

THE ADVANCED KNITTING ARCHITECT

by

SION ELALOUF

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This introduction was printed in the first KNITTING ARCHITECT.

This book is intended for the sole purpose of advancing the craft of knitting in this country.

Of all the developed countries of the world, America falls last in knitting. There is a very good reason for this. America has had no need to knit until the late 1970's when oil prices became so high and oil so scarce that people had to lower their thermostats considerably. There is nothing more comfortable than a sweater for inside wear, and many Americans became aware of this. Designers became aware of this too and started to produce expensive and interesting hand-made sweaters. This added fuel to the knitting market. More and more hand-made sweaters were being shown in magazines, in fashionable boutiques, on celebrities. This new excitement encouraged many people to try knitting. Hence the problems.

- 1. There were not enough yarn shops.*
- 2. There were not enough knowledgeable people at the customer, retail, wholesale, and teaching level.*
- 3. There were no schools teaching knitting.*
- 4. There were not enough yarns available to meet the sudden demand.*

Problem number 4 was solved to a great extent. Today America imports a great deal more yarn than it did five years ago.

Problem number 3 is being valiantly attacked by small knitting stores across the country, teaching their customers as best they can to knit and purl. Other efforts are in the works on the part of certain organizations concerned with the advancement of knitting.

Problem number 1 has also been diminished to some extent since there are many more knitting stores today in America than before.

The only problem that has not been touched is that of making people knowledgeable in this craft. There is more to knitting than just knitting and purling. It would be foolish to imagine that a brick layer could build an apartment house from scratch. You need an architect first to draw plans. This is work requiring knowledge, experience, and precision.

In other developed countries of the world, knitting has been practiced for so long, has been established so firmly, that the customers at the retail level are the architects. All they need is the yarns and the needles and they will custom design and knit. In America, not only are the customers novices, but in many cases so are the shop owners and/or their employees. So what does one do?

Many store owners rely on patterns and books supplied by yarn companies. The success of this method is limited. This approach was originally intended for the more knowledgeable European knitters who can adapt the patterns on their own to their specific needs.

A revolutionary newcomer to our industry is the Knitting Instructor™ computer. It produces knitting patterns for just about any style and measurements. Anyone without computer or knitting knowledge can operate it. Even though on its own it represents the greatest step forward our industry every took; even though it is the most practical and functional tool ever devised for our industry; still it does not teach people how to become the architect.

This is what I hope this little book will do. I hope it helps the retail customers--I hope it helps the store owners or the would be store owners and their employees--I hope it helps the designers and would be designers--I hope it helps all the manufacturers and importers of yarns--I hope it helps establish the wonderful craft of knitting firmly in America. So many big hopes for such a little book. Oh well, you know what they say about small packages!

Now, 5 years and 12 printings later, I can report that this little book has enjoyed success beyond the wildest expectations. Knitters, yarn store owners, and educators all over have used it, praising it as a first charting bible. A must for every serious knitter.

As knitters became familiar with the basic principles presented in my first book, they began to look for a follow up. A book that would take the principles covered in the first book and expand them, go into greater depth and into directions not touched upon before.

And so this is just what I have done.

I hope this new **KNITTING ARCHITECT** will meet with even greater success than the first. It should be immensely helpful to those who are already familiar with my basic charting principles as well as those discovering them for the first time.

Let's give the Europeans a real run for their money. And let's have fun in the process.

NECESSARY DATA

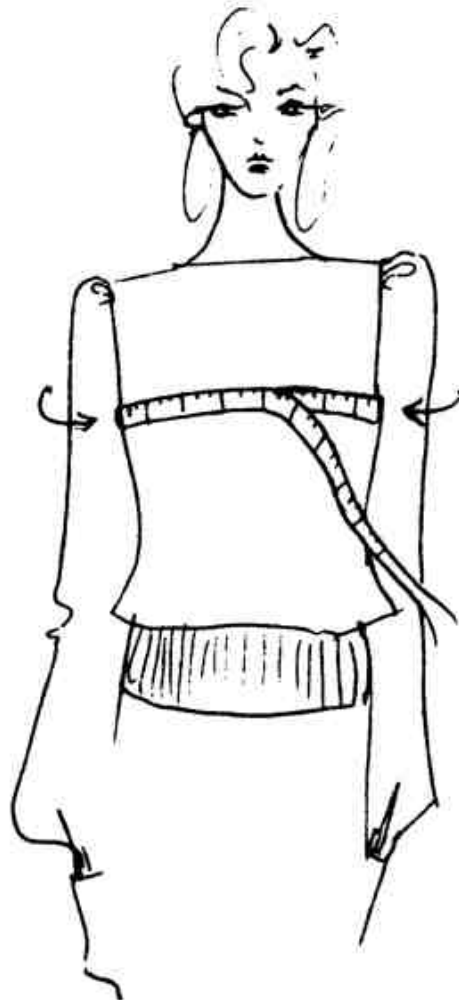
We will begin here to become knitting architects.

Before we undertake a project, it is important to understand what it actually represents. We will learn here to write a plan (directions) for the construction of a garment. This garment will be built of yarn and the unit will be the stitch. Relate this in your mind to a house and the stitches to the bricks. To build a house you need dimensions. Same for knitting a garment. To build a house of bricks, you must know the measurement of the bricks. Same for knitting a garment. To build a house you need understanding of shape and style. Same for knitting a garment.

Measurements

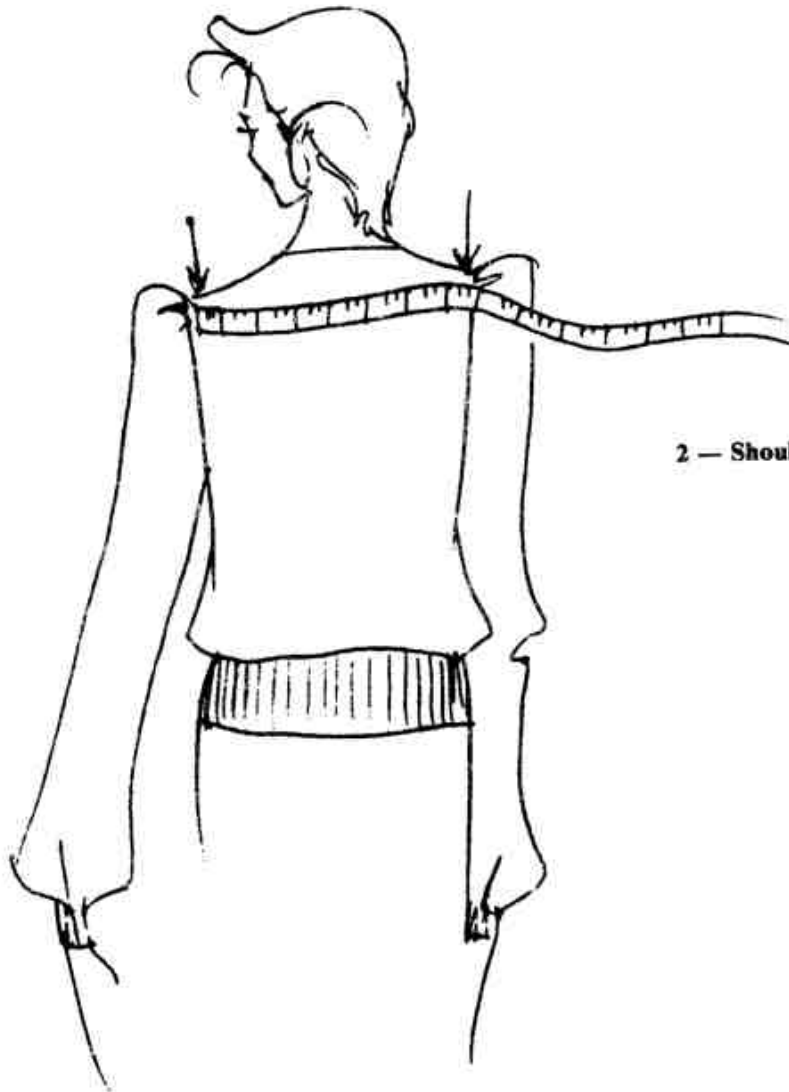
Let's temporarily forget about the house. To make a sweater pattern you must first have the measurements you wish the sweater to be. This is not the measurements of the body to fit into the sweater, but based on those body measurements you will formulate numbers adapted to suit the look and style desired. The necessary measurements are:

1. **Chest Measurement:** It is taken around the chest at the widest place. This body measurement is then adapted to suit the style and look of the garment and also the person's preference. For example, a casual drop shoulder pullover for a person with a 36 inch chest would be figured out on a 39 to 42 inch measurement, not on 36 inches. A short dressy pullover however would be figured out on 36 inches.



1 — Chest Measurement

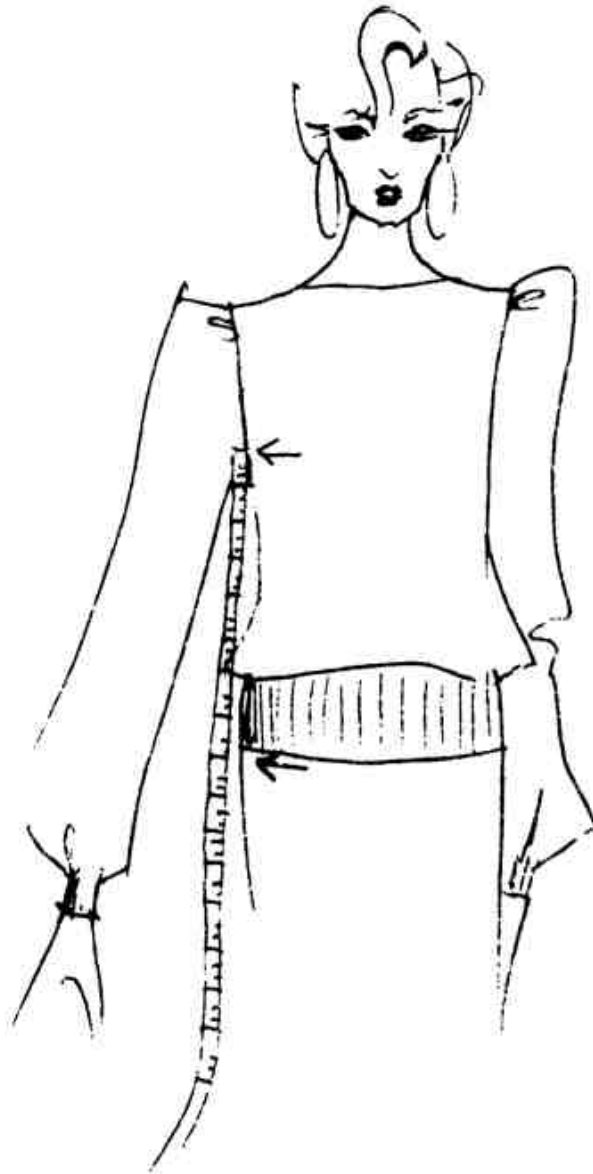
2. Shoulder Measurement: This is a very important measurement. The chances are that if the shoulders fit properly, the sweater will look good even if it is a little too wide, too long, etc. But if the shoulders don't fit, then everything else will seem not to fit. This measurement is taken across the back from arm joint to arm joint. My suggestion is to reduce this measurement by 1/2 to 1 1/2 inches depending on the nature of the yarn used. Some yarns stretch more than others or weigh more than others. This added to the weight of the sleeves and the pull placed on the shoulders everytime the sweater is put on compounds the problem and explains the need for the adjustment. It compensates for the stretch.



2 — Shoulder Measurement

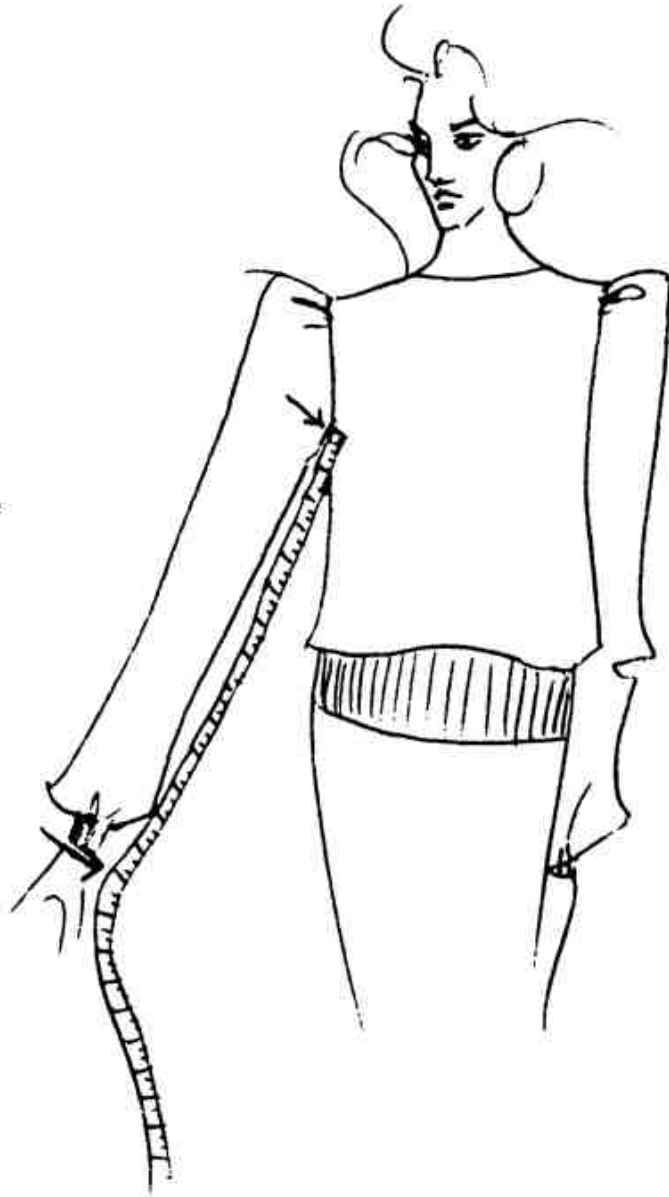
3. Length of Sweater: This measurement is taken from the underarm down. **Whenever measuring from the underarm you must start 2 inches below the armpit.** This is where your armhole will start. You must always think of fit and comfort. Whatever length you have measured you must add one or more inches to it to allow for the desired amount of ease and blouson.

3 — Length of Sweater



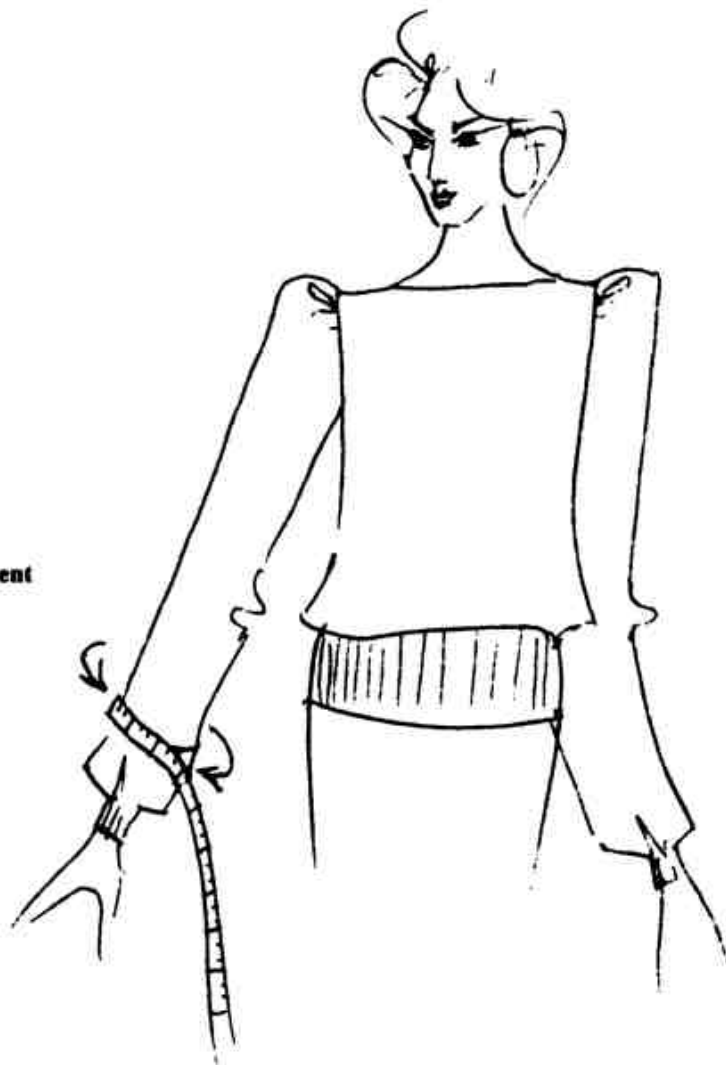
4. Length of Sleeve: The sleeve length is also measured from the underarm (2 inches below the armpit) to the wrist for long sleeves or to desired length for shorter sleeves. Here too, you might want to add 1/2 to 1 1/2 inches based on style and preference.

4 — Length of Sleeve



5. Wrist Measurement: This measurement is very important. It must be pointed out that it is never taken precisely at the wrist and for very good reason. The cuff of the sweater sleeves are generally knitted up in ribbing on small needles. If the measurement was to be taken precisely at the wrist and the number of stitches based on that measurement, the result would be a very tight, almost impossible fit. The wrist measurement must be taken $2\frac{1}{2}$ inches above the wrist and to that measurement must be added one or more inches to allow for a comfortable fit. Remember that the fist must go through the cuff.

5 — Wrist Measurement



6. Upper Arm Measurement: This measurement is taken around the bicep, somewhere around the middle of the upper arm. To this actual measurement must be added at least the same amount of ease that was added to the actual wrist measurement. The most recommended approach to determine the amount of ease is as follows: Divide the actual upper arm measurement by the actual wrist measurement and multiply the result by the amount of ease given wrist measurement.

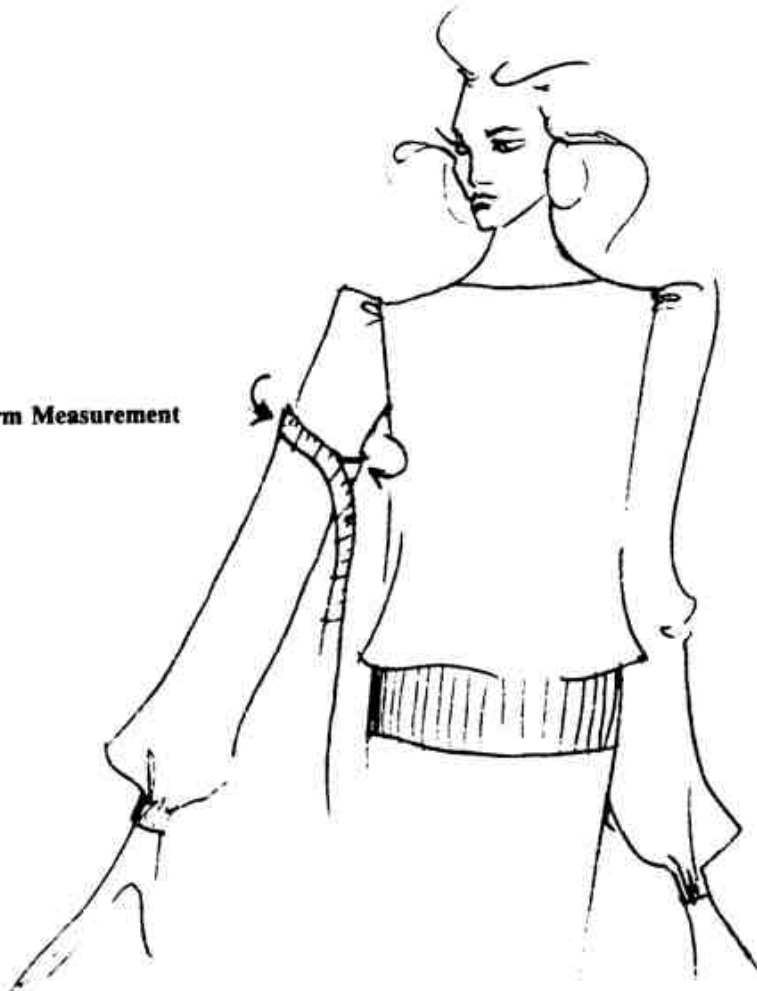
For example: Upper arm = 12 inches

Wrist = 6 inches + 2 inches ease It follows:

$$\frac{\text{Upper Arm } 12''}{\text{Wrist } 6''} \times 2'' \text{ ease} = 4'' \text{ ease or } 12'' + 4'' = 16'' \text{ Upper Arm}$$

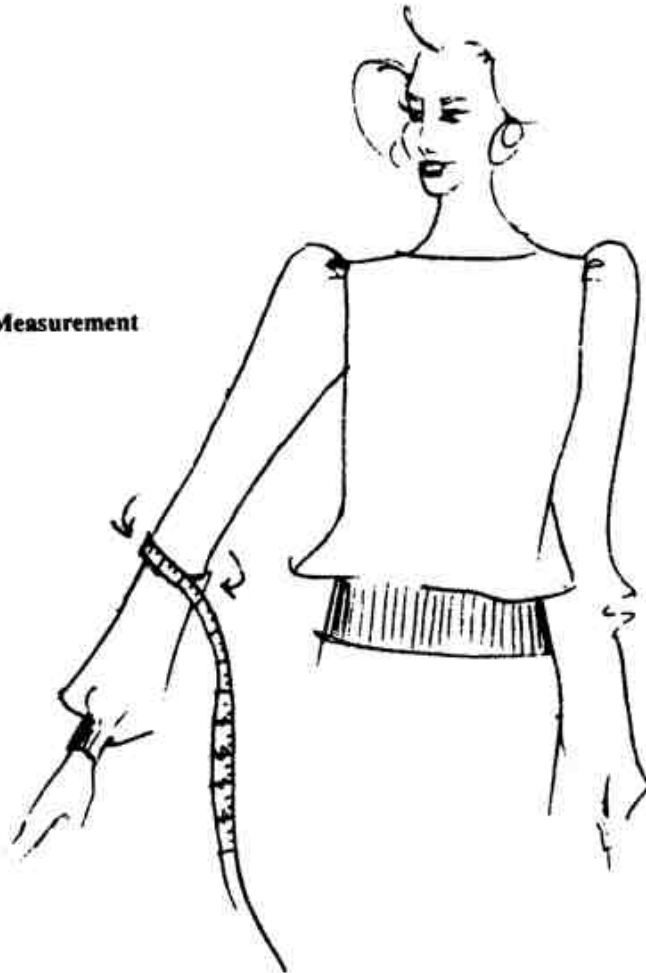
This will insure in most cases a well proportioned and graduated sleeve.

