Set-In Sleeves
by Christina Hanger

In the “Fashion Framework” series, we will help you explore basic elements of pattern make-up – things to know before you knit. Each article in this series will provide a “lesson” for a basic type of garment. The lesson will describe in detail aspects of the garment as well as provide a basic pattern and show ways to alter the standard pattern to customize the garment. This lesson is for sweaters with set-in sleeves.

Knitters have many choices of what type of sleeves to use in sweaters: drop shoulder, raglan, modified drop sleeves, saddle sleeves and set-in sleeves. Fashion trends, pattern considerations and personal preference influence knitter’s choices. Set-in sleeves are the most fitted option for sweaters, but have more shaping possibilities choices and more complicated calculations.

General Description
Set-in sleeves are the most tailored fit available to knitters. The edge of the sleeve lines up to the armhole at the shoulder and the amount of excess fabric under the arm is minimized versus a drop shoulder construction.

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This makes it a good choice for close fitting sweaters and sweaters that are worn under other pieces. To achieve this look, the sleeve and body pieces must fit together perfectly.

First, let's cover the basics. For a sweater with set-in sleeves, you work the sweater in pieces, typically from bottom up. Shaping occurs on both the front and back of the body as well as the sleeves. On the body at the point of the underarm, you decrease stitches to create the armpit opening, creating a smooth curve so that the armholes (the fabric edge to which the sleeve will be sewn) come in to match the shoulder width. The body is then continued without more armpit shaping for the depth of the armpit and the shoulders are bound off. Typically, the shoulder shaping is done in steps or short rows, since the shoulders of the human body slope out and down from the neck.

Sleeves are usually worked flat from the cuff up. They are narrower at the cuff and then increased by working paired increases at the outer edges at regular intervals. The sleeve is decreased by binding off in the same way as the body pieces and then decreasing at regular intervals to get a curved sleeve cap (the section of the sleeve above the armpit) that fits into the armhole.

The pieces are assembled by first seaming the shoulder seams together and sewing the sleeve cap to the armhole. Finally, the side seams and sleeve seam are sewn together.

**Shaping the armholes on the body**

For women's sweaters, the armholes are typically decreased between two to three inches at each side in order to match the shoulder width. This is done in multiple steps and typically takes between 1.5 to 3" of armhole (vertical) depth. You will find many different ways of doing this — and perhaps that is why many knitters shy away from designing this type of sweater. Some patterns will bind off 25% of what is needed at the beginning of the next two rows and then decrease one stitch at each edge on every right side row until the desired width is achieved. Some patterns bind off roughly one inch of stitches at each edge of the body. Then the remainder is decreased by decreasing one stitch at each edge of every right side row until the desired width of the body is achieved. Some patterns do the bind off rows in two steps; binding off more stitches in the first two bind off rows, followed by decreases at each edge until the desired width is achieved.

Let's look at an example of each method. For this example, we will use a sweater with a bust circumference of 40" and a shoulder width of 1.5". We will assume the front and back are both 20". The depth of the armhole is eight inches. Each piece needs to go from a width of 20" to a width of 15", a total decrease of five inches. This will be divided between the left and right sides, for a reduction of 2.5" at each edge. The gauge is six stitches and eight rows per inch. For a gauge of six stitches per inch, this decrease would be 15 stitches per side.

The first example has 25% being bound off at once (Illustration 1). At the armpit edge, you would bind off four stitches, 25% of 15 stitches (rounded up). Then every right side row you would decrease one stitch at each side 11 times; this is a total of 15 stitches at each edge bound off or decreased which equals the five inches you needed to decrease
to match the shoulder width.

In the second example, one inch is bound off first (Illustration 2). You begin by binding off six stitches at each edge, and then decrease each right side row by one stitch at each end nine times, again for a total of 30 stitches.

In the third example, you would first bind off six stitches at the beginning of the next two rows where the armhole begins (Illustration 3). You then bind off three stitches at the beginning of the next two rows. Then decrease the final six stitches by decreasing one stitch at each edge of the next six right side rows.

