden by it.

If our flat project has a central area of stockinette (or any stitch pattern based on stockinette) surrounded by garter stitch borders, then we may need an extra row between the end of the central area and the top border, compared to what we need between the bottom border and the beginning of the central area. But we actually need to add **two** (or any other even number) rows below the garter stitch top border so that it will mesh properly with the garter stitch left and right borders.

We also know that, depending on the exact stitch pattern of the central fabric, the gaps between the pattern area and the top and bottom borders may not match by about half a row.

Revisiting the Aran Sampler

In my eagerness to do all the knitting for the book, I cast on the number of stitches that the Aran sampler's patterns required, along with stitches for all the reverse stockinette between the patterns and at the left and right edges. I worked the bottom as garter stitch so that when I took photos, the bottom edge would behave by lying flat. But the bottom border wound up ruffled.

Once I started working the cables, I soon realized my folly. Instead of frogging, I decided to continue, because the result shows what happens if we don't take into account the pulling-in effect of cables and twists. Here's the bottom of the Aran sampler.



I ought to have remembered to cast on fewer stitches, and as it turns out, a **lot** fewer stitches, because I completely forgot about how the cables would pull in and make the fabric quite a bit narrower than the same number of stitches would be in garter (and stockinette) stitch.

On the top border, however, I at least tried to make up for my earlier mistake. As I bound off, I did some K2togs above the cables to make the top edge be the same measured width as the main body of the sampler. Believe it or not, the top edge is only **twenty-five stitches wide**. That's correct. Just twenty-five stitches wide, compared to the forty-five stitches needed for the patterns. I actually had to tink the bind-off several times along the way to do a few more K2togs, because I kept thinking to myself, *Surely I've decreased away enough of the stitches*. Nope. Had to go back and get rid of a few more.



For Stitch Patterns That Pull In

If we want to avoid flared, ruffled, or wavy top and bottom borders because our main fabric

pulls in, we have to know the difference between the width of the border’s stitch pattern and the width of the main fabric. And yes, I shouldn’t even need to say it, but I will: we have to swatch.

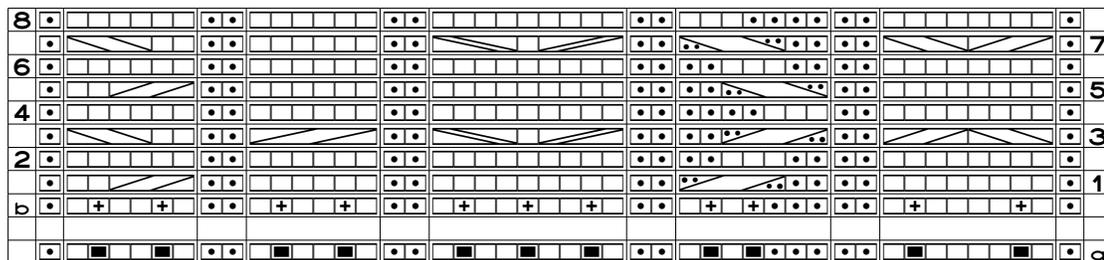
If we work every project with the same yarn on the same needles (not just size, but manufacturer and needle material), then as we work different stitch patterns, we’ll get a feel for what gauge we might get in a new stitch pattern.

But if we like to use different yarns and need to use different needles for different fibers, it’s even more imperative that we find out exactly how a particular pattern works up in a particular yarn on a particular needle. I know. Big sigh.

In my knitting lifetime, I have found that in worsted weight yarn my four-stitch cable pulls itself to the width of three stitches of stockinette, and my six-stitch cable is usually the equivalent of just four stockinette stitches wide. Other knitters may work their cablings more loosely or more tightly, so their cables will be wider or narrower, respectively.

Casting On

Had I used my knowledge and past experience to determine the number of stitches to cast on (instead of rushing into it and merely using the number of stitches the patterns were going to need), I would have cast on fewer stitches (shown in foundation row A), then worked most of the bottom border (indicated by the blank row). On the last private-side border row (foundation row B), I would have done increases this way:



Notice that the increases are not “spaced evenly across,” which is so often the instructions given for increasing the number of stitches for a sweater’s front, back, and sleeves when we switch from the bottom ribbing to the main fabric.

For a project with cables or twists, we have to do strategically positioned increases directly under the cables a row or two before we do the first crossing, so that the cables get the extra stitches **they** need.

In such a situation, we would **not** want to do increases evenly spaced across the work. If we do, then we’ll wind up with too many stitches in some places (the areas between the main patterns) and not enough right below the cables themselves. Until we know our stitch gauge

If we have the first problem, one solution would be to do decreases in the back stitches of the cable at its last crossing, reducing its stitch count to its equivalent width in stockinette. Decreases in the cable's back stitches will be mainly invisible.

If we know we'll cross right before the bind-off, then we might omit that final crossing, and in the crossing that has now become the final one, we would again do decreases in the back part of the cable. If there are, perhaps, eight or more rows between crossings, we might be able to do the crossing a row early, to put it a bit farther from the bind-off. We already know we can cross on the private side just as easily as on the public side (see the appendix "Crossing Cables on the Private Side").

So if our six-stitch cable is the equivalent width of four stitches of stockinette, then in the final crossing before the bind-off, we need to get rid of two of the cable's stitches. We could do a K3tog or SSSK on those three back stitches. If there's a purl stitch before a left cable, we can probably do a P2tog with the purl stitch and the cable's first back stitch, then do a K2tog on the other two back stitches. If the cable slants right, we do a K2tog with the first two back stitches and a P2tog with the cable's final stitch and the purl stitch that follows it.

If a four-stitch cable is the width of three stitches in stockinette, we can do a K2tog on the back stitches during the last crossing.

Summary

Borders on flat items don't always act the way we think they will.

Lessons Learned

Seed stitch left and right borders need to use the stitch gauge to make them the desired measured width, but seed stitch top and bottom borders need to use the row gauge to make them the same measured height.

Garter left and right stitch borders will almost certainly need short rows if the main fabric is not also garter stitch.

A public-side knit row **above** a public-side purl ridge will show in its entirety. No special treatment is needed when we finish a garter stitch bottom border with a private-side row and start a stockinette-based main fabric on the following public-side row.

A public-side knit row **below** a public-side garter stitch purl ridge will be almost invisible. We may need an extra row of stockinette before we work the first private-side row of a garter stitch top border. If there are garter stitch left and right borders, we need to add two (or any even number) stockinette rows before the top border to keep the entire width of the top border unbroken all the way to the bound-off edge.