6 — Upper Arm Measurement



7. Forearm Measurement: This is only needed for very special styles. The sleeve around the forearm must be measured below the elbow and the same amount of ease added to the wrist must also be added to it.

7. Forearm Measurement



Now please remember that everyone does not like to be fit the same way. Some people like looser fits, others, tighter. Be sure to know beforehand how the garment you are charting is to fit!

STITCH & ROW GAUGES

Now that we are done with sweater measurements, we need to know the size of the bricks (stitches) to be used. Since we are working on a much smaller scale than a building, and since the stitches are much smaller than bricks, we do not measure each stitch individually, but rather we work with the inch as a unit, and we figure how many stitches it takes to fill that inch. What we refer to here is called the **stitch gauge**.

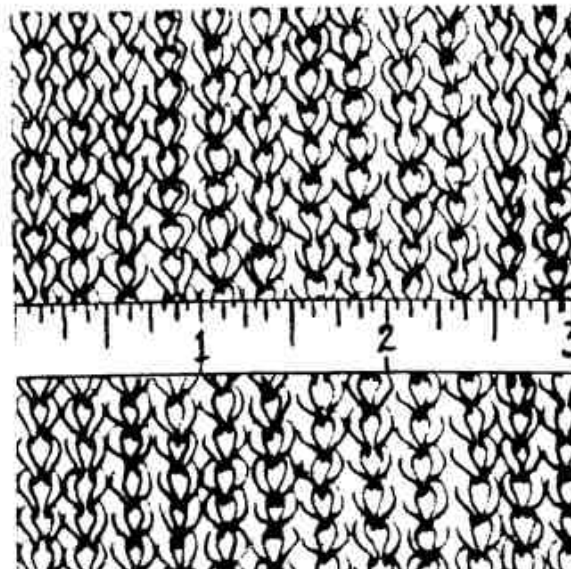
The **stitch gauge** is based on the thickness of the yarn. The thicker the yarn, the larger the gauge. The inverse is also true. A large gauge for a very bulky yarn may be 2 stitches per inch while a small gauge for a very thin yarn may be 9 stitches per inch. Please notice a large gauge implies small numbers (2 in this case), while a small gauge implies larger numbers (9 in this case).

The stitch gauge refers only to the horizontal measure of the stitch. We must also know the vertical measure of the stitch (the thickness of the brick). This vertical measure is called the **row gauge**.

Just as the stitch gauge is based on the thickness of the yarn, so is the row gauge. And again, since the thickness of each row is quite small, we work with the inch as a unit and determine the number of rows **within** the inch.

To obtain an accurate pair of gauges there are several prerequisites:

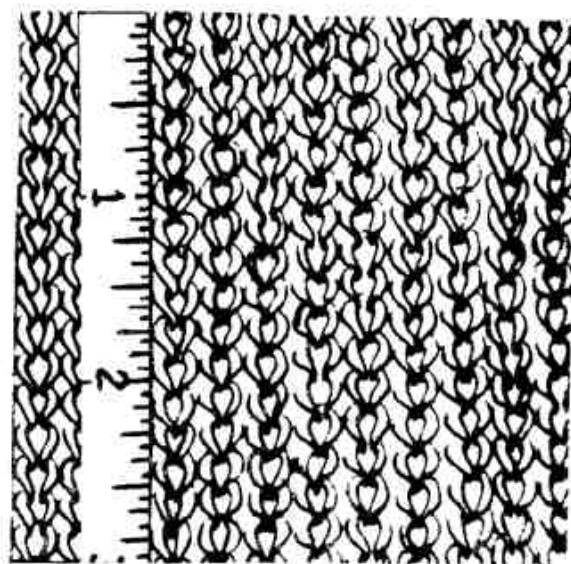
1. The person who is to knit the sweater must work up a sample square with the yarn and needles to be used. Since everyone knits differently, it is imperative to obtain this sample from the knitter.
2. This sample square must be made in the very stitch to be used in the sweater. There is a multitude of various stitches and they all measure differently. Be sure to make the sample out of the stitch to be used.
3. The sample square must be made large enough to get an accurate measure. This is very important with all yarns but it is most significant when working with novelty yarns and especially yarns with large nubs or thick and thin parts. We recommend a square at least 3 to 4 inches by 3 to 4 inches.



8 — Stitch Gauge

To measure a stitch gauge lay the sample on the table. Be sure to lay it flat without stretching it. Lay across it a ruler or tape measure defining precisely a 3 inch length. Count the number of stitches included within this 3 inch area. Then divide the number of stitches by the number of inches (3). The resulting number is the stitch gauge. It can be a whole number or it can have a decimal. This is the number we will use as a stitch gauge to chart the sweater.

The **row gauge** is measured precisely in the same manner, but this time you count the number of rows in the 3 inches instead of the number of stitches. Again, the number of rows is divided by the number of inches (3). The resulting number is the row gauge used to chart the sweater.



9 — Row Gauge

To work on a sample square of less than 3 to 4 inches is extremely risky. You will have great difficulty obtaining an accurate gauge. Understand that the few minutes spent on the sample square represent the single most valuable effort to assure a proper fit. It is really a small price to pay. If you wish the sweater to fit, knit the sample square.

Both the row gauge and the stitch gauge can be rounded off to a number and a single decimal. For example, 3.666 can be rounded off to 3.7, but 3.7 **must not** be rounded off to 4.

SHAPE

At this point we have obtained sweater measurements and both stitch and row gauges. All we need to speak of now is shape.

In order to chart, it is necessary to have a certain understanding of the human body--its shape that is. In spite of all the variations we will encounter in width, in length, in girth, etc., we still work with basically the same shape--that is one head, one torso, and two arms. The head must be exposed, even if not completely. The arms must have freedom of movement and perhaps be covered if we are making a garment that has sleeves. The hands should be exposed. The torso must be covered. This is a shape we have lived with for a while. This is the body we have dressed every day of the week--a body that has experienced discomfort when armholes are too small or garments too tight or too long. This is a body we are familiar with. Imagine for a moment designing clothes for a spider when you have no understanding of the way spiders move. How could you know what is comfortable and what is not? Luckily, we are going to become knitting architects for bodies such as our own; bodies we are familiar with. We will leave spiders for someone else.

Let's look now at some of the design possibilities. The first consideration is the **pullover**. This type of sweater, as the name implies is pulled over the head and body to go on. The only openings left are for the head and arms. Pullovers can have any length sleeves or even no sleeves at all. In the last instance, they are called **pullover vests**.



The next consideration is the **cardigan**. This is a sweater that generally has either a zipper, buttons, or even no closure at all down the front so that it can be slipped on like a jacket. Sleeveless vests can also be made in this style.



11 — Cardigan

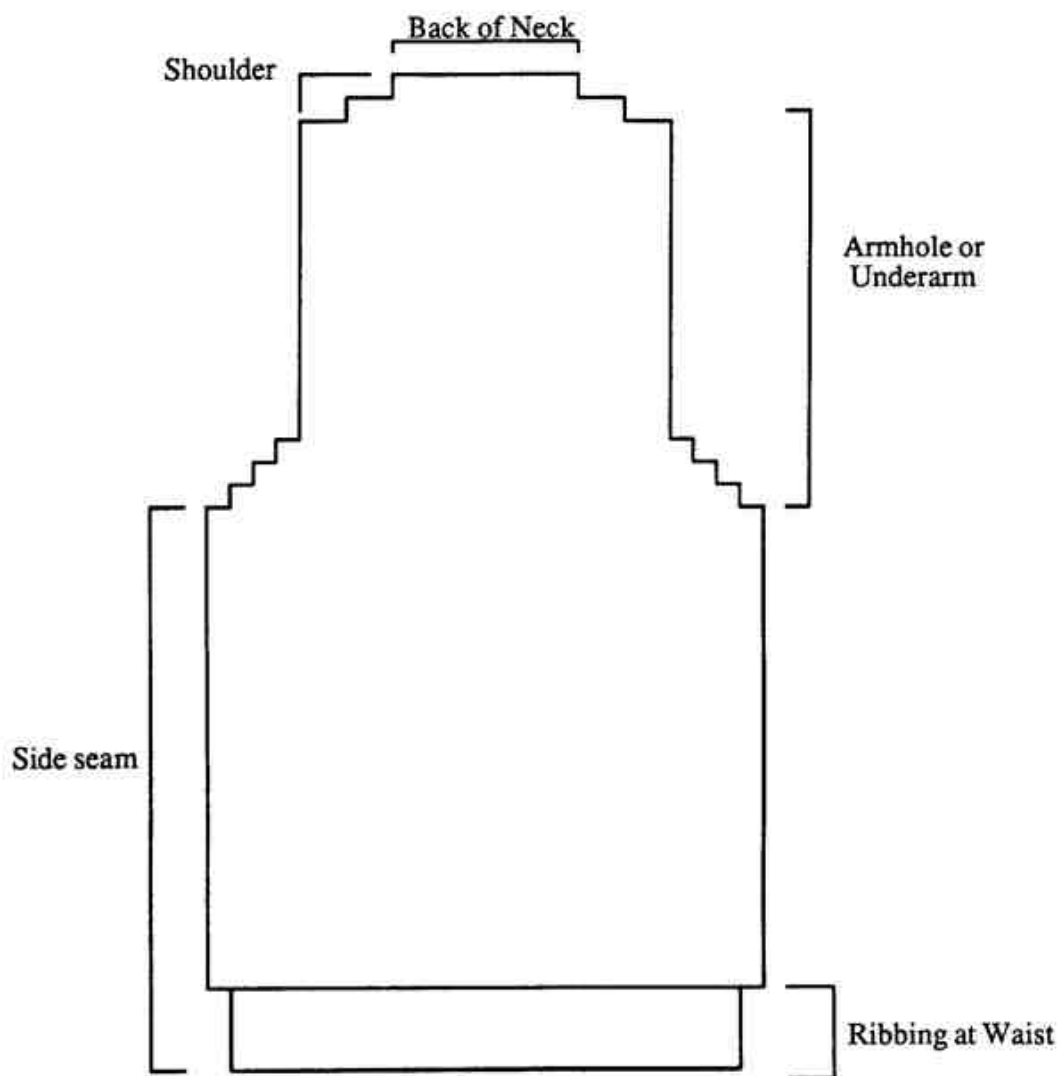
From these two basic types, we can turn out a multitude of styles, coats, tunics, dresses, etc. Vary the sleeve, the neck, the length; close it in the middle or on the side, long rib, no rib. There is no end. And all these possibilities are easy to achieve when we are familiar with the two basic types above and with the principles of charting.

So what it all boils down to is that in spite of all the possibilities, when it come to style and fashion, we are still basically dealing at this time with two types of designs that will fit over one body shape. Nothing overwhelming.

BASIC CHARTING PRINCIPLES

CONSTANTS

Before we start with the basics of charting, it is important to list what we will refer to as constants. These constants can be changed, in spite of their name, whenever your judgment calls for it. They are to serve as a general base from which to start. Remember these are not absolute.



12--Sketch of Back

The first constant we will consider is the **underarm constant**.

UNDERARM CONSTANT

Children--	Chest size	20 - 23	underarm	5 1/2 inches
	Chest size	24 - 27	underarm	6 inches
	Chest size	28 - 31	underarm	6 1/2 inches
Female adults--	Chest size	32 - 35	underarm	7 inches
	Chest size	36 - 39	underarm	7 1/2 inches
	Chest size	40 - 43	underarm	8 inches
	Chest size	44 - 47	underarm	9 inches
	Chest size	48 up	underarm	9 1/2 inches
Male adults--	Chest size	32 - 35	underarm	8 inches
	Chest size	36 - 39	underarm	9 inches
	Chest size	40 - 43	underarm	9 1/2 inches
	Chest size	44 - 47	underarm	10 inches
	Chest size	48 up	underarm	10 1/2 inches

When making larger and heavier garments that are to be worn over other clothes, all the measurements one works with must be increased to allow for the added bulk. This applies to the underarm constants. They must be increased as follows:

All children's chest sizes		add 1/2 inch to underarm constant	
Adult female--	Chest size	32 - 39	add 1 inch
	Chest size	40 - 47	add 1 1/4 inches
	Chest size	48 up	add 1 1/2 inches
Adult male--	Chest size	32 - 39	add 1 inch
	Chest size	40 - 47	add 1 1/2 inches
	Chest size	48 up	add 2 inches

When making a larger and heavier garment such as a coat, the actual chest measurements should be increased as follows:

Children's sizes	all	add 3 inches	
All adult sizes	Chest size	32 - 39	add 4 inches
	Chest size	40 - 47	add 5 inches
	Chest size	48 up	add 6 inches

The next constant is for the **back of neck**. This constant does not need to vary from females to males. We will be working at this time with relatively small numbers, and the differences that could exist between the male and female back of neck constants would be so small that they will be compensated for in the finishing. We can always rib an extra 1/4 inch of ribbing around the neck to make it fit properly or vice versa. This is where a little judgment comes in. Work up the whole sweater first. Then decide how much ribbing will be needed. This is called playing it safe -- and that's fine. Please remember that in the finishing you will generally rib around the neck for 3/4 inch or more. This takes off 1 1/2 inches from the back of neck measurement. For this reason, do not be alarmed if these new constants seem excessive.

BACK OF NECK CONSTANTS

Chest size	20 - 23	back of neck	4 1/2 inches
Chest size	24 - 27	back of neck	5 inches
Chest size	28 - 31	back of neck	5 1/2 inches
Chest size	32 - 35	back of neck	6 inches
Chest size	36 - 39	back of neck	6 1/2 inches
Chest size	40 - 43	back of neck	7 inches
Chest size	44 - 47	back of neck	7 1/2 inches
Chest size	48 - 52	back of neck	8 inches
Chest size	52 up	back of neck	8 1/2 inches

When it comes to constants, you must use judgment if variation is called for. These constants can be changed to suit the individual's specific needs. For example, the armhole constant for a female with a 38 inch chest is 7 1/2 inches, but depending on your knowledge of the yarn and its qualities or style, or the unusually heavy arm of the person, you may decide to change the 7 1/2 inch armhole to 8 inches or even 8 1/2 inches. The opposite could also be true if the arm were very skinny; you could reduce the underarm constant to 7 inches or even less. But be careful at this point to maintain a well proportioned whole. The ensemble of the parts must be balanced. It is important to keep this in mind when changing the constants.

Even though these constants cover us in 98 percent of all cases without alterations, we are not limited exclusively to them. The constants provide us with a base from which to work. There are other constants which will be established later. And as you become more expert, you will establish some of your own constants. But at this time, they are a good place to start.

ROUND NECK PULLOVER

Now we begin. We will learn to chart a basic ladies pullover with long set-in sleeves and a round neck. Please understand that if three qualified instructors chart the same sweater for the same person, the three charts may read differently. There may be slight differences between them, but these will not be important. What will matter is the fit. All three sweaters should fit properly. The fit is the key.

The best approach and the easiest approach to charting and knitting a pullover calls for the work to be done in four pieces; the back, the front, and the two sleeves.

We will work with the following sweater measurements:

Chest -- 40 inches
Shoulders -- 16 inches
Length of sweater -- 17 inches
Length of sleeve -- 18 inches
Sleeve around upper arm -- 15 inches
Sleeve around wrist -- 10 inches
Stitch gauge -- 3 stitches=1 inch
Row gauge -- 4 rows=1 inch
Pattern -- stockinette stitch and K1, P1 rib
Needles -- 8 and 10 1/2

The back and front of the pullover are generally made the same width. Since the whole sweater will measure 40 inches around, then the back must be $40 \div 2$ or 20 inches and so must the front ($20 + 20 = 40$). To obtain the number of stitches to cast on for the back, we simply multiply the stitch gauge by the width of the back.

Stitch gauge X Back = number of stitches needed for back.

$$3 \times 20 = 60 \text{ stitches}$$

So we start as follows:

Cast on 60 stitches

Since ribbing must be tight, we work it on needles 2 or 3 sizes smaller than needles used for the sweater.

on size 8 needles. Rib K1, P1 for 2 1/2 inches. Change to size 10 1/2 needles and stockinette stitch.

We determined that the sweater should be 17 inches long to the underarm.

Work even until piece measures 17 inches.

"Work even" implies working straight up -- no increases or decreases.

At this point we are going to shape the underarm. What we need to do is to reduce the back to the size of the shoulders. The shoulders are 16 inches. That represents 48 stitches (3 times 16). We need to reduce 60 stitches, which is what we started with, to 48 stitches, which is the size of the shoulders. 60 stitches less 48 stitches leaves 12 stitches to be eliminated. This reduction must be arranged half on one side, half on the other side. We must have symmetry. That means we must eliminate 6 stitches on the right and 6 stitches on the left. But these stitches are not eliminated all at once. We start first with a bind off of several stitches at each side. *This first underarm bind off is usually equal to the stitch gauge.*

Bind off 3 stitches at beginning of next 2 rows.

Remember that a bind off is always done at the beginning of a row. The other stitches left to eliminate will be reduced one at a time in an effort to create a slope instead of a right angle.

Decrease 1 stitch each end every other row 3 times.

We now refer to our constants. A 40 inch chest has an 8 inch armhole.

Work even until armhole is 8 inches. Avoid measuring the armhole depth on the edge of the work. More accurate results will be obtained if measurements are taken inside of work.

The back of the sweater is now finished. We have reduced it to 48 stitches, the size of the shoulders (60 stitches less 2 bind offs of 3 stitches each = 54 stitches less 2 set of decreases of 3 stitches each = 48 stitches). We must now shape the shoulders and the back of neck.

We know that the back of neck is 7 inches which is the constant for size 40.
 $7 \text{ inches} \times \text{gauge } (3) = 21 \text{ stitches.}$

The total number of stitches left on the needle is 48 stitches. The difference between the total number of stitches left on the needle and the number of stitches needed for the back of neck represents the number of stitches to be worked in the shaping of the shoulders. $48 \text{ stitches} - 21 \text{ stitches} = 27 \text{ stitches}$. This number must be divisible by 2, $1/2$ for the right shoulder and $1/2$ for the left shoulder. Since each shoulder must be identical to the other, remember symmetry, and since 27 does not divide equally by 2, we are forced to add or to eliminate 1 stitch from the number of stitches needed for the shoulder shapings. Whether you add or subtract is entirely your choice. In most cases it will make no difference. But to be safe, look at your customer and determine if she or he has a wide or narrow neck. For a wide neck, add a stitch to the back of neck and subtract from shoulders. A narrow neck, subtract from neck and add to shoulders.

In this instance, we are working with a narrow neck. We will subtract 1 stitch from the 21 stitches of back of neck to make it 20 stitches. We will add this one stitch to the 27 stitches of shoulders making them 28 stitches. Remember that no matter what you do, the original 48 stitches you were left with does not change. $21 + 27 = 48$ and $20 + 28 = 48$.

To shape the shoulders, we must bind off the 28 stitches we allocated to them. We must bind off $1/2$ or 14 stitches for the right side and 14 stitches for the left side leaving 20 stitches for the back of neck in the middle. But we do not wish to bind off all 14 stitches at one time. We want to create a slope to match the natural shape of our shoulders. In order to do this, we break the bind off into several steps.

SHOULDER BIND OFF CONSTANT

At this point we introduce another constant. It applies to the number of steps in which one will bind off at the shoulders.

- Stitch gauge under 4 stitches, bind off each shoulder in 2 steps.
- Stitch gauge of 4 to 6 stitches, bind off each shoulder in 3 steps.
- Stitch gauge of more than 6 stitches, bind off each shoulder in 4 steps.

Our stitch gauge is 3. We fall into the first category so:

Bind off 7 stitches at beginning of next 4 rows.

This represents two rows at the right and two rows at the left. This is a two step bind off on each side.