Each of these methods will work and which you choose is up to you. Illustration 1 is going to leave much more fabric under the arm. Illustration 2 is relatively straightforward and has less fabric under the arm. Illustration 3 is the most fitted. Your preference and body type will influence which you select. Once you have completed the armhole shaping, you work the body straight to the top of the armhole, including whatever neck shaping you desire. Then bind off for the top of the shoulders with short rows or stepped bind offs to provide shoulder shaping.

Shaping the sleeve cap
Now, on to the sleeves. You begin the sleeve at the cuff and continue to the desired length, increasing the width until you get to the armhole. Many times designers will make the set-in sleeves twice as wide at the underarm as the armhole depth on the body. While this will work, it might not be the most flattering for your body type. If you have narrow upper arms this will probably give you excess material under the arms.

You can check this by measuring your arm circumference and adding a few inches for ease.

When the sleeve is at the desired width and length for the underarm, the sleeve cap shaping is begun. The cap is formed by first decreasing the same number of stitches and in corresponding order as the armhole decreases on the body. From that point, there can be some variation in how you approach the design. My research found many different ways of approaching the sleeve caps. Please see the insert box on page 54 General Guidelines for Sleeve Cap Shaping for advice.

It is best to start by thinking of the end – how wide the sleeve cap will be at the top of the sleeve and how deep the sleeve cap needs to be. As a guide, the top of the sleeve cap (the final bind off row of the sleeve) should be equal to or slightly less than 25% of the widest part of the sleeve. The depth of the sleeve cap needs to be a few inches shorter than the armhole depth. How you shape the angle of the sleeve cap has several different options (Diagram 1). Some designers will simply calculate the sleeve cap height needed and then knowing row and stitch gauge calculate how frequently to decrease at each edge of the sleeve cap. This will have a single slope from the armhole decreases to the sleeve cap, making it trapezoidal in shape.

The other, more traditional option is to shape the sleeve cap more like a bell curve. You would match the initial decreases to the armhole decreases and then have a slope that does not decrease as fast as it does at the top of the cap. See Diagrams 1 and 2 for the comparison of these two methods.

The second method with two different slopes on the sleeve cap requires more calculations. Like the other method, you begin by matching the decreases to the armhole decreases on the body. Then you calculate the top of the sleeve cap width and determine how many stitches that will be. Next calculate the slope and shaping at the top part of the cap, the top 0.5″. You will bind off one of stitches on each side in this top part. Knowing how many rows you have in 0.5″ and how many stitches you must decrease per side you can calculate how many stitches to decrease per row in the last few rows. Don’t worry, an example is coming!

Then you calculate the decreases in the middle section of the cap. The cap depth is typically the armhole depth minus half the final cap width. Typically this is three inches shorter than the armhole depth for adults. The number of stitches to decrease in this section will be the difference between the stitch count after the armhole decreases and the final stitches at the top of the cap. Once you know the stitches to decrease and the height of the cap, you can calculate the decreases in this center section.

Time for an example. Using the armhole decreases from Illustration 3, we’ll calculate the slopes for the caps for both methods – the trapezoidal shape and the bell curve shape.

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Next we calculate the width of the sleeve cap at the top of the cap. The cap width at the top is typically equal to or slightly less than 25% of the widest part of the sleeve. One fourth of 16" is 4". We'll set our cap width at 4". This is 24 stitches. Since we will be doing paired decreases and we're starting with an even number of stitches for the sleeve width, we don't need to adjust the 24 stitches. To get from 78 stitches to 24 stitches, we will need to decrease 54 stitches over the cap height, which works out to 27 rows of decreases at each edge.

For the first method with the trapezoidal shape, we have to decrease 1 stitch at each edge on 27 right side rows. When these rows are complete, bind off the last 24 stitches. While this will work, it is going to give a taller sleeve cap (nearly seven inches) than most design and fit guidelines recommend. This may work for your body type if you have thin arms and are tall. If that doesn’t match your body type, you may want to make the final sleeve cap width wider, say five inches. This would mean that you had to go from 78 stitches to 30 stitches, thereby decreasing 48 stitches. This would be done on 24 right side rows. This would give a sleeve cap height of six inches.