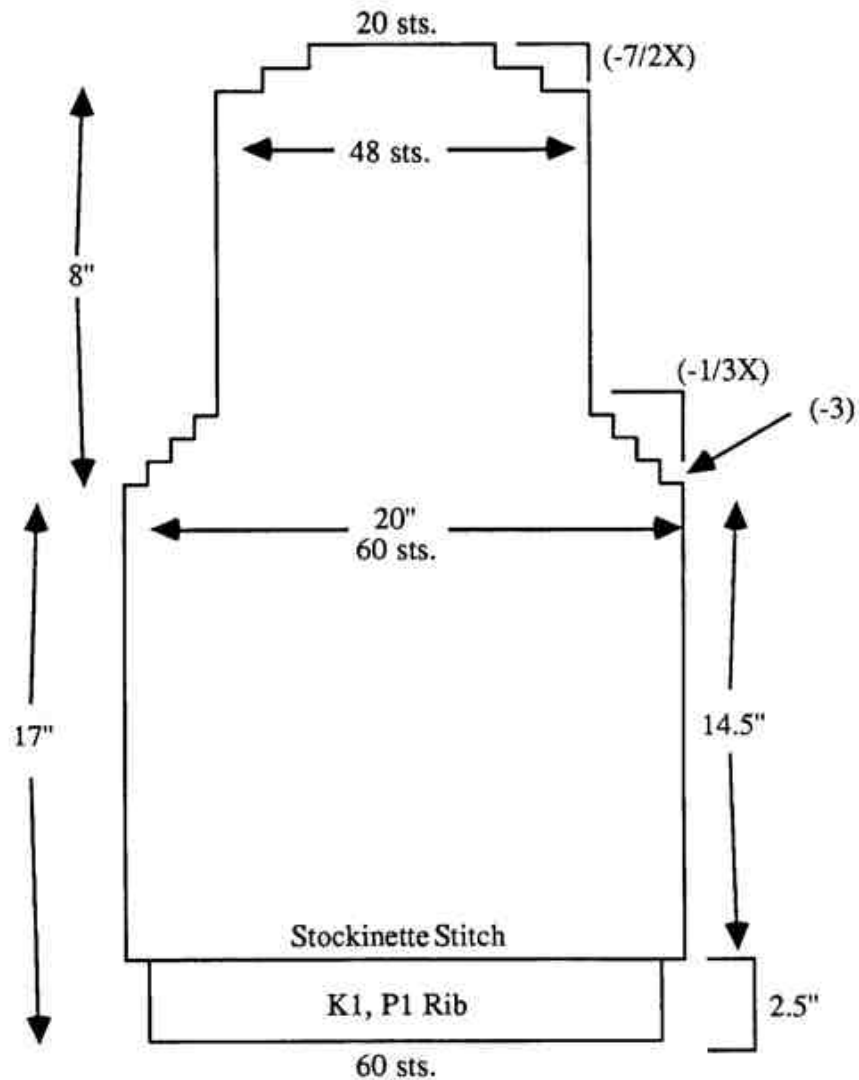
The shoulders are now done. We are left with 20 stitches for the back of neck. Here we have a choice.

1. We can bind off these 20 stitches
2. We can place them on a holder

My preference is to bind off. This will create a firmer frame that will prevent the shoulders and back from stretching.

Bind off 20 stitches for back of neck.

The back is now all done.



13--Sketch of Back with Data

FRONT

We are now ready to begin the front. The front is identical to the back up to the point where the neck starts (for a pullover) so:

Cast on 60 stitches on size 8 needles and rib K1, P1 for 2 1/2 inches. Change to 10 1/2 needles and stockinette stitch. Work even until piece measures 17 inches. Bind off 3 stitches at the beginning of the next 2 rows. Decrease 1 stitch each end every other row 3 times.

At this point we must establish another new constant. We must locate the start of the round neck shaping on the front of the sweaters.

ROUND NECK SHAPING CONSTANT

Size 20-25, neck starts 1 inch short of top of armhole.

Size 26-30, neck starts 1 1/2 inches short of top of armhole.

Size 31-42, neck starts 2 inches short of top of armhole.

Size 43-52, neck starts 2 1/2 inches short of top of armhole.

The armhole constant is 8 inches for size 40. The neck starts 2 inches below that. 8 less 2 = 6 inches. So we continue.

Work even until armhole is 6 inches.

We have allowed 20 stitches for the back of neck. We must allow the same number for the front of neck in the sweater. These 20 stitches for the front must be rounded off. We will bind off a center portion of these 20 stitches in one step and then we will round off the corners by decreasing a stitch at each end every other row until the balance of the 20 stitches of neck is used up. The question is how many stitches do we first bind off in the center?

The one rule we use is to take the number of stitches for the back of neck and deduct from it two times the gauge. Should the gauge not be a whole number, it must first be rounded to its next whole number. So we take 20 stitches less $(2 \times 3) = 14$ stitches to be bound off in the center of row.

At this point, we have 48 stitches, 14 of which we must bind off in the center. To determine where the bind off should start, we use the following formula.

Total number of stitches (48) less stitches to be bound off (14) divided by 2.

$$\frac{48 - 14}{2} = 17 \text{ stitches}$$

This number (17) tells me that there will be 17 stitches on either side of the 14 stitches to be bound off in center of row. So we continue:

Work 17 stitches.

Now we want to bind off 14 center stitches and create the separation in the front for each side to be worked up. To create this separation and work both sides up simultaneously we must introduce a second ball of yarn, one for each side. By working both sides simultaneously we make sure to work the same number of rows on both sides. We continue:

With a second ball of yarn, bind off 14 stitches and work remaining 17 stitches.

The 17 stitches represent 14 stitches of the shoulder plus the 3 stitches taken from the front of neck, 3 for each side. To round off the front of the neck, it is these 3 stitches that we must eliminate gradually and on each side. It follows:

Decrease 1 stitch each neck edge every other row 3 times.

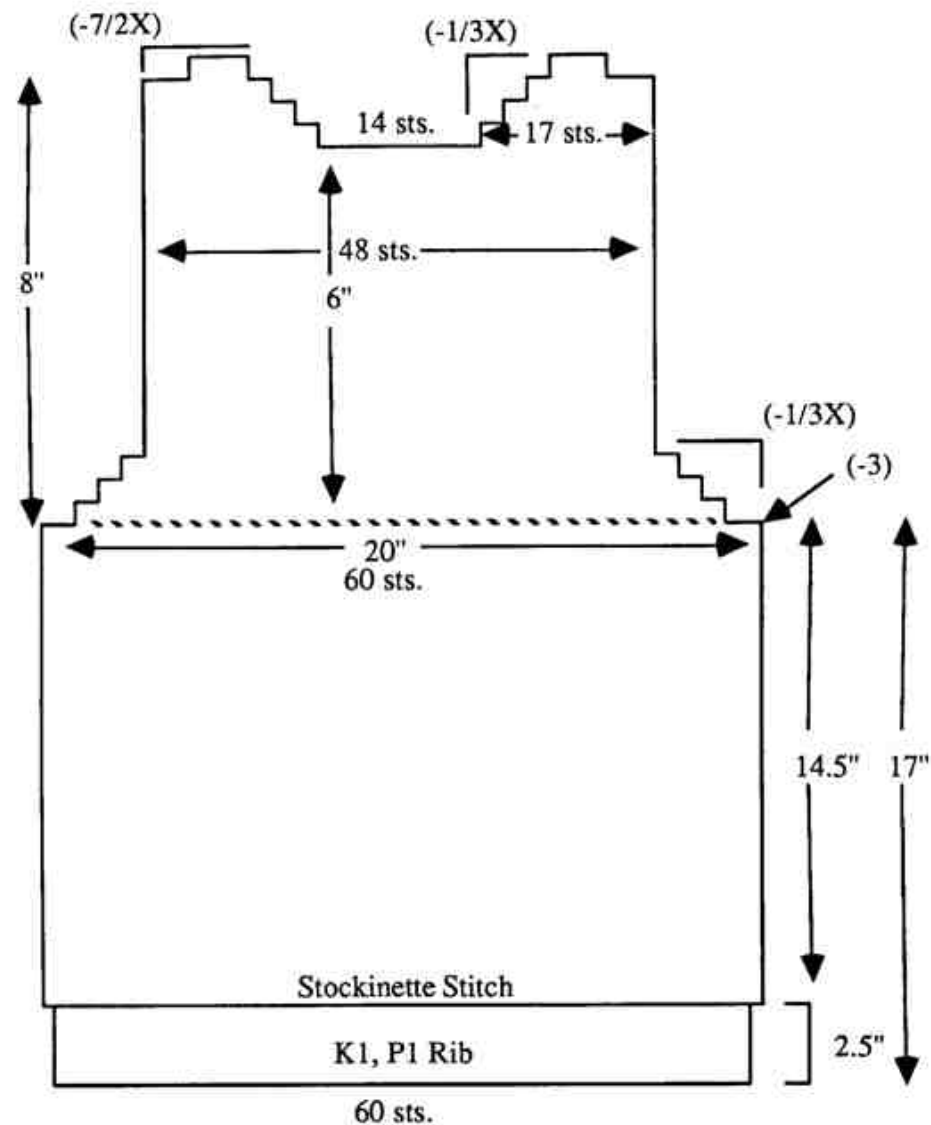
These 6 stitches plus the 14 stitches bound off represent the same 20 stitch opening in front as we have in back. We now have 14 stitches remaining on each side for the shoulders. The shoulder bind off in the front must match the shoulder bind off in the back. So we continue:

Work even until armhole measures 8 inches.

Armhole for back and front must match.

Bind off 7 stitches at the beginning of the next 4 rows.

This is the same thing we did for back. Shoulder must also match. Now the front is finished.



14--Sketch of Front With Data

SLEEVE

Since both sleeves are the same, we only need to chart one. We multiply the wrist measurement by the gauge to obtain the cast on number of stitches. Wrist is 10 inches, gauge is 3, so $10 \times 3 = 30$ stitches. It follows:

Cast on 30 stitches on size 8 needles. Rib K1, P1 for 2 1/2 inches.

From this point we must progressively increase the width of the sleeve. We must go from 10 inches around the wrist to 15 inches around the upper arm. 15 inches represents 45 stitches. We must add 45 less 30 = 15 stitches to the width of the sleeve. These increases must be made equally on both sides. The sleeve must be symmetrical. Since 15 is not divisible by 2, we must even up or even down this number in order to be able to divide by 2. We must use our judgment. A thin arm, even down. A heavy arm, even up. In this instance, we will even down. We will increase 14 stitches, 7 on each side, progressively.

The sleeve length is 18 inches. We already used 2 1/2 inches for the ribbed cuff. $18 \text{ less } 2\frac{1}{2} = 15\frac{1}{2}$ inches left. *As a rule, all the increases on a long sleeve must be finished approximately 3 inches before the armhole bind off on adults and 2 inches before the armhole bind off on children.*

For our sweater sleeve, we started with an 18 inch sleeve. We reduced that by 2 1/2 inches for the cuff, and we now reduce it by 3 inches (see above rule). $18 \text{ less } 2\frac{1}{2} = 15\frac{1}{2}$ less 3 = $12\frac{1}{2}$. We have 12 1/2 inches in which to make our 7 increases on each side. We cannot work with inches for placing our increases. We must make use here of very valuable data obtained at the beginning. ROW GAUGE! This will yield accurate easy to follow instructions. 12 1/2 inches times the row gauge represents 12 1/2 times 4 = 50 rows. We must increase 14 stitches, that is, 2 stitches, one at each end 7 times. These increases must be spaced equally in the 12 1/2 inches of sleeve immediately above the cuff. Every so many rows we must increase. The questions is how many rows?

To figure this, we take the number of rows in the 12 1/2 inches (50) and divide it by the number of times we must increase (7). $50 \div 7 = 7.14$. We round it down to the nearest whole number which is 7. We then increase every 7 rows.

In many cases we will get away with this rather simple method, forgetting the left over rows. For example: $50 \div 7 = 7$ and we have 1 row left over. One row can very easily be overlooked. But as perfectionists, if we are to accept this method, it must work in all instances. Taking for example the case where you might have 55 rows in which to place your increases, in which case $55 \text{ rows} \div 7 = 7$ and we are left with 6 rows or the equivalent of 1 1/2 inches. This is too much to overlook. This method does not work all the time.

Let's go back to our first example. $50 \text{ rows} \div 7 \text{ rows} = 7 \text{ times}$ and 1 row left over. How do we deal with the extra row? The following numbers represent the first 49 rows.
7 rows--7 rows--7 rows--7 rows--7 rows--7 rows--7 rows
Let's take the extra row and add it to the last number. We will then have
7 rows--7 rows--7 rows--7 rows--7 rows--7 rows--7 rows + 1 row or a total of 50 rows.
It then follows:

Change to 10 1/2 needles and stockinette stitch. Increase 1 stitch each end every 7 rows 6 times.

We had 7 increases to make. The first 6 are done. That leaves 1. These 6 increases were done every 7 rows.

$$\begin{array}{rcl} 6 \text{ increases} \times 7 \text{ rows} & = & 42 \\ 1 \text{ increase} \times 8 \text{ rows} & = & 8 \\ \text{Total} & & 50 \text{ rows} \end{array}$$

It follows:

Increase 1 stitch each end every 8 rows 1 time. Continue to work even until sleeve measures 18 inches.

In order to successfully shape and fit the parts of the sweater together, the bind offs and decreases of the front and back must match those of the sleeves. For a set in sleeve, the cap is shaped by binding off gauge on each side and decreasing 1 stitch each end every other row until cap is (refer to following constant):

CONSTANT FOR CAP OF SET IN SLEEVE

Size 20 - 26	2 inches less than armhole.
Size 27 - 31	2 1/2 inches less than armhole.
Size 32 - 40	3 inches less than armhole.
Size 41 - 48	3 1/2 inches less than armhole.
Above 48	4 inches less than armhole.

All caps are not shaped the same way. Since the bind offs and decreases of back and front must match that of sleeve, we start as follows.

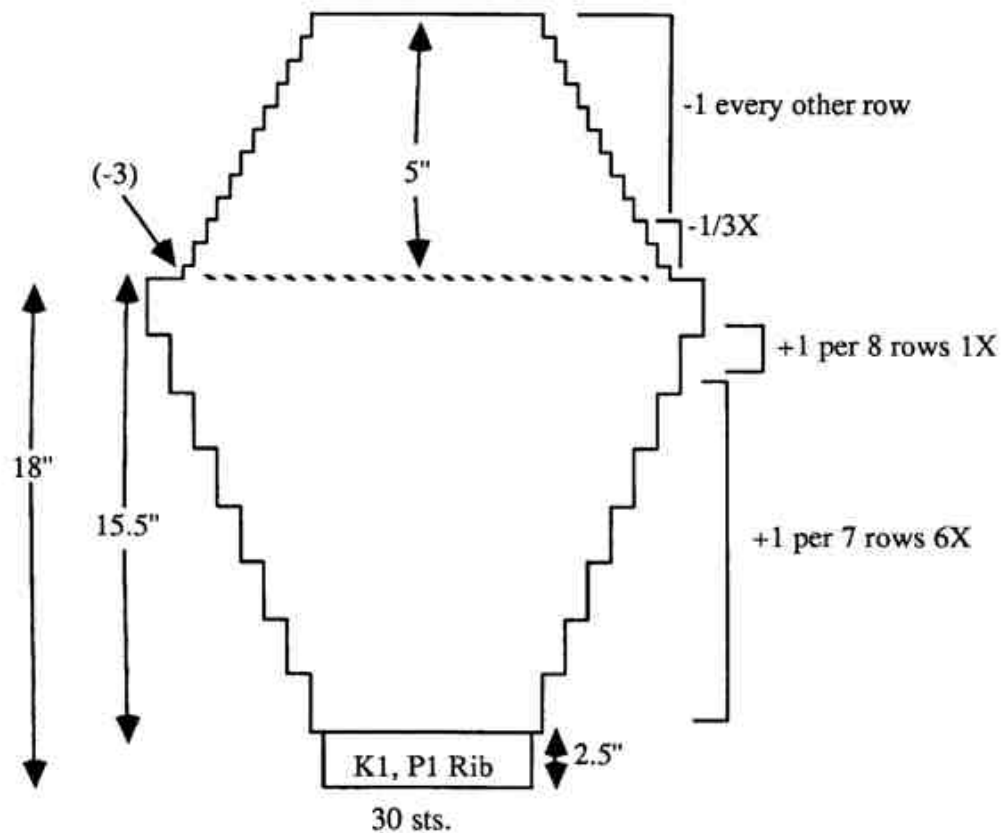
Bind off 3 stitches at beginning of next 2 rows. Decrease 1 stitch each end every other row 3 times.

Since this is a set in sleeve cap, we continue as follows.

Decrease 1 stitch each end, every other row, until cap is 5 inches (3 inches less than armhole). Bind off all remaining stitches.

Start over for second sleeve.

When measuring cap, do not measure along the edge but rather from the middle of the sleeve up. Refer to arrow in cap in sketch #15.

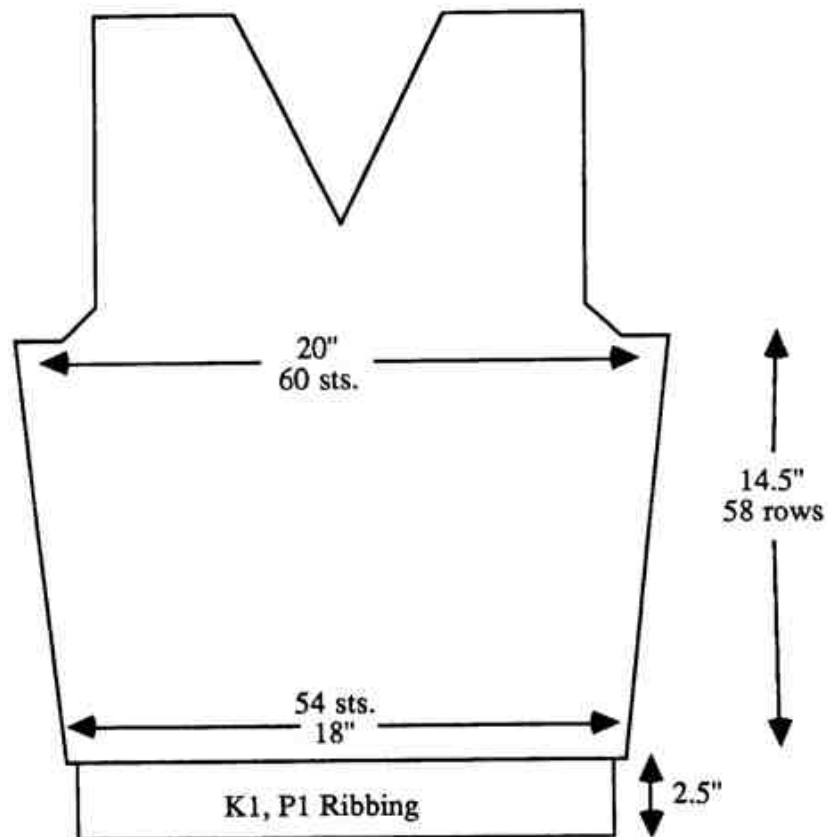


15--Sketch of Sleeve With Data

Please understand that the principle for this sleeve applies also to the body of sweaters where the waist or ribbing measurement is smaller than the chest measurement. For example, sweater is to be 36 inches around at ribbing but 40 inches around at chest.

We cast on $36 + 2 \times 3$ or 54 stitches. We want to increase 60 minus 54 or 6 stitches, 3 on each side. We have $14\frac{1}{2}$ inches or 58 rows to do it in, so we would increase 1 stitch each end every $(58 \div 3 = 19 \text{ rows } 19 \times 3 = 57 \text{ leaving } 1 \text{ row})$ 19 rows 2 times and one stitch each end on 20th row one time.

You see, the whole point of this book is that the very same principles will be used over and over for a multiple of purposes and styles. You need to understand the principles as well as the shapes you want to achieve. This will permit you to determine which principle to use to achieve the desired end. This is the whole trick to it. Understand principle and shape and you will conquer.



16--Sketch of Waist Smaller Than Chest Measurement

FINISHING

The main work is finished. The four pieces are done. They must be put together as follows.

Holding the knitted pieces inside out, back stitch the front and back together at the shoulders and at the sides. Fit in the sleeves by matching the bind offs, and back stitch all around armhole.

To finish the neck, we will rib 3/4 inch all around. To determine the number of stitches to be picked up, we measure around the neck of the sweater. We multiply this number by gauge. 18 inches X 3 = 54 stitches. It follows:

Pick up 54 stitches evenly around the neck on circular or double pointed needles and rib K1, P1 for 3/4 inch or desired length. Bind off loosely or sweater won't go on.

APPLICATION OF CHARTING PRINCIPLES

NECKS

At first sight it will appear that all we have learned so far is to chart a round neck pullover. Right? Wrong!

Let's see why. The best way to approach it is to chart a different sweater.

V NECK PULLOVER

Let's chart a V neck pullover with long, set in sleeves. The back of the V neck pullover is identical to the back of the round neck pullover. We already know how to do the back. The sleeves of the V neck pullover are identical to the sleeves of the round neck. We already know how to do the sleeves. The front of the V neck sweater is identical to that of the round neck up to the point where the neck starts. The V neck usually starts at the height of the armhole. I say usually because it could also start at the belly button or anywhere you choose. To make sure we understand, we are going to chart the whole front.

Cast on 60 stitches on size 8 needles and rib K1, P1 for 2 1/2 inches. Change to size 10 1/2 needles and stockinette stitch. Work even until piece measures 17 inches.

Everything is the same up to this point. We now must make our underarm bind offs, and at the same time we must begin to shape our V neck. The V shaping is started at precisely the middle of the row--30 stitches on one side and 30 stitches on the other. The division is made on the same row as the first bind off and it is made as follows:

Bind off 3 stitches at beginning of row and work 27 stitches. ($27 + 3 = 30$ stitches of first side). With a second ball of yarn work remaining 30 stitches. Bind off 3 stitches at beginning of next row.

We have done our bind offs. We have created our division. We must now make our decreases on the armsides and shape our neck.

Decrease 1 stitch each arm edge every other row 3 times. (Same as for back). AT THE SAME TIME: Shape neck.

The question is how. Let's see what we know. The back of neck is 20 stitches. The armhole is 8 inches. 8×4 (row gauge) = 32 rows. What this indicates to me is that we have 32 rows in which to eliminate 20 stitches. These 20 stitches must be eliminated 1/2 on the right side and 1/2 on the left side of neck. For the sake of symmetry we decrease on both sides of the neck at the same time. So we must eliminate the 20 stitches in $20 \div 2 = 10$ steps.

The next question is how often must we make these decreases. We take the number of rows, 32, and divide it by the number of decreases. $32 \div 10 = 3.2$ Always round the number down. In this case it is 3 rows.

The beginner may accept this simplified method, but in order for us to adopt this method, it would have to work in all instances. Any situation that will leave us with extra rows is not going to work satisfactorily all the time. So we can't just accept to decrease every 3 rows and forget the extra 2 rows.

Let's see what we have. 32 rows + 10 decreases = 3 rows. ($10 \times 3 = 30$). That leaves 2 extra rows to dispose of. Our 10 decreases every 3 rows look as follows:
 3 rows--3 rows--3 rows--3 rows--3 rows--3 rows--3 rows--3 rows--3 rows--3 rows
 We have 2 more rows to dispose of. We must add them, one row at a time, to the number of rows of 2 decreases. The question is to which. To create a smooth and open V neck, we add these leftover rows to the rows of the last 2 decreases. The decreases will then take place like this:
 3 rows--3 rows--3 rows--3 rows--3 rows--3 rows--3 rows--3 rows--3 + 1 rows--3 + 1 rows

It would follow:

Decrease 1 stitch each neck edge every 3 rows 8 times and decrease 1 stitch each neck edge every 4 rows 2 times.

3 rows \times 8 = 24 rows
 4 rows \times 2 = 8 rows
 Total = 32 rows-- no leftovers

This method is acceptable but not perfect because some decreases are done on even rows while others are done on odd rows. The perfect approach is to place all decreases on even rows. Let's go back to the beginning.

We have 8 inches at 4 rows per inch in which to fit our 20 decreases (10 on each side). $8 \times 4 = 32$ rows. Let's take 32 rows and divide them by the number of decreases. $32 \div 10 = 3.2$. We cannot have decimals so it becomes 3. But we can't have an odd number of rows so we must even 3 up to 4 or down to 2. If we go up to 4 and we have 10 decreases to make we will need 40 rows (10×4) to make our decreases. That cannot be since we only have 32 rows (8 inches) to work with. If we go down to 2 rows and we have 10 decreases to make, we will only use up 20 (10×2) rows out of 32. That leaves us with 12 extra rows. Let's see how we can dispose of these 12 extra rows keeping all numbers even.

Let's look at our 10 decreases every 2 rows:

2 rows--2 rows--2 rows--2 rows--2 rows--2 rows--2 rows--2 rows--2 rows--2 rows
 In these 10 sets of decreases, we must incorporate the left over 12 rows and we must do so in the smallest even units possible or units of 2. If we break up the 12 rows left over into units of 2 ($12 \div 2$), we then have 6 units to dispose of. What we must now do is add these 6 even units, one at a time to the last six sets of decreases as follows:
 2 rows--2 rows--2 rows--2 rows--2+2 rows--2+2 rows--2+2 rows--2+2 rows--2+2 rows--2+2 rows

So the neck shaping will read:

Decrease one stitch each neck edge every 2 rows 4 times and decrease one stitch each neck edge every 4 rows 6 times. Work even until armhole is 8 inches. Bind off 7 stitches at beginning of next 4 rows.

2 rows \times 4 = 8 rows
 4 rows \times 6 = 24 rows
 32 rows--no leftovers and all even

We now have as perfect a V neck shaping as possible. The front is done.

What if the neck was deeper?

In the event you had wanted a V neck that started 4 inches below the armhole, it would have followed:

When piece is 13 inches (length to underarm is 17 inches less 4 inches = 13 inches), **work 30 stitches. With a second ball of yarn work 30 stitches.**

This creates the division in the middle. Note, we are not binding off yet since underarms will be shaped 4 inches later. We have then a 12 inch V neck (8 inches for underarm + 4 extra inches) at 4 rows per inch. $4 \times 12 = 48$ rows. Let's follow the formula we used before.

$48 + 10 = 58$ rows. Since we can't have decimals and since evening up would require more rows than available, the only alternative is evening down. $58 + 10 = 68$ rows. $4 \times 17 = 68$ leaving 8 rows to be disposed of. Let's look at our 10 decreases.

4 rows--4 rows--4 rows--4 rows--4 rows--4 rows--4 rows--4 rows--4 rows--4 rows

Let's dispose of the 8 left over rows in even units of 2 ($8 + 2 = 10$ units) as we did before, in the last 4 decreases:

4 rows--4 rows--4 rows--4 rows--4 rows--4 rows--4+2 rows--4+2 rows--4+2 rows--4+2 rows

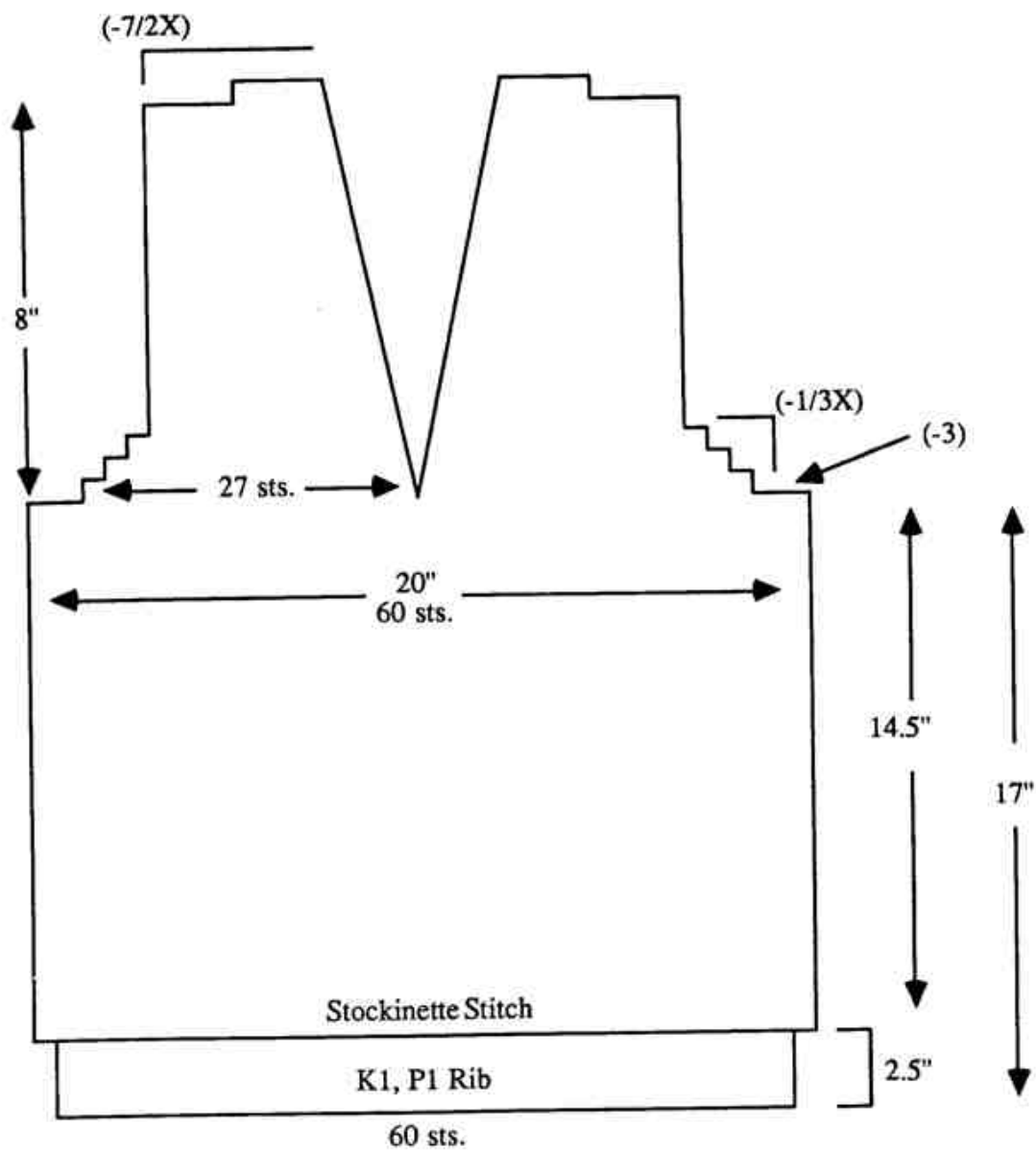
It would follow:

Decrease one stitch each neck edge every 4 rows 6 times. Decrease one stitch each neck edge every 6 rows 4 times.

But we must not forget our bind off shapings for underarm. So in bold we follow:

AT THE SAME TIME: Shape underarm: When work measures 17 inches, bind off 3 stitches at beginning of next 2 rows. Decrease 1 stitch each end, on arm edge, every other row 3 times. Continue shaping neck until armhole measures 8 inches and then bind off same as before.

To figure out the number of stitches to be picked up around the neck, use the formula used for the round neck. If you notice that we are not spending much time on finishing it is so because we are concerned here with general principles of charting. The fact that we use very specific examples to demonstrate these principles does not limit in any way their broad application.



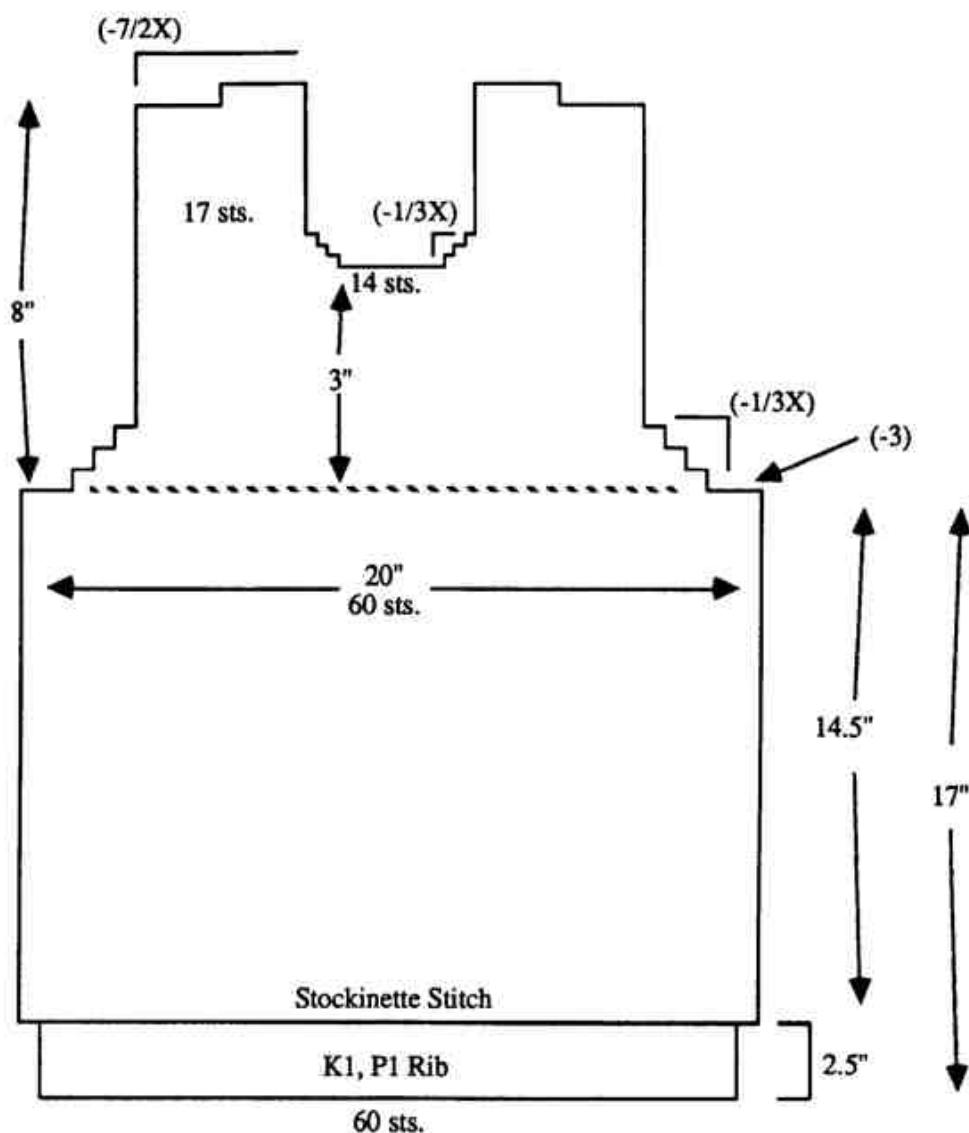
17--V Neck Front Sketch With Data

SCOOP NECK PULLOVERS

A scoop neck pullover is even easier. Not only are the back and sleeves identical to those of a round neck pullover, but so is the front with one exception only: The scoop neck shapings start usually 3 inches above the armhole. Everything else is identical. It reads as follows:

Neck shaping: When armhole measures 3 inches, work 17 stitches. With second ball of yarn, bind off center 14 stitches and work other 17 stitches. Decrease 1 stitch on each neck edge every other row 3 times.

Everything is identical to the round neck pullover. The only thing that changed was the height at which the neck shaping started.



REVEALING SCOOP NECK

BACK

For a more revealing scoop neck, we allow for a wider neck opening. How wide is a matter of personal taste. For the sake of an example we will make the back of neck 10 inches instead of the 7 inches we worked with. In a situation like this, we start adjusting the back to match the front. We started the back with 60 stitches. We bound off 6 stitches at underarms (3 each side). That leaves 54 stitches. We decreased 6 stitches at underarms (1 each side 3 times) and that leaves 48 stitches. We are saving 30 stitches for back of neck (10 inches X 3) and that leaves 18 stitches for shoulder shapings, 9 for each side. These are eliminated in 2 steps on each side, first 5 stitches then 4 stitches. We then bind off 30 stitches for back of neck. The principles remain the same regardless of numbers.

FRONT

When armhole is 3 inches, work 17 stitches. With a second ball of yarn bind off the center 14 stitches and work remaining 17 stitches. We are now left with 30 stitches of neck less 14 bound off stitches or 16 stitches to be eliminated--8 on each side of neck opening. These 16 stitches can be eliminated in one of several ways.

First & least revealing: Decrease 1 stitch each neck edge every other row 8 times.

Second & a little more revealing: Bind off 2 stitches each neck edge every other row 3 times. Decrease 1 stitch each neck edge every other row 2 times.

Third & still a little more revealing: Bind off 3 stitches each neck edge every other row 2 times. Bind off 2 stitches each neck edge every other row 1 time.

The choice is yours. We have shown above only some of the possibilities. The idea is that the principles will work in all.

The shoulders will then be bound off same as back.

Bind off 5 stitches at beginning of next 2 rows. Bind off remaining 4 stitches at beginning of next 2 rows.

COWL NECK

The material covered with the scoop neck applies to the cowl neck. Basically the cowl and round neck are alike. The principle is the same. The main difference is that for the cowl:

A. The back of neck will be about 1 to 3 inches wider than the back of neck of the regular round neck based on the size of garment and the look we wish to achieve.

B. The neck will start 1/2 to 1 inch lower in the front, again based on size and look. The principle is the same.

We cast on 60 stitches and work them up for 17 inches. We bind off 6 stitches (3 on each side) leaving 54 stitches. We decrease 6 stitches (1 on each side 3 times) leaving 48 stitches. At this point we work even for 5 inches (armhole 8 inches less regular 2 inches less additional 1 inch = 5 inches). We work 17 stitches. With second ball of yarn we bind off center 14 stitches and work remaining 17 stitches.

For the back of neck I will use 2 extra inches. 7 inches + 2 inches = 9 inches. 9 inches X 3 stitches per inch = 27 stitches. Let's go back to the total number of stitches we had left--48 stitches. We must allocate for the back of neck 27 stitches leaving for the shoulders 21 stitches. Since 21 is not divisible by 2, we will even the back of neck to 28 stitches and the shoulders to 20 stitches, 10 on each side. We bound off 14 stitches for center of neck. That leaves 28 less 14 = 14 stitches. 7 on each side to be eliminated.

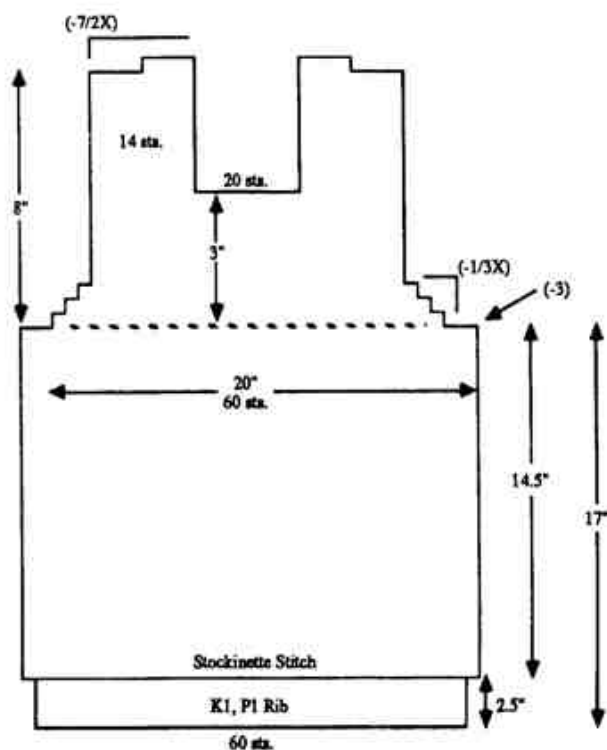
Bind off 3 stitches on each neck edge 1 time and 2 stitches each neck edge 1 time. Decrease 1 stitch each neck edge 2 times. When armhole is 8 inches, bind off same as back.

SQUARE NECK PULLOVER

The square neck pullover is identical to the scoop neck except for one little difference. The neck shaping across the front is done in one step. There are no decreases done on the neck edges, just one bind off equal to the number of stitches left for back of neck. It reads as follows:

Neck shaping: When armhole measures 3 inches, work 14 stitches. With second ball of yarn bind off center 20 stitches and work other 14 stitches. Work even until armhole measures 8 inches, etc.

The square neck can be made more revealing by making the back of neck wider and by starting the shaping of neck lower down. The principle is the same. The thing to remember is that there are no decreases to be made in the neck edges, just one bind off. The rest is the same.



BOAT NECK PULLOVER

A boat neck pullover is the easiest to do of all the necks because it requires no shaping at all. The front and the back of the sweater are knitted up in two identical pieces. These two pieces are identical to the back of the pullovers we have done thus far. The only difference is that up to now we shaped the shoulders of the pullovers we learned to chart. The boat neck has no shoulder shapings. It would be written as follows:

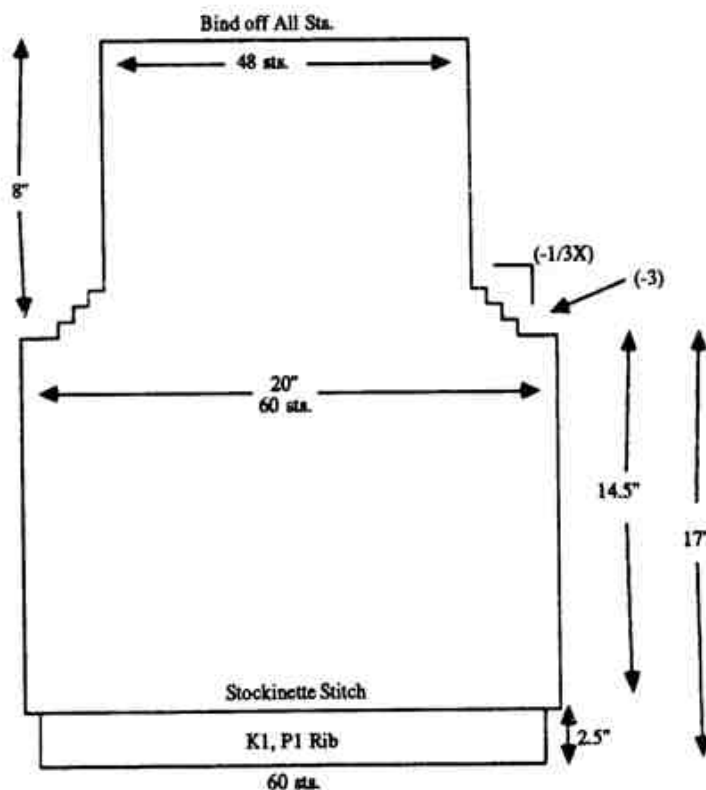
Back: Cast on 60 stitches on size 8 needle and rib K1, P1 rib for 2 1/2 inches. Change to size 10 1/2 needles and stockinette stitch. Work even until piece is 17 inches. Bind off 3 stitches at beginning of next 2 rows. Decrease 1 stitch each end every other row 3 times. Work even until armhole measures 8 inches. Bind off all stitches straight across the row.

Front: Identical to the back. Repeat from start.

Sleeves are the same as for the other pullovers we learned to chart.

The thing to remember is that for a boat neck we do not rib around the neck. We leave an opening 8 to 10 inches wide and crochet around it.

Often enough, for a different look, a stitch or rib pattern is used in the yoke. The right choice of pattern will dress up the sweater and make it so that it will require no finishing around the neck. The pattern selected should be firm enough to prevent the neck edge from rolling. There will therefore be no need to crochet around the neck.



20--Boat Neck Front or Back
Sketch With Data

TAB COLLAR

The tab collar is done the same way as the round neck with a slight difference. A division is created, usually in the middle of the front, starting a few inches below the neck shaping and this division will usually have buttons and buttonholes to make it functional. See sketch below.

This will require in the center, from each side, a ribbed edge approximately 1 inch wide. These 2 ribbed edges will overlap to permit buttons to close collar without stretching the sweater.

The back of this sweater is achieved exactly as we have the back of our round neck. The sleeves are the same as for the round neck. The front is the same as the front of the round neck up to the point where the shaping of neck starts. This happens usually at the height of the armhole shapings.

We cast on 60 stitches and rib for 2 1/2 inches. We change to larger needles and pattern stitch. We work even. When work measures 17 inches, it follows:

Bind off 3 stitches at beginning of row. Work 25 stitches. Rib next 4 stitches. With second ball of yarn work remaining 28 stitches. (60 less {3 + 25 + 4} = 28). Bind off 3 stitches at beginning of next row. Work 25 stitches. Cast on 4 stitches. (These 4 stitches will be worked in rib to create overlapping flap.)

Remember you are working with two balls of yarn and you are creating 2 edges in rib that will overlap. Remember to place buttonholes if you wish them knit in. Here we are learning charting principles, not finishing, so we will not go into buttonholes.