For the second method with the fitted bell cap, we start by calculating the height of the cap. Since our armhole depth is eight inches, and our top sleeve cap width is four inches, our cap height should be eight inches minus one-half of four inches, or six inches. At our row gauge of eight rows per inch, this is 48 rows.

Now we calculate the top slope for the cap. In the top half inch of the sleeve, we know that we want to decrease one inch on each side for a total of two inches. This is six stitches on each side. The top of the cap is a half inch or 4 rows. To decrease a total of 12 stitches, we bind off three stitches at the beginning of the last four rows.

Now we calculate the shaping for the middle of the sleeve cap. We know that after the first decreases that mirror the armhole shaping, we have 78 stitches. At the top of the cap, we want to have 24 stitches at the final bind off. We also know that we also are decreasing 12 stitches at the top of the cap. This means that we have to decrease from 78 stitches to 36 stitches, or a decrease of 42 stitches in the center section of the cap. This means 21 rows of decreases since we are decreasing two stitches per row. Our sleeve cap height is 48 rows. We did four rows of decreases at the beginning of the shaping to match the armhole and we will do four rows of shaping at the top of the cap. This means we have 40 rows left for decreasing 42 stitches. Unfortunately this does not work out evenly, and in most cases it is not going to work out evenly. We know that on the right side rows of this center section will each have two decreases, one decrease on each side. That means there are 20 right side rows, which will give us 40 decreases. We need to fit in two more decreases. The easiest way to do this is by making the first decrease row bind off two stitches, or we could just do two more rows. At the gauge we are working at, adding two rows is not going to make a difference.

To summarize, our sleeve pattern for the first (trapezoidal) method is:

- Ending with a wrong side row and 96 stitches.
- Bind off six stitches at the beg of the next two rows.
- Bind off three stitches at beg of next two rows. There are 78 stitches.
- Decrease one stitch at each edge of every right side row 24 times.
- Bind off remaining 30 stitches.

The sleeve pattern for the second (bell curve) method is:

- Ending with a wrong side row and 96 stitches.
- Bind off six stitches at the beg of next two rows.
- Bind off three stitches at beg of next two rows. There are 78 stitches.
- Continue in pattern and decrease one stitch at each side on every right side row 21 times. There are 36 stitches remaining.
- Bind off three stitches at the beginning of next four rows.
- Bind off remaining 24 stitches.

Choosing your decreases

You now have to choose what type of decreases and where you place them for the armholes and sleeve caps. In this article, bind off refers to just that – decreasing live

GENERAL GUIDELINES FOR SLEEVE CAP SHAPING

1. Always match at least the first two rows of the sleeve bind off at the under arm to the first two rows of decreases on the armholes of the body.

2. The finished width of the top of the sleeve cap varies by size:
   a. 2-5" for adults
   b. 1.5-2.5" for infants
   c. 1.5-3" for toddlers (size 2-6)
   d. 2-4" for children

3. How wide the bound off sleeve cap will influence the shape of the sleeve. For a narrower sleeve cap for an adult, use 2-3" as a final cap width. For a fuller sleeve, use 4-5".

4. There are many different ways of calculating the depth of the sleeve cap. Remember that the tighter you want the sleeve and armhole to fit, the deeper the sleeve cap needs to be. (The looser fitting the sleeve, the shorter the sleeve cap will be.) Here are three different ways:
   a. Take one-half of the sleeve cap top width and subtract that from the armhole depth for the cap height.
   b. For the cap to fit the armhole well, the cap height plus half the top cap bind off needs to be at least 90% of the armhole depth. If it is less, then you would widen the sleeve cap width to have a fuller sleeve.
   c. Another guideline for cap height is that it is 2" shorter than the armhole depth for chest circumferences of less than 30". 3" for circumferences between 30-48" and 4" for circumferences above 48".