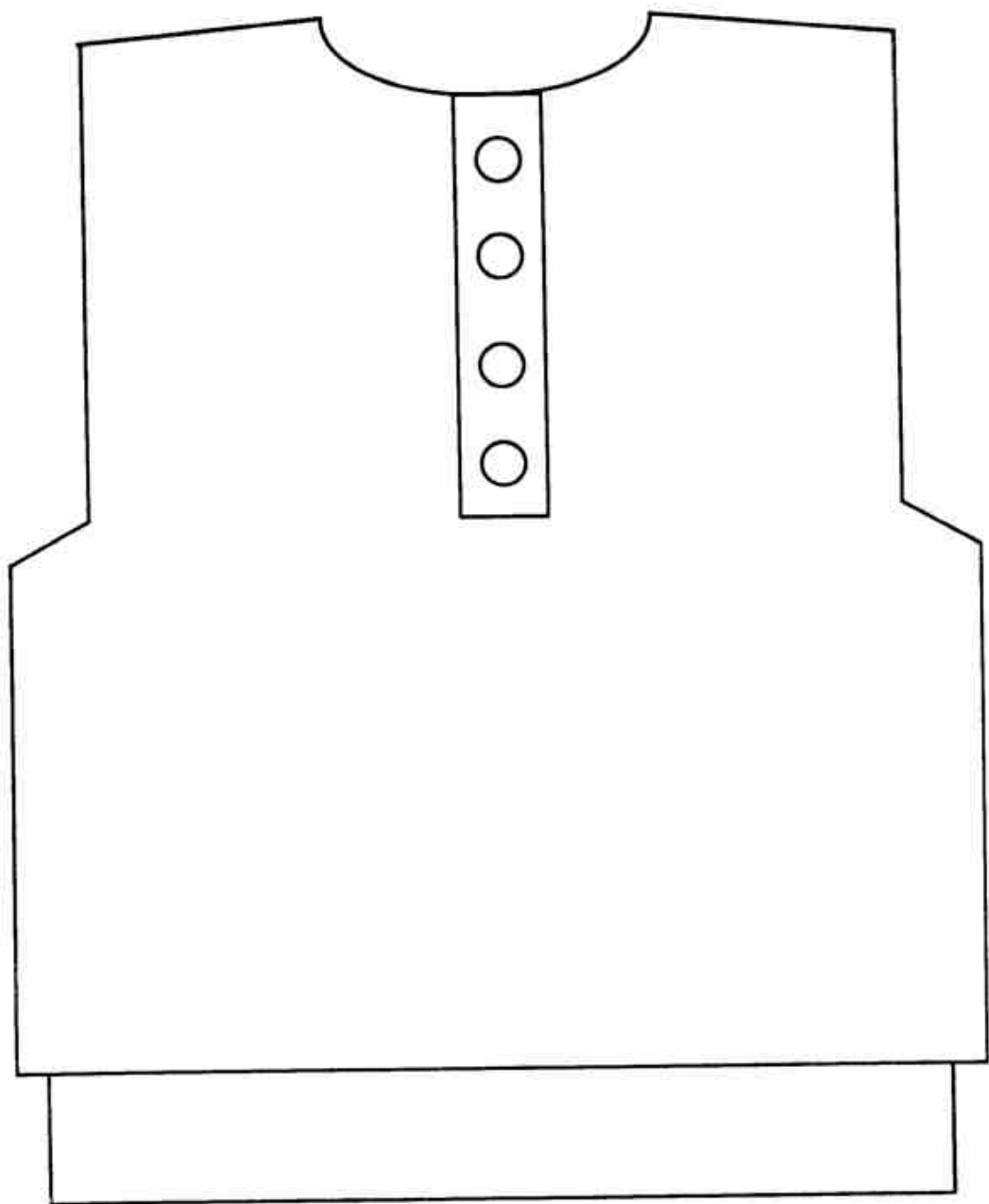
Decrease 1 stitch each arm edge every other row 3 times. Work even until armhole is 6 inches.

You must not forget that each half started out with 32 stitches. Actually, we casted on 4 stitches on the second half to make up for having worked 32 stitches on the first (bind off 3 stitches + work 25 stitches + rib 4 center stitches = 32 stitches).

Coming back on the second side we also bound off 3 stitches and worked 25 stitches. We then cast on 4 more for a total of 32 stitches. We had eliminated on each side 3 stitches in the bind off and 3 stitches in 3 decreases for a total of 6 stitches. 32 stitches less 6 stitches = 26 stitches left. We know we need 14 stitches for each shoulder shaping. 26 less 14 = 12 stitches. This number is the number of stitches I must eliminate on each neck edge to form my neck shaping. I need gauge or 3 stitches for my decreases. The rest must be bound off. 12 stitches less 3 = 9.

When armhole is 6 inches, bind off 9 stitches on each neck edge. Decrease 1 stitch each neck edge every other row 3 times. When armhole is 8 inches, bind off same as back.

We placed the opening in the middle for this example. The opening could have also been on the side. The principle is the same. It is just a matter of adjusting the number of stitches on either side of opening correctly.



21--Tab Collar

APPLICATION OF CHARTING PRINCIPLES

SLEEVES

We have covered the seven most common types of necks. And we can chart instructions for a set in, long sleeve pullover with any of the above necks. That makes seven styles. To double the number of styles that we can chart, all we need is one new element. Apply this element to all seven styles and that gives you seven new styles. For example, let's change the sleeve. Instead of a long set in sleeve, we will make a **long pleated sleeve**.

LONG PLEATED SLEEVE

The only difference between a long pleated sleeve and a long set in sleeve is in the sleeve cap. The sleeve is identical up to the bind off for the underarm. So we take it from there. (Turn back to the set in sleeve to refresh your memory.)

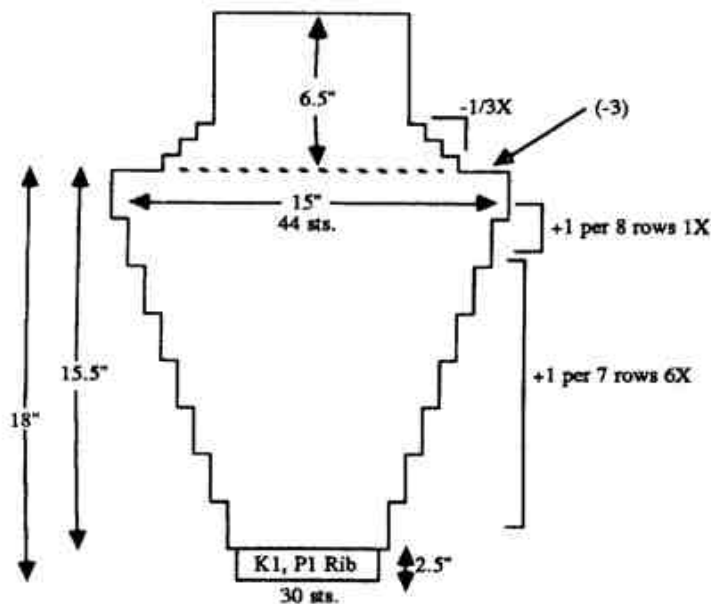
Bind off 3 stitches at the beginning of the next 2 rows. Decrease 1 stitch each end every other row 3 times.

Up to now everything is still identical to the set in cap. The bind offs and decreases match the front and back of sweaters. The difference is in the cap.

PLEATED CAP CONSTANT

At this point we will introduce a **constant** that applies to the pleated cap. The cap must measure 1 1/2 inches less than the length of the underarm.

Work even until cap measures 6 1/2 inches. Bind off all stitches straight across.



22--Sketch of Pleated Sleeve with Data

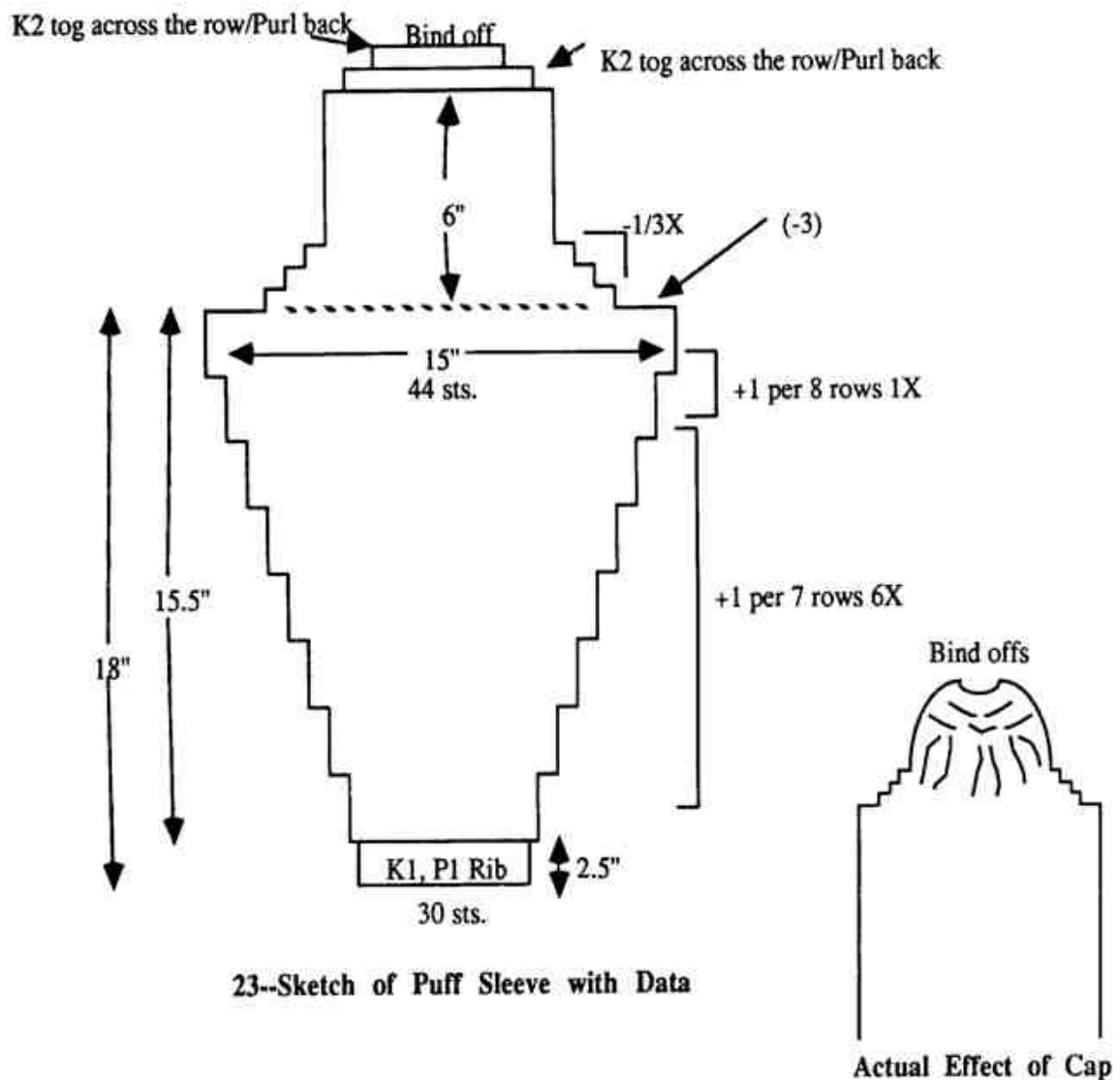
PUFF SLEEVE

From here we go to the **puff sleeve**. This sleeve is practically identical to the pleated sleeve with the following exceptions:

1. The cap must measure 2 inches less than the length of the underarm.
2. When cap measures 2 inches less, it is finished as follows:

When cap measures 6 inches, knit 2 stitches together across the row. Purl back. Knit 2 stitches together across the row. Purl back. Bind off all remaining stitches.

The last 2 sets of decreases pull in the sides and create the puff.



SHORT SLEEVES

This makes 21 styles we have learned to chart. By learning to chart one new element that will apply to the above 21 styles, we will double the library of styles from which to pick. For example, we will learn to chart a short sleeve. This same short sleeve will apply to the 21 styles we can now chart. The caps for a short set in sleeve, short pleated sleeve, and short puff sleeve are identical to those of the corresponding long sleeves. The only difference is in the body of the sleeve.

To chart a short sleeve, we need the measurement around the upper arm and the length of the sleeve. We also need to know how wide a sleeve we want. The principle is similar to that of the long sleeve.

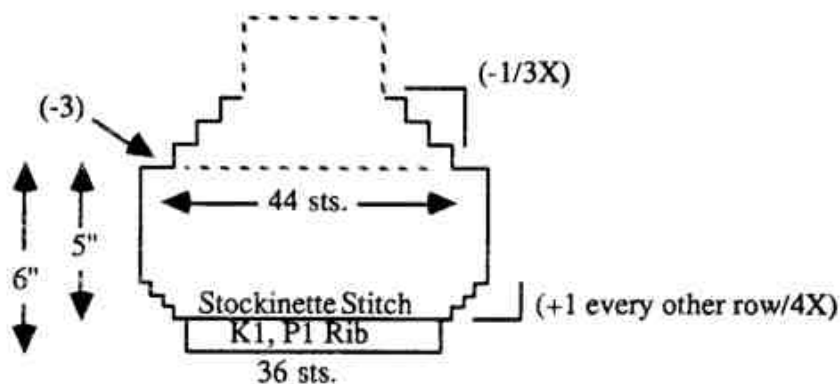
To start, we multiply the gauge and the actual upper arm measurement (allowing for a small amount of ease). Gauge = 3 stitches. Upper arm = 12 inches. $3 \times 12 = 36$ stitches. Length is 6 inches. It follows:

Cast on 36 stitches on size 8 needles and rib K1, P1 for 1 inch (or desired length).

At this point we wish to increase to 15 inches, the desired width for the sleeve. $15 \times 3 = 45$ stitches. We even out this number just as we did for the long sleeve to 44 stitches. We must now increase from 36 to 44 or 8 stitches. That is 4 on each side. We recommend that these increases be done every other row as follows:

Change to size 10 1/2 needles and stockinette stitch. Increase 1 stitch each end, every other row 4 times. Work even until sleeve measures 6 inches.

From here on the cap shapings are identical to those of the corresponding long sleeve. So now we can chart 42 different styles.



24--Short Sleeve With Data

LANTERN SLEEVE

A variation on all these sleeves calls for all the increases to be done on one row immediately after the ribbing. It is the lantern sleeve. This sleeve applies to all the styles we learned to chart. The caps are identical. The body of the sleeve changes.

The principle for arriving at the number of stitches needed is always the same. The sleeve is 10 inches around the wrist. We multiply the gauge by the wrist measurement to arrive at the number of stitches. $3 \times 10 = 30$ stitches.

Cast on 30 stitches on size 8 needles and rib K1, P1 for 2 1/2 inches. Change to size 10 1/2 needles and stockinette stitch.

Now we want to place all our increases evenly across the row. Our sleeve is to be 15 inches at the upper arm. This represents 44 stitches for our purposes (evened down). We need to increase 44 stitches less 30 stitches or 14 stitches. It follows:

Increase 14 stitches evenly across the row. Work even until sleeve is 18 inches.

From here on it is all the same as before. You can now chart 84 different styles.

The lantern sleeve can also be made short. All increases are made on one row immediately after ribbing regardless of length.

For that matter, any of the sleeves described can be made to any length. It is your decision. For example, a 3/4 length sleeve starts with the measurement of that part of the arm where the sleeve begins. The principle is the same as for a long sleeve. The only differences are:

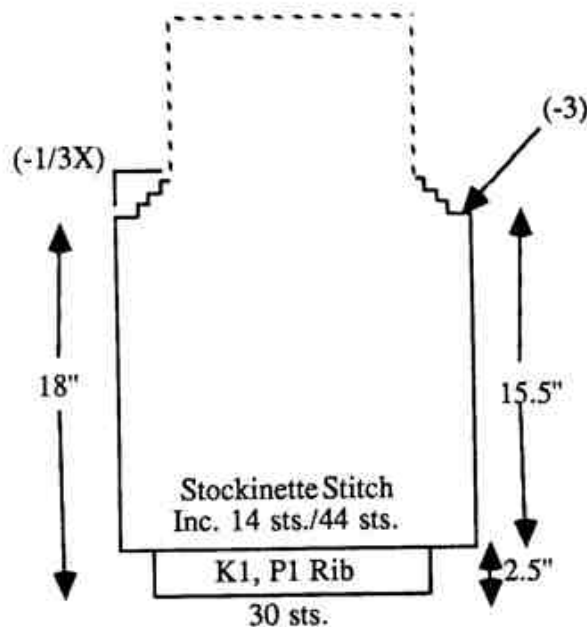
1. The sleeve is shorter and so the increases will be made closer to each other.
2. The ribbing may be made shorter or even eliminated based on style.

So now we have added even more possibilities to our library. Before we are done, we will be able to chart a multitude of patterns and truly become independent knitters--knitting architects!

APPLICATION OF LANTERN PRINCIPLE FOR BODY

The principle of the lantern sleeve will apply also to sweaters where we allowed some ease around chest and where we want tight ribbing around the waist or hips. Let's say 34 inch hips and 40 inch chest. We start with $34 + 2 \times 3$ (gauge) or 51 stitches and we want to increase immediately after the ribbing to $40 + 2 \times 3$ or 60 stitches. It would read as follows:

Cast on 51 stitches on size 8 needles. Rib K1, P1 for 2 1/2 inches. Change to size 10 1/2 needles increasing 9 stitches evenly across the first row. Work even...(The same principle, but different application.)



25--Lantern Sleeve Sketch With Data

LEG O'MUTTON SLEEVE

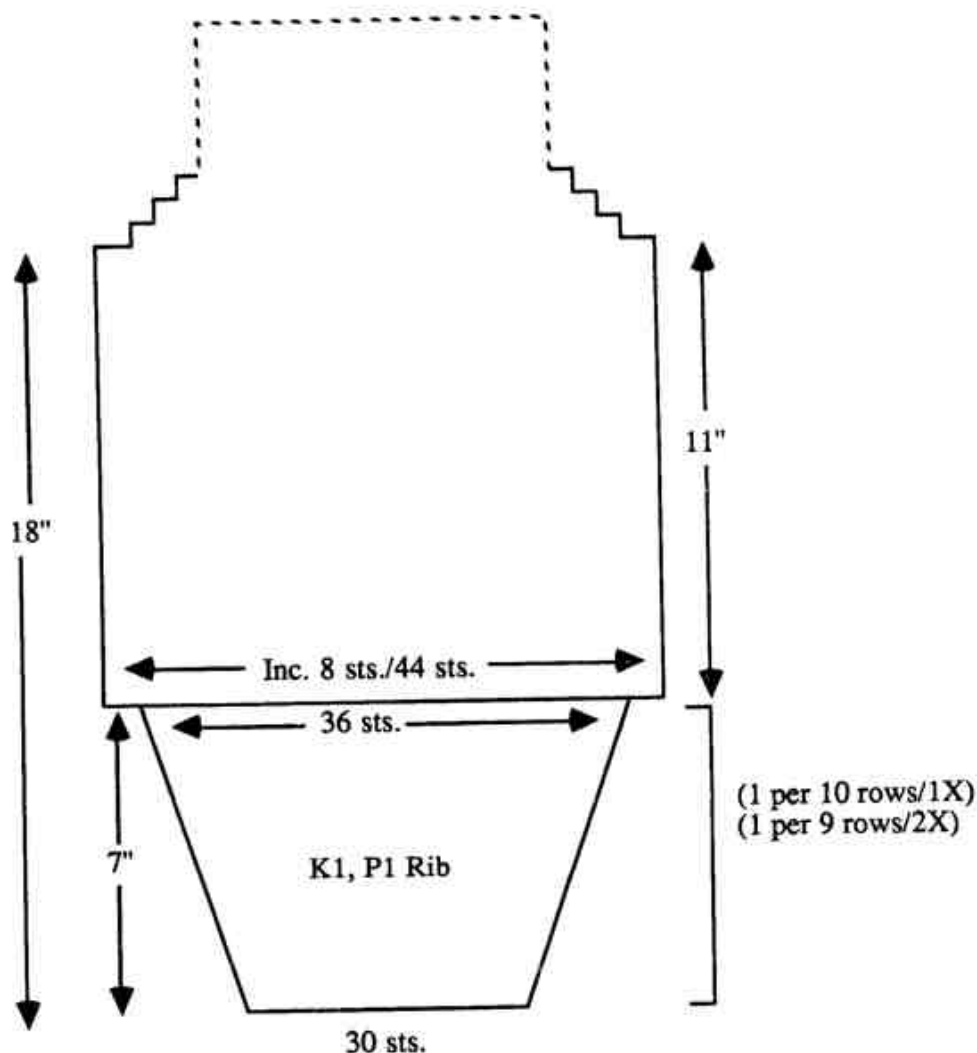
The leg o'mutton sleeve is a very interesting sleeve. It combines the principle of a regular sleeve and that of a lantern sleeve. For this particular sleeve we need the wrist measurement, the forearm measurement (below the elbow), and the upper arm measurement. Wrist 10, forearm 12, upper arm 15, gauge 3. So wrist is 30 stitches, forearm is 36 stitches, and upper arm is 44 stitches. The ribbing in this sleeve is done up to the forearm. We must increase while ribbing from 30 to 36 stitches. From wrist to forearm, in this particular instance measures 7 inches. The row gauge is 4 so the ribbing represents 28 rows. We must increase 6 stitches, 3 on each side in 28 rows. So we divide 28 by 3 and we learn that we must increase 2 times every 9 rows and once in 10 rows. It follows:

Cast on 30 stitches on size 8 needles and rib K1, P1 for 7 inches. At the same time increase 1 stitch each end every 9 rows 2 times. Increase 1 stitch each end 10 rows later.

Now we want to increase from 36 to 44 stitches. That is 8 stitches. We want the increases here to be along one row, as in a lantern sleeve.

Increase 8 stitches evenly across the row. Work even until sleeve measures 18 inches and...

From here on, pick any of the caps we learned to chart up to now. We recommend the puff cap. We find it to be the most appropriate for this style. We have also found that the leg o'mutton looks best when made very wide.



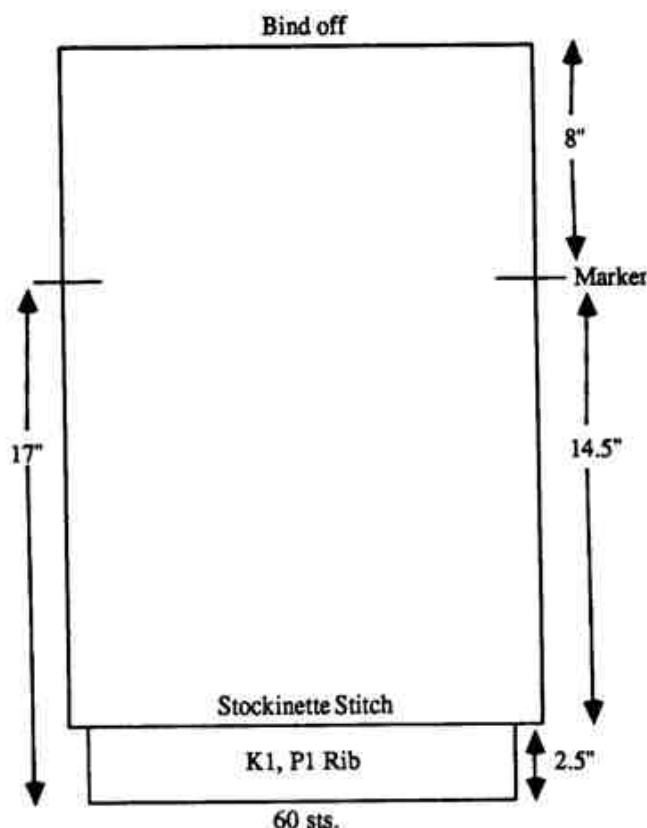
26--Leg O'Mutton Sleeve Sketch With Data

DROP SHOULDER

There are two other sleeve styles that I wish to cover here. The drop shoulder, which is the easiest and the raglan, which is the hardest.

For a drop shoulder sweater, like the others, we start with half the chest measurement multiplied by the gauge. We are still working with the same measurements. Chest $40 + 2 \times 3 = 60$ stitches. The main difference is that for a drop shoulder there are no bind offs for underarm, no decreases, and no shoulder shaping. The front and the back both are worked up evenly on both sides.

Back: Cast on 60 stitches with size 8 needles. Rib K1, P1 for $2\frac{1}{2}$ inches. Change to size $10\frac{1}{2}$ needles and stockinette stitch. Work even until piece is 17 inches. Place a marker on arm sides to indicate start of armhole and work even for another 8 inches. Bind off all stitches across the row.



27--Drop Shoulder Back Sketch With Data

FRONT

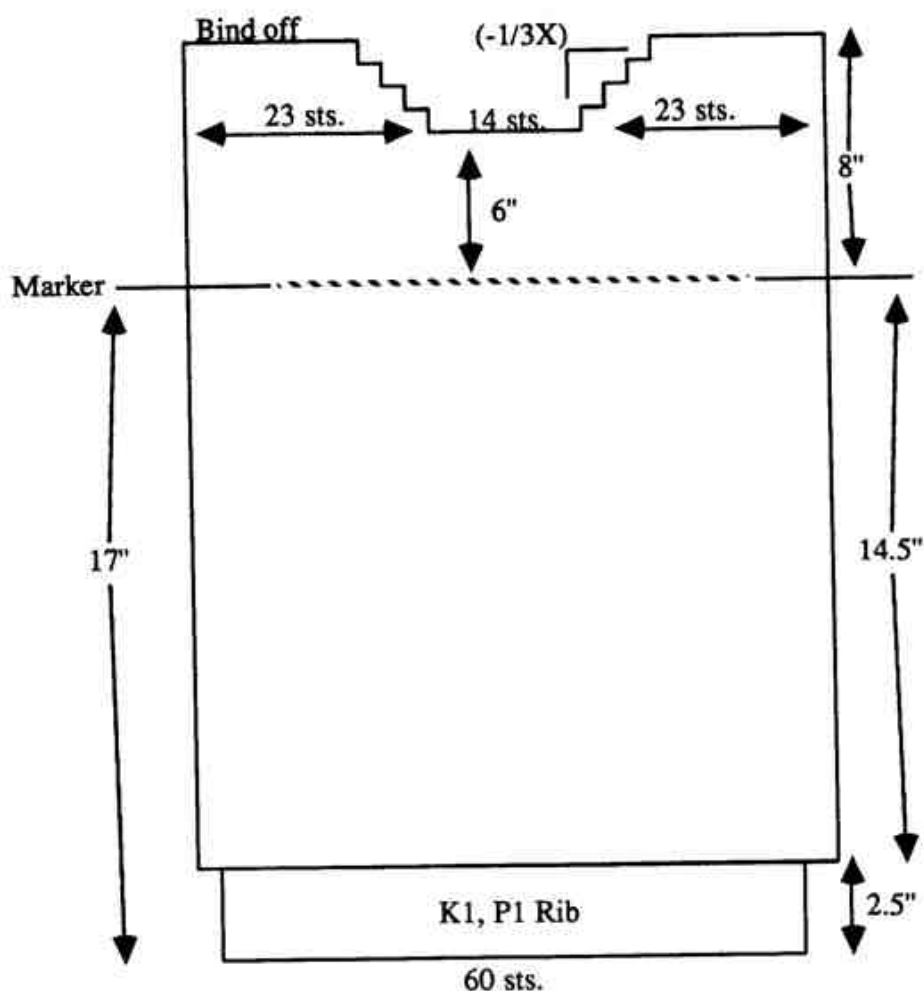
The front is worked up the same way as the back. The only thing to remember is that because we did not eliminate stitches on either side we will end up with different numbers from those obtained for the set in sleeve pullover. This is the way it will read.

Round neck: Cast on 60 stitches with size 8 needles and rib K1, P1 for 2 1/2 inches. Change to size 10 1/2 needles and stockinette stitch. Work even until piece is 17 inches. Mark start of armhole with marker. Continue to work even until armhole measures 6 inches.

Here we will start neck shaping. Remember we are working here with 60 stitches (not 48). We know that the back of neck measures 20 stitches. $60 \text{ less } 20 = 40$ stitches or 20 on each side for shoulder. We apply here the very same principle we used in the set in sleeve (shoulder + gauge).

Work 23 stitches (20 + 3). With second ball of yarn bind off center 14 stitches and work 23 stitches. Decrease 1 stitch each neck edge every other row 3 times. Work even until armhole is 8 inches. Bind off all remaining stitches.

The very same principle applies to all the necks.



28--Drop Shoulder Front Sketch With Data

DROP SHOULDER SLEEVE

The sleeves are worked up differently. For the proportion of the drop shoulder to be correct, the upper arm measurement cannot be just any number. It must be at least twice as large as the height of the armhole. The reason for this is that a drop shoulder sleeve has no cap. The edge of the sleeve at the bind off row will have to be wide enough to be attached to the front and back of the sweater at the underarm.

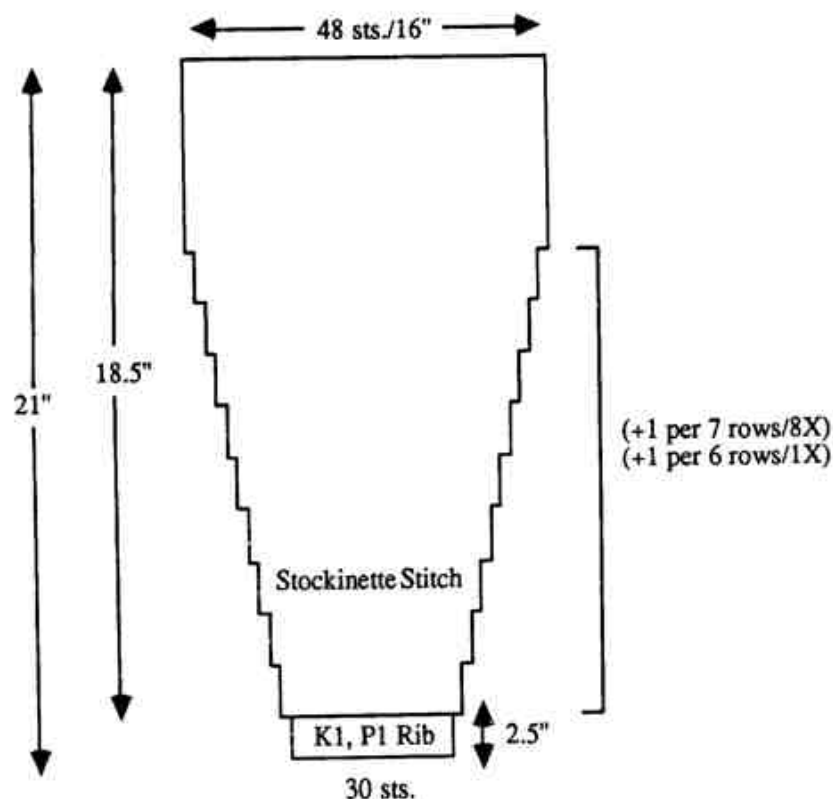
The armhole is 8 inches so the sleeve at its widest point must be 16 inches. 16×3 (gauge) = 48 stitches so we must increase from the 30 stitches we started with to 48 stitches. From here on, the principle is the same. $48 \text{ less } 30 = 18$. That means we must increase 9 stitches on each side. Please note that for sleeve shaping where a seam will join open edges, it is alright to make increases on odd or even rows.

The striking thing here is that the sleeve has no cap. None at all. Because a drop shoulder has no cap and no underarm shapings, there is still one more adjustment to be made. We have to compensate in the length of the sleeve for the lack of a cap. This can represent a few inches. How do we determine the size of the adjustment needed?

First we start with the width of the back across the shoulders. Since we did not shape any underarms we still have 60 stitches or 20 inches. Our actual shoulder measurement was 16 inches--a 4 inch difference between the two. Our sweater is symmetrical and so we will actually have a 2 inch difference on each shoulder. This represents a 2 inch overlap. The body of the sweater will actually be contributing 2 inches towards the missing cap.

A plain set in sleeve sweater has a 5 inch cap. We need to make up all 5 inches in length. Since we determined that the body already contributed 2 inches to each sleeve, what remains to be done is to adjust the sleeve length by $(5 - 2)$ or 3 inches. What this means is that to properly chart this sleeve, even though the regular length of sleeve to underarm is 18 inches, we would have to work with 18 inches + 3 inches or 21 inches. The principle for placing increases and shaping the sleeve does not change. We only have more rows to place our increases in. Our sleeve here is 3 inches longer. This converts into 12 more rows. If you recall we had 50 rows with our 18 inch sleeve in which to place the increases. Here we have $50 + 12 = 62$ rows. So it follows:

Cast on 30 stitches with size 8 needles and rib K1, P1 for 2 1/2 inches. Change to size 10 1/2 needles and stockinette stitch. Increase 1 stitch each end every 6 rows 1 time. Increase one stitch each end every 7 rows 8 times. Work even until sleeve is 21 inches. Bind off straight across.



29--Drop Shoulder Sleeve Sketch With Data

RAGLAN SHAPING

The further we go, the more obvious it becomes that the principles we have learned apply in a general sense to charting all shapes. For example, we have not covered the raglan sleeve and yet we have covered the major principle involved. It is the same principle that deals with V neck shapings. Let's take a look.

All the pullovers we have learned to chart are worked up the same way up to the underarm. And so it is for the raglan. Here we add one inch to the underarm constant of sizes under 40 and 1 1/2 inches to the underarm constant of sizes 40 or over.

Let's take the same pullover we have been working on; size 40, round neck, etc. We begin as before.

Back: Cast on 60 stitches with size 8 needles and rib K1, P1 for 2 1/2 inches. Change to size 10 1/2 needles and stockinette stitch. Work even until piece measures 17 inches. Bind off 3 stitches at the beginning of the next 2 rows.

Up to now everything is identical to the first sweater we charted. Let's see what we know up to now.

1. We started with 60 stitches.
2. We eliminated 6, leaving 54 stitches.
3. Back of neck constant calls for 20 stitches.
4. $54 \text{ less } 20 \text{ divided by } 2 = 17 \text{ stitches}$. That is the number of stitches for each shoulder.
5. Armhole constant is 9 1/2 inches or $9.5 \times 4 = 38 \text{ rows}$.

To create a raglan shaping we must eliminate all the shoulder stitches, and we have here 38 rows in which to do it. How often must we decrease? We know that--17 times on each side. But we don't know how many rows apart these decreases must be made. Here is how we figure it out.

We take the number of rows and divide it by the number of decreases. In very few cases will we get a whole number as an answer. For example, if we had 34 rows and 17 decreases, that would be perfect since $34 \div 17 = 2$. In this case, we have 38 rows and 17 decreases. We end up with 2 as an answer and 4 rows left over. This indicates that 4 decreases will have to be made every $(2 + 1)$ or 3 rows and $(17 - 4)$ or 13 decreases will have to be made every 2 rows. To double check, $4 \times 3 = 12$ and $13 \times 2 = 26$. $26 + 12 = 38 \text{ rows}$. That checks so it follows:

Decrease 1 stitch each end every 3 rows 4 times. Decrease 1 stitch each end every other row 13 times. Bind off remaining 20 stitches for back of neck.

At this point, let's refer back to the shaping of the V neck. Just as for the V neck, we do not want our decreases to be placed on odd and even rows. They must all be placed on even rows. We know just how to achieve this since we have done it for the V neck shaping.

We have 38 rows and 17 decreases to make. $38 \div 17 = 2 \text{ rows}$. We have 4 leftover rows. We break up these 4 rows into the smallest even units ($4 \div 2 = 2$). We are left with 2 such units. We are going to have to add these 2 units, one at a time, to 2 sets of decreases. We have 17 decreases every 2 rows. Let's see then.

2--2--2--2--2--2--2--2--2--2--2--2--2--2--2

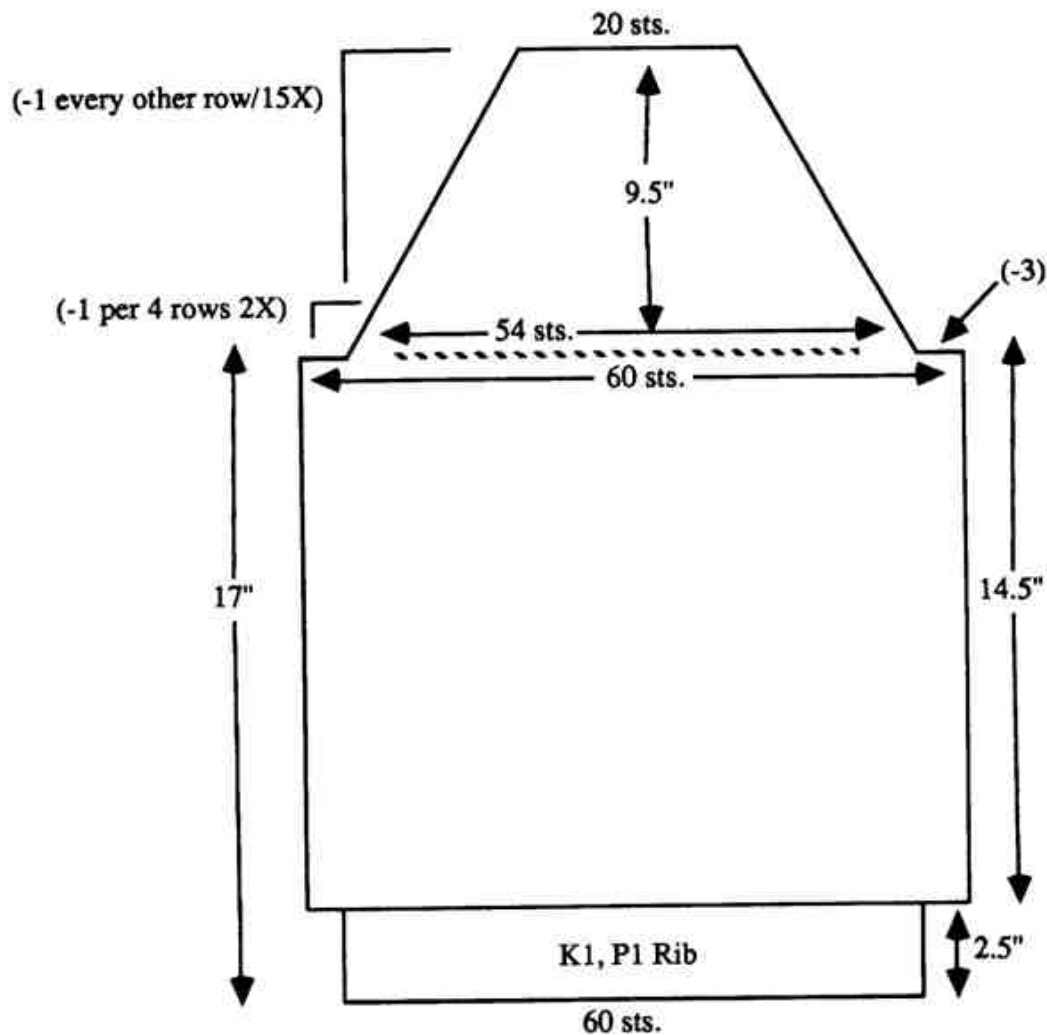
In order to achieve a proper and roomy fit, we have to add these 2 units of 2 rows each to the first 2 sets of decreases. It will look like this:

(2 + 2)--(2 + 2)--2--2--2--2--2--2--2--2--2--2--2--2--2--2--2

It will have to be written as follows:

Decrease one stitch each end every 4 rows 2 times. Decrease one stitch each end every 2 rows 15 times. Bind off remaining 20 stitches for back of neck.

This takes care of the back.



30--Raglan Back Sketch With Data

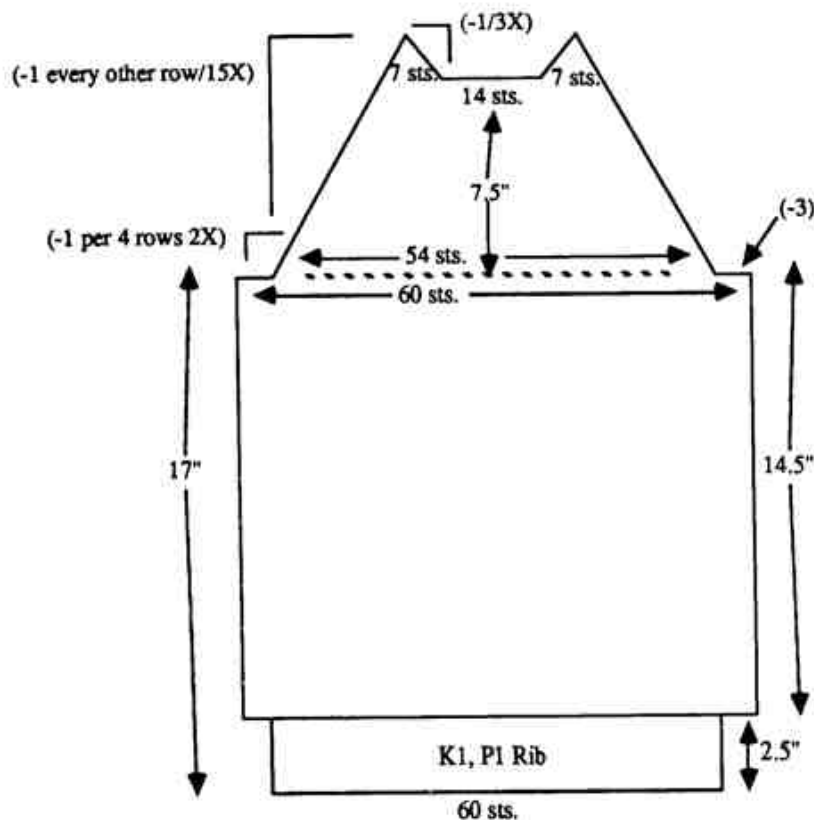
RAGLAN FRONT

The front is identical to the back up to the point where the neck starts. We know that the round neck shaping starts at 7 1/2 inches or 30 rows. (2 inches below the end of the 9 1/2 inch armhole). We need to know how many stitches are left at this point.

We decreased 1 stitch each end every 4 rows 2 times. This means that we used up 8 rows and 4 stitches (2 on each side). 30 rows less 8 rows = 22 rows.

We are decreasing 1 stitch each end every other row for the next 22 rows. That represents 22 stitches (11 on each side). $22 \text{ stitches} + 4 \text{ stitches} = 26 \text{ stitches}$ eliminated by the thirtieth row. That represents 13 decreases. We had 54 stitches left after the underarm bind off. We eliminated 26 stitches. That leaves 28 stitches. This is a round neck with 20 stitches for back of neck. The central bind off we know is 14 stitches, that leaves 28 less 14 or 14 stitches to be worked $1/2$ on one side and $1/2$ on the other. That is 7 stitches on each side. It follows:

When armhole is 7 1/2 inches (30 rows) start to shape neck all the while continuing to shape armhole. Shape neck starting on row 31 of armhole (that is after your 13th decrease). Work 7 stitches. With second ball of yarn bind off 14 stitches and work 7 stitches. Decrease one stitch on each neck edge every other row 3 times.



31--Raglan Front Round Neck Sketch With Data

RAGLAN SLEEVE

Now we come to the sleeves. The body of the sleeve is identical to that of any other style we pick. That is it is identical up to the underarm bind off. From here on the bind off and decreases must match those of the body of the sweater. At first glance this seems easy, but there is an important question to ask.