5. If you have heavier upper arms, round the top of the sleeve cap more by either decreasing faster toward the top or by binding off two stitches at a time at the beginning and end of the final row. This eliminates the harsh corners of the sleeve cap as well.
stitches by binding them off at the beginning of the row. When there is only one stitch to be decreased, you could do it by binding off, but that makes assembly more difficult. The preferred way to do this is to use a decrease stitch, placed at least one stitch in from the selvedge to make assembly easier. There are several important factors to consider when deciding which type of decrease stitch to use and where to place it. First, decreases should be mirrored — they should be mirror images of each other. If you use right slanting decreases on the right side of the fabric, you should use left slanting decreases on the left side. By making the placement and slant of the decreases mirror each other the fabric piece will look symmetrical. The next decision reflects your personal preference. Do you want to use blended or full-fashioned decreases? Blended decreases are decreases that slant in the same direction as the fabric, as shown in Illustrations 1, 3 and 4. Full-fashioned decreases slant towards the edge the fabric, see Illustration 2. K2tog decreases slant towards the right, so if they are used on the left side of a piece, the decreases and the fabric both slant to the right. These are blended decreases. If a K2tog is used on the right side of a piece, it is a fully-fashioned decrease that slants towards the edge of the fabric. The choice is your preference, but use the same method on the sleeves as you choose for the body.

Summary
Set-in sleeves give a fitted and tailored look. While they do take more planning, the improvement in fit is worth the effort and up-front planning. There are many different ways of doing the shaping which gives you the freedom to match the fit to your body type and the desired design. While it takes some time, experimenting with different methods will help you adjust patterns to fit you the best.

For further reading and inspiration:

Girl’s Frilled Cardigan by Christina K. Hanger

BEYOND THE PATTERN
This cardigan with set in sleeves, falls and crocheted buttonholes will be a favorite for your little girl. This is a great first project to practice set in sleeve shaping and construction techniques.

DESIGNER NOTE: Sample shown is a size 4.

Materials:
Classic Elite Yarns LIBERTY WOOL (.75oz/50g, 122yds/111.5m, 100% Washable Wool):
4 (3, 5, 6, 6) skeins #7862
Size 7 (4.25 mm) needles or size needed to obtain correct gauge
Size F-3 (3.75mm) crochet hook
Five 5” diameter buttons
Stick markers
Tapestry needle

Gauge:
In Stockinette st, 20 sts & 28 rows = 4”/10 cm. To save time, take time to check gauge.

Special Abbreviations:
M1F = From front, lift loop between stitches with left needle, knit into back of loop.
M1R = From back, lift loop between stitches with left needle, knit into front of loop.

Stitch Pattern:
Crab stitch (reverse single crochet)

DESIGNER NOTE: This is a simple crochet

Step 1: Join yarn to left corner of fabric, with right side facing. Insert hook from front to back, in top of the next stitch to the right.
Step 2: Do a yarn over the hook and draw it through the stitch.
Step 3: Do another yarn over the hook and draw it through the two loops on the hook. One stitch completed. Repeat until end.

Back
CO 217 (237, 257, 277, 293) sts.
Row 1: K1, *k2, lift second st on right needle over first st and off needle, rep from *, Row 2: P1, *p2tog, rep from *. There are now 55 (60, 65, 70, 74) sts.
Work in Stockinette st until piece meas 8 (9, 11.5, 12.5, 13.5)” from beg of St st.

Shape Armholes: Beg next two rows, BO 2 (4, 4, 5) sts. Beg next two rows, BO 2 (2, 3, 4, 4) sts — 47 (48, 51, 54, 56) sts rem. Work even until armhole meas 4.25 (5.5, 6, 6.25, 6.5)”

Shape Shoulders: Dec 5 (5, 5, 5, 5, 6) sts at beg next two rows. Dec 4 (4, 5, 5, 5, 5) sts beg next two rows. Dec 4 (4, 5, 5, 5, 5)sts beg next two rows. BO rem 21 (22, 23, 24, 24) sts.

Left Front
CO 109 (117, 129, 137, 145) sts.
Row 1: K1, *k2, lift second st on right needle over first st and off needle, rep from *, Row 2: P1, *p2tog, rep from *. There are now 28 (30, 33, 35, 37) sts.
Work in Stockinette st until piece meas 8 (9, 11.5, 12.5, 13.5)” from beg of St st.