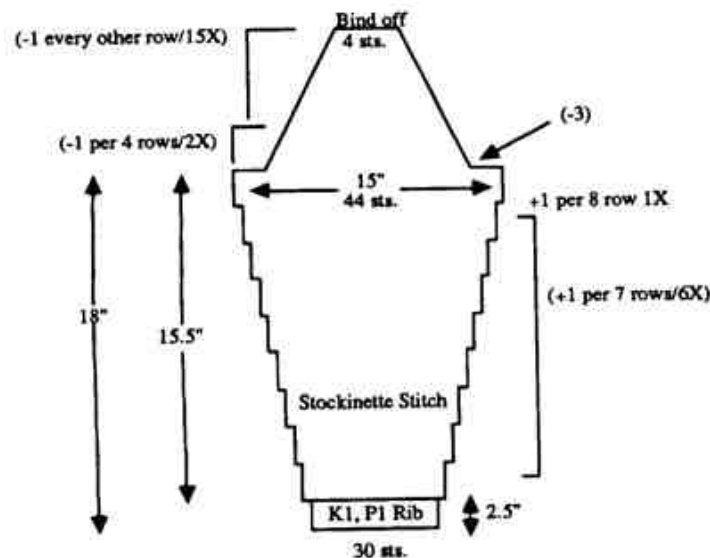
Is the sleeve going to have enough stitches on it to allow for all the decreases? Will it be wide enough? Remember that the cap of the sleeve must match the underarm. For this sweater, we know that we need 17 decreases on each side. We also need 6 stitches, 3 on each side for the bind offs ($34 + 6 = 40$ stitches). If we left it at that, the cap would come to a sharp point. We can't have that. We must be left with at least gauge stitches (3 stitches here) to bind off; so $40 + 3 = 43$. This number, 43, represents the smallest possible number of stitches you could have for this particular raglan sweater sleeve.

We have 44 stitches to work with. That is one more than the minimum. That's good. Instead of binding off gauge, we bind off gauge + 1 or 4 stitches.

We always work with the largest of the 2 numbers (44 in this instance) when charting the sleeve. The rest is easy.

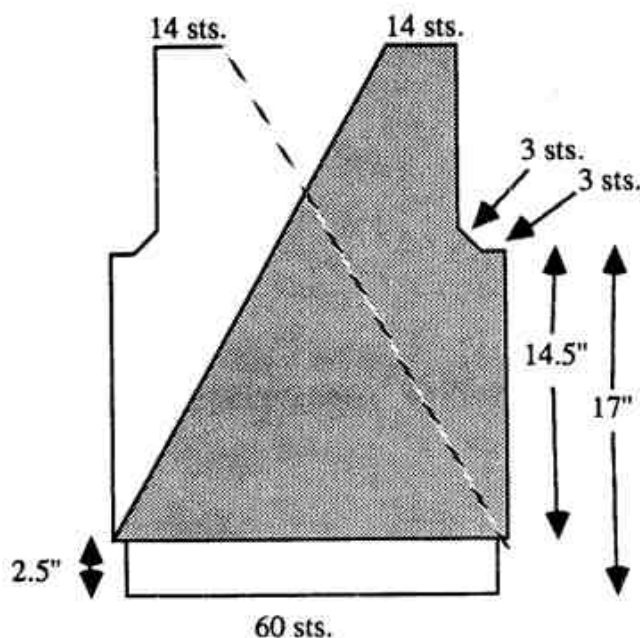
Cast on 30 stitches on size 8 needles. Rib K1, P1 for 2 1/2 inches. Change to 10 1/2 needles and stockinette stitch. Increase 1 stitch each end every 7 rows 6 times and increase 1 stitch each end 8 rows later. When sleeve measures 18 inches bind off 3 stitches at beginning of next 2 rows. Decrease 1 stitch each end every 4 rows 2 times. When all decreases are done, bind off remaining 4 stitches.

By now you have learned the principles necessary to permit you to chart raglan pullovers of all neck shapings.



SURPLUS SWEATER

The back and sleeves of a surplus sweater are the same as those of a regular sweater. The front differs. It is done in two parts. To better understand, let's look at the sketch below.



33--Surplus Sweater

FRONT

Cast on 60 stitches on size 8 needles and rib K1, P1 for 2 1/2 inches. Change to size 10 1/2 needles and stockinette stitch.

At this point, I am looking to decrease, on one side only, enough stitches to end up with 14 stitches on the shoulder. Now keep in mind I must also bind off and decrease on the armhole a total of 6 stitches. So let's see: 60 stitches (cast on number) less 14 stitches (shoulder) = 46 stitches less 6 stitches (bind off and decrease on armhole) = 40 stitches. We must decrease 40 stitches. We have 14 1/2 inches (length of sweater less ribbing) + 8 inches for armhole or 22 1/2 inches in which to place our decreases. This represents 90 rows (22 1/2 inches X 4 rows = 90 rows) in which we must decrease 40 stitches. Once again we make use of the same principles.

90 rows + 40 decreases = 2 rows. We break up these 10 left over rows in even units of 2 and this gives us 5 such units. This means that 5 of our decreases will be made further apart by 2 rows than all the others. We will make these 5 decreases last. We have a total of 40 decreases to make. 5 will be made later (40 - 5 = 35) so we will make 35 decreases every 2 rows, and then we will make 5 decreases every 2 + 2 rows. It follows:

Decrease one stitch on one side of work (right) every other row 35 times. Then decrease one stitch on same side every 4th row 5 times. **AT THE SAME TIME:** Shape armhole: When work measures 17 inches, bind off 3 stitches on armhole. Decrease 1 stitch on armhole every other row 3 times. When armhole is 8 inches, bind off shoulder same as back.

For the second side of the front:

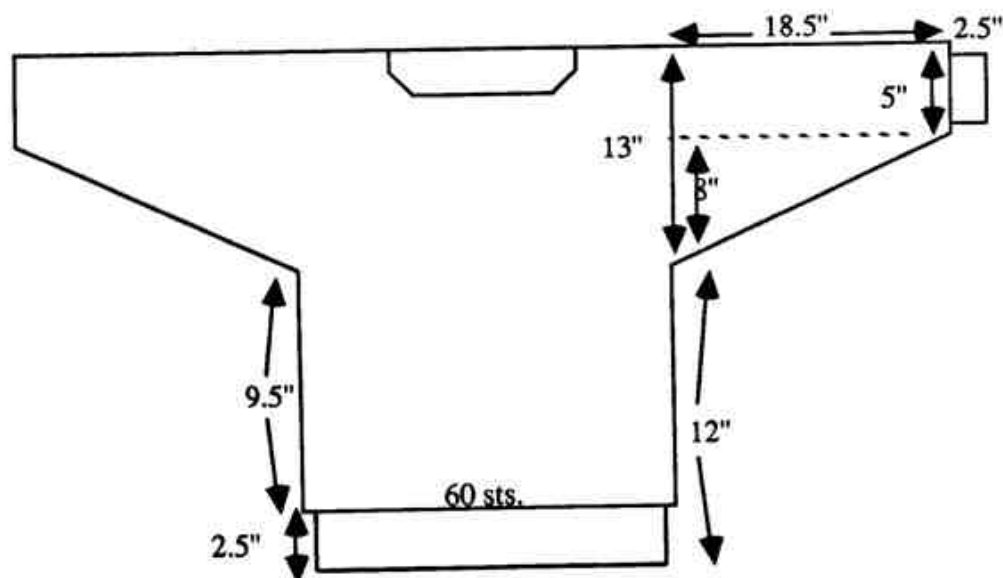
Pick up 60 stitches on last row of ribbing, on purl side (wrong side of work) with size 10 1/2 needles and work in stockinette stitch. Repeat front instructions making sure to reverse all shapings for the second part. When armhole is 8 inches, bind off shoulder same as back.

DOLMAN SWEATER

Many people have shown interest in the dolman sweater. There are several ways of making a dolman.

1. The easiest is to construct it in 4 pieces--back, front, and 2 sleeves. The sweater here is actually nothing more than a wide sleeve drop shoulder. All the principles apply. No caps for the sleeves. No underarm shaping for the body. The main difference is that the sleeve is very wide and the underarm must be deep enough to accomodate it. At this point you certainly know enough to do this yourself.

2. The next easy way is to construct a dolman in 2 pieces--front and back. The sleeves are knitted together with the front and with the back of the sweater. When knitting is done, the shoulder seam continues down the arm to the wrist, and the body seam works up to the underarm and then down the underpart of the sleeve to the wrist.



34--Dolman Sweater

The only measurement different on this sweater is the upper arm. We will make it 26 inches or 13 inches for the front and 13 inches for the back. Remember this is like a wide arm, drop shoulder. Normally the underarm for a drop shoulder size 40 chest would be 8 inches. Here we will make it 13 inches, or 5 inches longer. Normally, as a drop shoulder, this sweater would have been 17 inches from underarm to the start. In this case it will be 17 inches less the 5 inches that have been taken up by the longer armhole. So we begin:

Back: Cast on 60 stitches on size 8 needles and rib K1, P1 for 2 1/2 inches. Change to size 10 1/2 needles and stockinette stitch. When work measures 12 inches, begin to form sleeves.

Here we have to create the sleeves by casting on stitches. Before we can do anything, we must know the length of the sleeve. If you recall, our regular 18 inch sleeve in our first round neck set in sleeve sweater, had become 21 inches long for a drop shoulder sweater of the same size. Since the sleeve is being knitted up in the same direction as the body of the sweater, we have to wait for the front and back to be finished and assembled before we can pick up stitches around the cuff to do the ribbing. This means that instead of casting on enough stitches to create a 21 inch sleeve, we are going to cast on 21 - 2 1/2 inches for ribbing or 18 1/2 inches. This represents $18.5 \times 3 = 55.5$ stitches or 56 stitches. We will need to cast on that many stitches on each side for both sleeves. But we do not want to cast them on at one time.

Let's see what we know.

The wrist is 10 inches around. This means 5 inches for the front piece and 5 inches for the back piece. The armhole is 26 inches or 13 inches for the front and 13 inches for the back. As we cast on, we must reduce the opening of the sleeve to bring it from 13 inches at the underarm to 5 inches at the wrist. That means that we must make all our cast ons or increases within the 13 inch armhole depth less the 5 inches for the wrist. $13 - 5 = 8$ inches.

8 inches converts into 8 inches \times 4 rows (gauge) = 32 rows. We now have 32 rows in which to place 56 stitches. We cast on stitches at the end of a row so that we can only cast on every other row. This means that even though we have 32 rows in which to place our cast ons, we must make them all in $32 \div 2$ or 16 steps on each side.

Please note that here the number of stitches is greater than the number of rows for cast ons. The principle does not change. We take here the larger number (stitches) and divide by number of cast ons (the smaller number). We then adjust our findings to use up all left over stitches. $56 \text{ stitches} \div 16 = 3$ and we are left with 8 stitches. Since we do not wish to overlook these 8 stitches, we will dispose of them. Try to visualize our cast ons in 16 groups of 3.

3--3--3--3--3--3--3--3--3--3--3--3--3--3--3--3

Then add 1 stitch to the first 8 to use up the 8 left over stitches.

(3+1)--(3+1)--(3+1)--(3+1)--(3+1)--(3+1)--(3+1)--(3+1)--3--3--3--3--3--3--3--3

So now you continue:

Both sleeves get started and are worked up together. Cast on 4 stitches at the end of the next 16 rows and cast on 3 stitches at the end of the next 16 rows. Work even for following 5 inches (wrist opening). Bind off all stitches.

FRONT

The front is identical to the back except for the neck shaping.

Round neck: The neck starts 2 inches short of shoulder or armhole less 2 inches. We can also use 2 inches short of wrist. We know back of neck is 7 inches or 21 stitches made even at 20 stitches. We also know that the body of the sweater is 60 stitches wide while we cast on 56 stitches on each side for sleeves. This makes a total of $56 + 60 + 56$ or 172 stitches. We know that we will bind off center 14 stitches and then decrease 3 times on each neck edge. The round neck is the same as for other style sleeves. The larger number of stitches is the main difference. The question here is how many stitches to work up before we reach the bind off point. We know the answer already. We covered this principle at the start.

Total number of stitches less number of stitches for bind off divided in 2 (half for one sleeve and half for the other)

$$\frac{172 - 14}{2} = \frac{158}{2} = 79 \text{ stitches}$$

So it follows:

When sleeve is 3 inches high at wrist, (11 inches at underarm) work 79 stitches. With a second ball of yarn bind off 14 stitches and work remaining 79 stitches. Decrease 1 stitch each neck edge every other row 3 times. Work even until wrist is 5 inches high. Bind off all stitches.

Square neck: The bind off here is the full 20 stitches, not 14 as for round neck. So it becomes $172 - 20 = 152 + 2 = 76$ stitches.

When sleeve is 3 inches high at wrist, work 76 stitches. With second ball of yarn, bind off 20 stitches and work remaining 76 stitches. Work even until wrist is 5 inches high. Bind off all stitches.

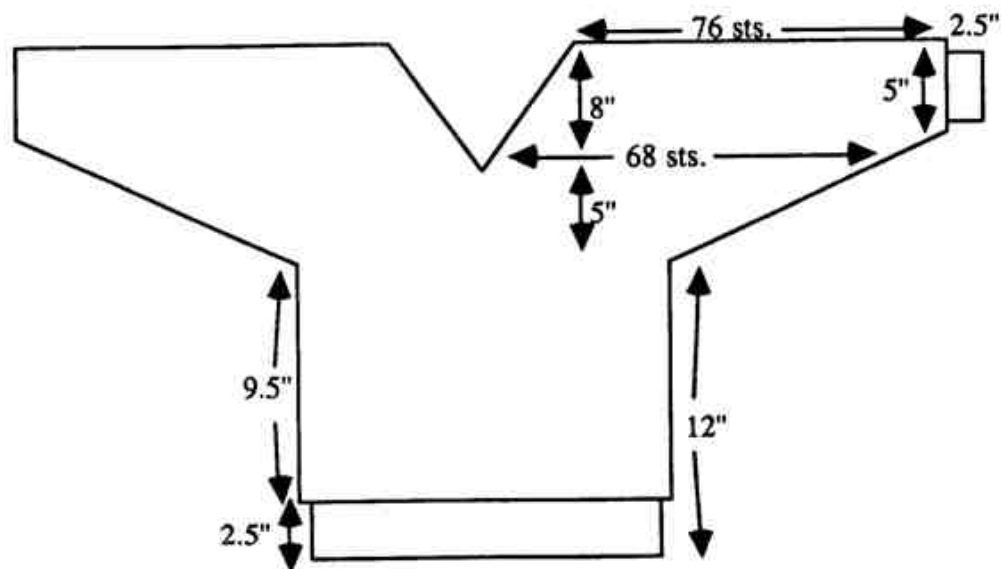
V Neck: We must determine here at which point our neck will start in the midst of cast ons. Let's assume a traditional V neck 8 inches deep. What we need to find out is how many cast ons have already been made by the time we must start our neck. We need to know how many stitches are already on our needles.

Our armhole is 13 inches deep, but our V neck is only 8 inches deep so 13 inches less 8 inches = 5 inches. Our armhole will already be 5 inches deep at the time we must begin our V neck. 5 inches X 4 rows per inch = 20 rows. In these 20 rows we have cast on 4 stitches every other row (at end of every row) 8 times and 3 stitches every other row (at end of every row) 2 times. $(4 \text{ stitches} \times 8 = 32) + (3 \text{ stitches} \times 2 = 6 \text{ stitches}) = 38$ stitches for each side. We know that we cast on 60 stitches for the body so we now have $38 + 60 + 38 = 136$ stitches on our needles. From here on it is easy. The V neck starts in the middle $136 + 2 = 68$ stitches and is 20 stitches wide. So it follows:

When armhole is 5 inches deep (20 rows), work 68 stitches. With a second ball of yarn work remaining 68 stitches. Decrease 1 stitch each neck edge every 2 rows 4 times and decrease 1 stitch each neck edge every 4 rows 6 times. **AT THE SAME TIME:** be sure to continue to cast on for sleeves. When wrist is 5 inches deep, bind off all stitches.

All other necks are now easy to work out. There is no need for us to cover them here.

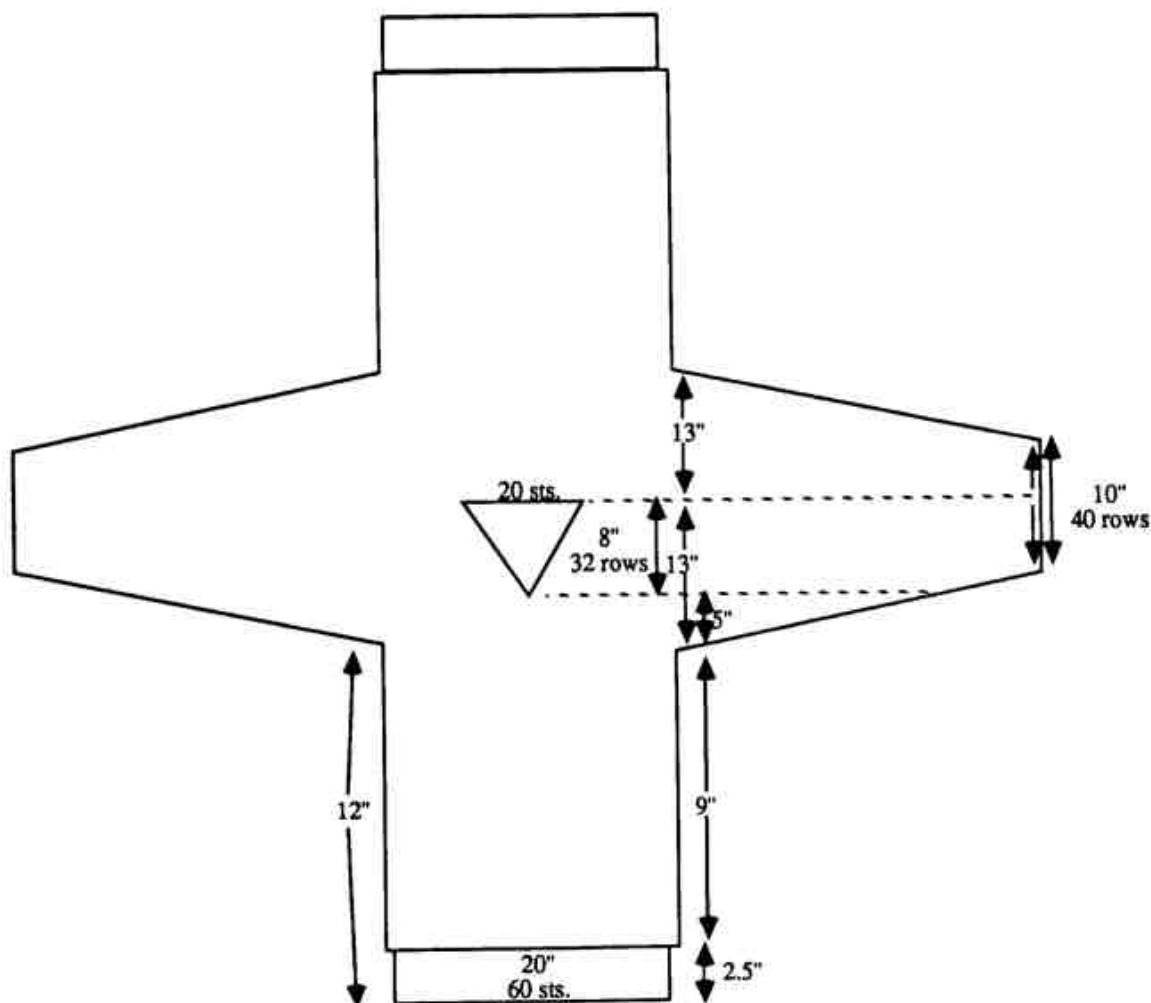
When both pieces are woven or sewn together, pick up 30 stitches around the wrist on size 8 circular needles and rib K1, P1 for 2 1/2 inches. Bind off.



35--2 Piece V Neck Dolman

ONE PIECE DOLMAN (FRONT TO BACK)

We now come to the dolman sweater in one piece. This sweater will be knit starting with the front ribbing and working up, shaping the sleeves, the neck and then working down the back to the ribbing.



36--One Piece Dolman

ONE PIECE V NECK DOLMAN

The work starts exactly like the 2 piece dolman. We begin as before:

Cast on 60 stitches with size 8 needles and rib K1, P1 for 2 1/2 inches. Change to size 10 1/2 needles and stockinette stitch. Work even until piece measures 12 inches. Begin to shape sleeve by casting on 4 stitches at the end of the next 16 rows and then casting on 3 stitches at the end of the next 16 rows. **AT THE SAME TIME:** When armhole is 5 inches (20 rows) work 68 stitches. Decrease 1 stitch each neck edge every 2 rows 4 times and decrease 1 stitch each neck edge every 4 rows 6 times. Be sure to continue to cast on for sleeves at same time you shape neck.

Up to this point the 2 piece dolman and the one piece dolman are identical. The main difference will be with the back. The 2 piece dolman back was knit up from rib to shoulder. The one piece will be worked down from the shoulders to the rib. This means that instead of casting on for our shapings we now have to bind off making sure to match the front shapings.