Shape Neck: When armhole meas 2.25 (3.5, 4, 4.25, 4.5)” beg neck shaping. On WS row, BO 9 sts. Next WS row BO 2 (3, 3, 3) sts — 13 (13, 14, 15, 16) sts rem. Work even until armhole meas 4.25 (5.5, 6, 6.25, 6.5)” end WS row.

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Shape Shoulders: Dec 5 (5, 5, 5, 6) sts beg of next RS row. Dec 4 (4, 5, 5, 5) sts beg of next RS row. BO rem 4 (4, 4, 5, 5) sts on next RS row.

Right Front
CO 109 (117, 129, 137, 145) sts.
Row 1: K1, *k2, lift second st on right needle over first st and off the needle, rep from *. Row 2: P1, *p2tog, rep from *. There are now 28 (30, 33, 35, 37) sts.
Work in Stockinette st until piece meas 8 (9.5, 11.5, 12.5, 13.5)" from beg of St st.


Shape Neck: When armhole meas 2.25 (3.5, 4, 4.25, 4.5)", beg neck shaping. On RS row, BO 9 sts. Next WS row BO 2 (2, 3, 3, 3) sts – 13 (15, 15, 15, 16) sts rem. Work even until armhole meas 4.25 (5.5, 6, 6.25, 6.5)", end on a RS row.

Shape Shoulders: BO 5 (5, 5, 5, 6) sts beg next WS row. BO 4 (4, 5, 5, 5) sts beg of next WS row. BO rem 4 (4, 4, 5, 5) sts on next WS row.

Sleeves (make 2):
CO 117 (125, 125, 133, 141) sts.
Row 1: K1, *k2, lift second st on right needle over first st and off needle, rep from *. Row 2: P1, *p2tog, rep from *. There are now 30 (32, 32, 34, 36) sts.

Work St st, inc 1 st ea side on every third RS row 9 (9, 10, 11, 11) times – 48 (50, 52, 56, 58) sts.

TECHNICAL TIP: Work increase rows as follows: K2, M1L, K until 2 sts rem, M1R, K2. This will result in mirrored increases that are two stitches in from the edge and will make seaming easier.

Work even until sleeve meas 8 (9.5, 11.5, 12.5, 13.5)".

Beg next two rows, BO 2 (4, 4, 4, 5) sts. Beg next two rows, BO 2 (2, 3, 4, 4) sts – 40 (38, 38, 40, 40) sts rem.

For smallest size, shape sleeve cap by dec 1 st ea end of every RS row 10 times.
For all other sizes, shape sleeve cap by dec 1 st ea end of every RS row 8 (7, 7, 6) times.

TECHNICAL TIP: Work decrease rows as follows: K2, k2tog, knit until 4 stitches remain, ssk, k2. This will result in mirrored, fully-fashioned decreases that are two stitches in from the edge and will make seaming easier.

BO 3 sts beg of next two rows, BO 2 sts beg of next two rows. BO rem 10 (12, 14, 16, 18) sts.

Finishing

On left front, sew on buttons. Place top one .5" from the top edge, the bottom button 5" from the bottom edge, and remaining three at evenly spaced distances along the front edge. Place buttons .5" (1.25 cm) in from edge.

To finish cardigan opening edges and neckline, start at lower left front corner. Work crab stitch (Reverse Single Crochet) up left front side, around left neck edge, across the back and around right neck edge. As you go down the right cardigan edge, stop opposite the butoons and make crochet buttonholes as follows:

DESIGNER NOTE: These instructions work for a .5" button. If you want to use a smaller or larger button, you will need to adjust the number of chain stitches and single crochet stitches.

Pull up a loop in the knitting and crochet 4 chain stitches. Drop loop off the hook and insert hook into the knitting through the next row. Place dropped loop back on the hook, and pull it through the body. Chain one stitch and then work 6 single crochet stitches over the chain. Anchor it down to the body with a slip stitch. Turn. Chain one and slip stitch across tops of the single crochet stitches. Secure to bottom edge of buttonhole with a slip stitch. Continue in crab stitch to next button or end of the garment. Weave in ends.