The difference starts here. To begin the back, we must close the back of neck. We had cast on 56 stitches for each sleeve and 60 for the back ($56 + 56 + 60 = 172$ stitches). We know the back of neck is 20 stitches so on each side of neck at shoulder height we must have $172 - 20 + 2 = 76$ stitches. It follows:

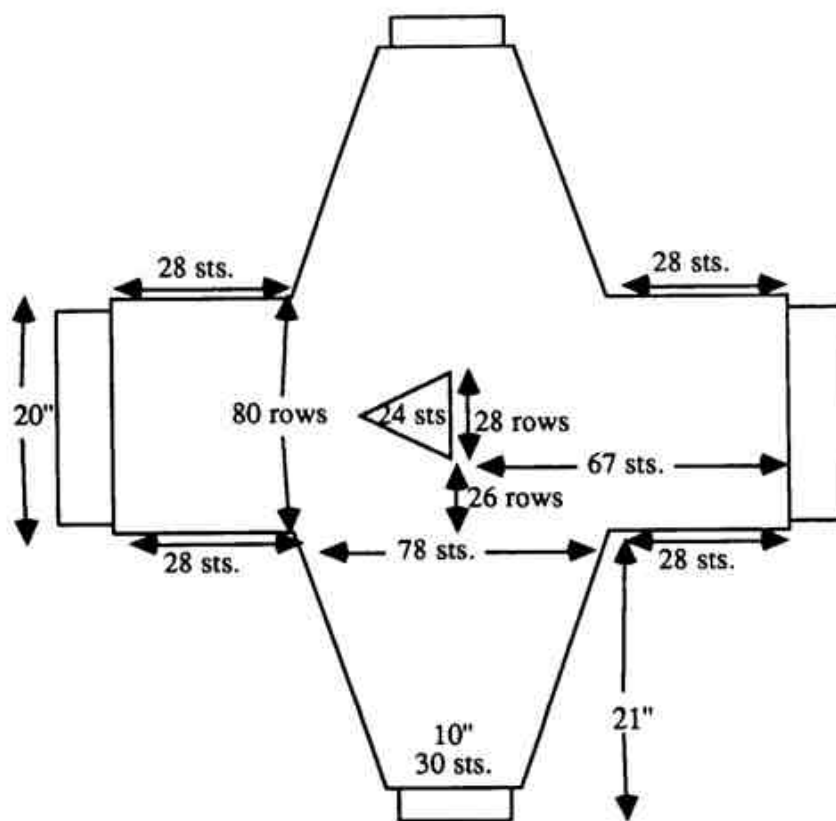
When work measures 25 inches (armhole is 13 inches) (all neck shapings are done) work 76 stitches. Cast on 20 stitches for back of neck and work remaining 76 stitches. Work even for 5 inches (depth of wrist for back). Bind off 3 stitches at the beginning of next 16 rows. Bind off 4 stitches at beginning of next 16 rows. Work even for $9\frac{1}{2}$ inches ($12 - 2\frac{1}{2}$). Change to size 8 needles and rib K1, P1 for $2\frac{1}{2}$ inches. Bind off all stitches.

We now pick up 30 stitches on size 8 needles around wrist and finish cuffs by ribbing K1, P1 for $2\frac{1}{2}$ inches. Bind off.

There is no need to cover other neck shapings here. If you have gotten this far, you certainly can work them out.

ONE PIECE SIDE TO SIDE DOLMAN

We are now going to make a dolman sweater in one piece knit from side to side. I would like you to recall the dolman knit in one piece from front to back as well as the dolman knit in 4 pieces.



37--Side To Side Dolman

We will start this garment at one wrist and work across to the opposite wrist. The first sleeve is worked exactly as that of the dolman in 4 pieces--that is, just like a wide sleeve drop shoulder. So we begin:

Cast on 30 stitches with size 8 needles and rib K1, P1 for 2 1/2 inches. Change to size 10 1/2 needles and stockinette stitch.

The sleeve is 26 inches wide or 78 stitches wide. We want to increase $78 - 30 = 48$ stitches, 24 on each side. The sleeve is 21 inches long. For a dolman, the increases can be placed, after the ribbing all the way to the end of sleeve. This means that we have 21 inches less 2 1/2 inches of ribbing in which to place our increases. $21 - 2\frac{1}{2} = 18\frac{1}{2}$ inches. $18\frac{1}{2} \text{ inches} \times 4 \text{ rows per inch} = 74 \text{ rows}$. We therefore have 24 stitches on each side to increase in 74 rows.

$74 \div 24 = 3$ rows and 2 rows are left over. This means 22 increases every 3 rows and 2 increases every 4 rows. It follows:

Increase 1 stitch each end every 2 rows 22 times and increase 1 stitch each end every 4 rows 2 times.

At this point we must cast on for the body of sweater. When we did the one piece dolman front to back, we cast on to add the sleeves. Since we started here with a sleeve we now cast on to add the body. The main difference is that the body is added on in one cast on while the sleeves required several cast ons to achieve a slope. Note that here too the ribbing of the newly cast on pieces will be done after the pieces are finished.

From bottom to underarm measures 12 inches. Take away 2 1/2 inches of ribbing (to be mounted later) and you are left with 9 1/2 inches or 28 stitches to cast on each side of sleeve to create front and back. It follows:

Cast on 28 stitches at the end of the next 2 rows.

We now want to work even for 20 inches or 1/2 the chest measurement. At the same time we want to shape our neck. At this point we must note that we have reversed the roles of the stitch and the row. 20 inches for the width of the front is no longer 60 stitches but it now becomes 80 rows. The back of neck will no longer be 20 stitches wide but 28 rows wide. Before shaping the neck we must work 80 rows of body less 28 rows + 2 or 52 rows + 2 = 26 rows. (see picture 37)

Work even for 26 rows.

The back of neck must start in middle of row. We have $28 + 78 + 28$ stitches on our needle (134 stitches), so the back of neck starts at $134 \div 2$ or 67 stitches.

Then work 67 stitches. With second ball of yarn work remaining 67 stitches.

Remember now that stitches have taken the place of rows and vice versa. Back of neck is 28 rows wide and V neck is 8 inches \times 3 stitches per inch or 24 stitches deep. We have to eliminate 24 stitches on one side of neck and then cast on 24 stitches on opposite side of neck to create V. Since back of neck is 28 rows, that leaves 14 rows for each side. Bind off must be made at beginning of rows only, so that for neck shaping this means that these will be made every other row. In 14 rows, we could therefore have only $14 \div 2 = 7$ bind offs. $24 \text{ stitches} \div 7 = 3 \text{ stitches}$ and 3 stitches are left over. Let's look at what we have:

3--3--3--3--(3 + 1)--(3 + 1)--(3 + 1)
 This should look familiar. It follows:

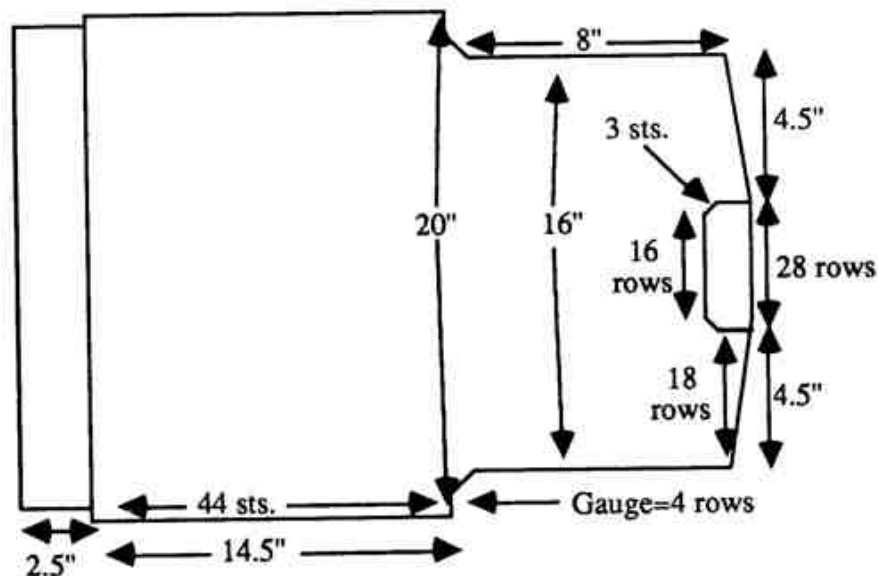
Bind off on neck edge, 4 stitches every other row 3 times and bind off 3 stitches every other row 4 times. Then cast on at neck edge 3 stitches every other row 4 times and cast on 4 stitches every other row 3 times. Make sure to work back of neck straight. At this point resume working with one ball of yarn. When body measures 80 rows wide (20 inches) bind off 28 stitches at beginning of next 2 rows. Now shape the second sleeve by reversing order of first sleeve.

Decrease 1 stitch each end every 4 rows 2 times and decrease 1 stitch each end every 2 rows 22 times. Change to size 8 1/2 needles and rib K1, P1 for 2 1/2 inches. Bind off remaining 30 stitches.

To finish the sweater we weave or stitch side and sleeves together. We then pick up 60 stitches for the front and 60 stitches for the back and we rib K1, P1 on size 8 circular needles for 2 1/2 inches. Then bind off.

PULLOVER VEST KNIT SIDEWAYS

We actually know how to do this. Instead of casting on at ribbing or bottom, we will start at side of sweater. Length to underarm is 17 inches. Ribbing measures 2 1/2 inches. Since ribbing must be done after all pieces are knitted up, we deduct these 2 1/2 inches from the 17 inch length of the sweater. That leaves 17 inches less 2 1/2 inches = 14 1/2 inches.



38--Pullover Vest Knit Sideways

14 1/2 inches X 3 stitches per inch = 43.5 or 44 stitches. We start:

Cast on 44 stitches on size 10 1/2 needles.

Note we use larger needle.

Work even for 4 rows.

This is 1 inch or gauge. We must create a slope for underarm shaping one inch wide and then we must cast on enough stitches to create an 8 inch deep armhole. It follows:

Increase 1 stitch on arm side every other row 2 times. Cast on ({8" - 1" for slope} X 3 stitches/inch = 7 X 3 = 21) 21 stitches at end of row on arm side.

Let's stop here and see what we know. Shoulders are 16 inches wide across the back. The back of neck is 7 inches. 16 less 7 = 9 inches or 4 1/2 inches for each shoulder. In our regular pullover sweater this size has each shoulder bound off in 2 steps. Since we do not bind off here to shape shoulders we will shape shoulders in 2 steps each as follows.

The shoulders are 4 1/2 inches deep each or 4.5 X 4 rows = 18 rows. That means 18 + 2 = 9 rows represent the size of the steps we will create.

Work even for 9 rows. Increase one stitch at shoulder edge one time and work even for 9 more rows.

Back of neck is 7 inches wide or 7 X 4 = 28 rows. So:

Work even for 28 rows. Decrease 1 stitch on shoulder every ninth row one time. When sweater is 16 inches across the shoulders (64th row) bind off 21 stitches. Decrease 1 stitch on armside every other row 2 times. Work even for 4 rows. Bind off remaining 44 stitches.

FRONT

This piece is identical to the back with the exception of a neck shaping. The front works up as follows:

Cast on 44 stitches with size 10 1/2 needles. Work even for 4 rows. Increase 1 stitch on arm side every other row 2 times. Cast on 21 stitches at end of row on arm side. Work even for 9 rows. Increase one stitch at shoulder edge one time and work even for 9 more rows.

Neck shaping starts here. We must bind off on shoulder side one inch or 3 stitches. We must also decrease 1 inch more to create a gradual slope.

Bind off 3 stitches at beginning of row on shoulder side. Decrease 1 stitch every 2 rows 3 times on shoulder side.

We must now work even for 28 rows of back of neck less (6 X 2) rows or 28 - 12 = 16 rows.

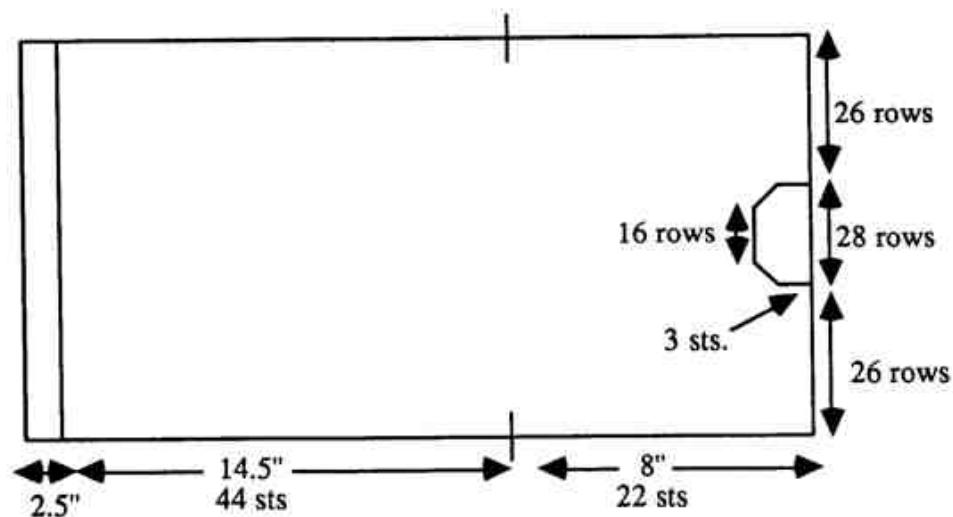
Work even for 16 rows. Increase 1 stitch on neck edge every 2 rows 3 times. Cast on 3 stitches at end of row on neck edge. Work even for 9 rows. Decrease 1 stitch on shoulder edge then work even for 9 more rows. Bind off 21 stitches at beginning of row on arm side. Decrease one stitch on arm side every other row 2 times. Work even for 4 rows. Bind off all 44 remaining stitches.

Ribbing is picked up after work is assembled.

There is no need here to demonstrate other necks. Once we understand the principle it becomes easy to apply it. See dolman sweater knit sideways for a hint if needed.

DROP SHOULDER VESTS SIDEWAYS

These are done without any shapings for armholes and shoulders. Cast on takes into consideration the length of armhole. The principles are the same.



39--Drop Shoulder Vest Knit Sideways

SWEATER KNIT FROM THE NECK DOWN

This sweater is a take off on the raglan sweater. The idea is that instead of doing each part separately, all 4 parts (front, back, & sleeves) have to be knit up simultaneously. Also, instead of starting at the bottom of the sweater, we cast on at the neck. What this means is that we should first chart the pattern for a regular raglan sweater and then set about to rewrite our instructions piecing the 4 parts together as the work develops.

Let's reconstruct the round neck raglan pullover and let's write all the pieces (back, front, & sleeves) in adjacent columns.

BACK

Cast on 60 sts. on size 8 needles. Rib K1, P1 for 2 1/2 inches. Change to 10 1/2 needles & stockinette stitch. Work even until piece measures 17 inches. Bind off 3 stitches at beginning next 2 rows. Decrease 1 stitch each end every 4 rows 2 times. Decrease 1 stitch each end every 2 rows 15 times. Bind off remaining 20 stitches for back of neck.

SLEEVE

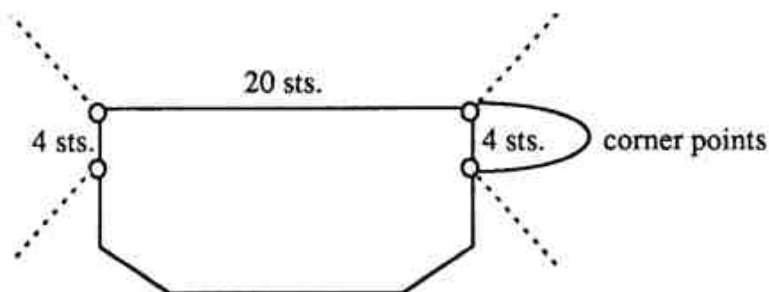
Cast on 30 sts. on size 8 needles. Rib K1, P1 for 2 1/2 inches. Change to 10 1/2 needles & stockinette stitch. Increase 1 stitch each end every 7 rows 6 times and increase one stitch in the 8th row 1 time. Work even until sleeve is 18 inches. Bind off 3 stitches at the beginning of the next 2 rows. Decrease 1 stitch each end every 4 rows 2 times. Decrease 1 stitch each end every 2 rows 15 times. Bind off remaining 4 stitches.

FRONT

Cast on 60 sts. on size 8 needles. Rib K1, P1 for 2 1/2 inches. Change to 10 1/2 needles & stockinette stitch. Work even until piece measures 17 inches. Bind off 3 stitches at beginning of next 2 rows. Decrease 1 stitch each end every 4 rows 2 times. Decrease 1 stitch each end every 2 rows 15 times. At the same time shape neck on row 31 of armhole (after 13th decrease). Work 7 stitches. With second ball of yarn, bind off 14 center stitches and work remaining 7 stitches. Decrease 1 stitch on each neck edge every other row 3 times. This disposes of all sts.

What we need to do here is to build this sweater backwards and to do all the pieces at one time and together. The back of neck has 20 stitches. Each sleeve ends with 4 stitches, and the front ends with no stitches left on each side of neck. Total of 28 stitches. Remember, this type of sweater is knit on circular needles. Also, because we start at the neck, on a round neck, the first 2 inches of work will be knit by going back and forth until we close the front and then we will work round and round.

We have to establish 4 corner points on either side of which we will place our increases to shape raglan. This represents the raglan seams in a regular raglan sweater.



40--Sketch XY of Raglan Cast On & Corner Points

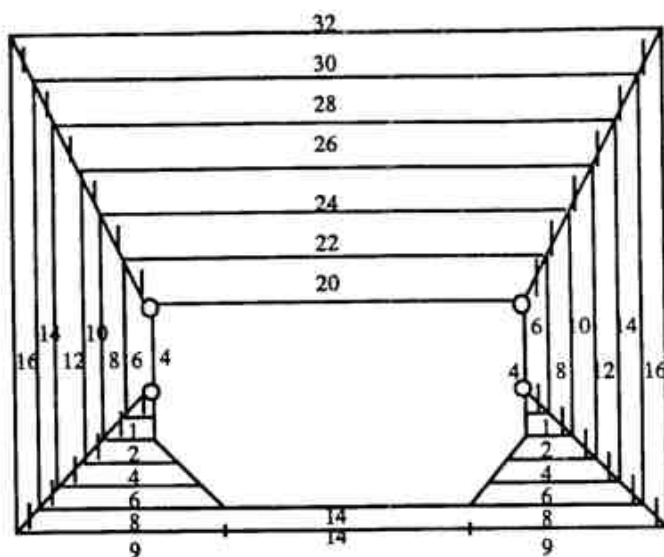
So we begin.

Cast on (4 + 20 + 4 + 4 corner points) 32 stitches on 10 1/2 circular needle.

For our raglan we decreased one stitch each end every 2 rows 15 times on the sleeves, and back, and front. On this sweater from neck down we must do the reverse and increase the above amount. So the sleeve will become 4 then 6 then 8, etc. and the back will become 20 then 22 then 24, etc. and the front neck on either side will become 1 + 1 then 2 + 2, etc.

Remember we will have to shape the neck. The neck is 2 inches deep. We need 5 rows to create slope on neck and we have 8 rows in 2 inches. First 3 rows here are worked straight down. In next 5 rows we create slope.

Work in stockinette stitch. Knit the first row as follows: Increase 1 stitch, work one corner stitch, increase 1 stitch, work 4 stitches. Increase 1 stitch, work one corner stitch, increase 1 stitch, work 20 stitches. Increase 1 stitch, work one corner stitch, increase 1 stitch, work 4 stitches. Increase 1 stitch, work one corner stitch, increase 1 stitch. (Total of 40 stitches.) **Purl back.**



**41--Sketch of Raglan Cast On,
Corner Points, & Increases**

Please note that from here on XOX is equivalent to "Increase 1 stitch, work 1 corner stitch, increase 1 stitch".

We now work 1 stitch (knit)

XOX work 6 stitches.

XOX work 22 stitches.

XOX work 6 stitches.

XOX work 1 stitch.

Purl back (48 stitches).

At this point we must shape the neck. We begin to increase on neck edge. We must do this 3 times.

1. Increase 1 stitch. Work 2 stitches.

XOX work 8 stitches.

XOX work 24 stitches.

XOX work 8 stitches.

XOX work 2 stitches.

Increase 1 stitch. (58 stitches). Purl back.

2. Increase 1 stitch. Work 4 stitches.

XOX work 10 stitches.

XOX work 26 stitches.

XOX work 10 stitches.

XOX work 4 stitches.

Increase 1 stitch. (68 stitches). Purl back.

3. Increase 1 stitch. Work 6 stitches.

XOX work 12 stitches.

XOX work 28 stitches.

XOX work 12 stitches.

XOX work 6 stitches.

Increase 1 stitch. (78 stitches). Purl back.

Cast on 14 stitches for center of neck and from here on work round and round.

We have to continue to increase on each side of corner points every 2 rows (15 times less 4 times already done) or 11 more times.

Work 8 stitches.

XOX work 14 stitches.

XOX work 30 stitches.

XOX work 14 stitches.

XOX work 30 stitches.

Front of neck is closed here.

10 more times every other row.

XOX work 16 stitches.

XOX work 32 stitches.

XOX work 16 stitches.

XOX work 32 stitches.

108 stitches.

Note that all XOX should fall under one another while stitch numbers to be worked between XOX's will increase by 2 after each repeat.

For example: 2 -- 8 -- 24 -- 8 -- 2
 4 --10 -- 26 --10 -- 4
 6 --12 -- 28 --12 -- 6

We now need to continue to repeat this increasing procedure 9 more times every other row. We then will have to repeat it 2 more times every 4th row. By then we will have 188 stitches on our

needle. At this point we need to shape our sleeve and body bind offs and to work the body (front and back) in one piece.

At this point, we work 54 stitches for the front. We cast on 6 stitches (bind offs in normal sweater). We place 38 stitches plus 2 stitches for corner points on a holder for first sleeve. We work 54 stitches for the back (we have created one armhole). We cast on 6 stitches for second armhole and place 38 stitches plus 2 stitches for other corner points on a holder (second sleeve). We now work the body round and round for 14.5 inches. We then change to smaller needles and rib for 2.5 inches. Then we bind off.

To Shape Sleeves:

We go back to pick up 40 stitches from first holder. We would need to cast on 6 stitches to make up for the 3 stitch bind off we normally would do on each side of sleeve. But let's remember that we were left with 2 extra stitches (corner points) on each sleeve. So we will cast on only 4 stitches on each sleeve and we will work the 44 stitches on round needles doing each sleeve separately so as not to have seams and making sure to reverse all shapings, decreasing where we may have increased in a regular sleeve.

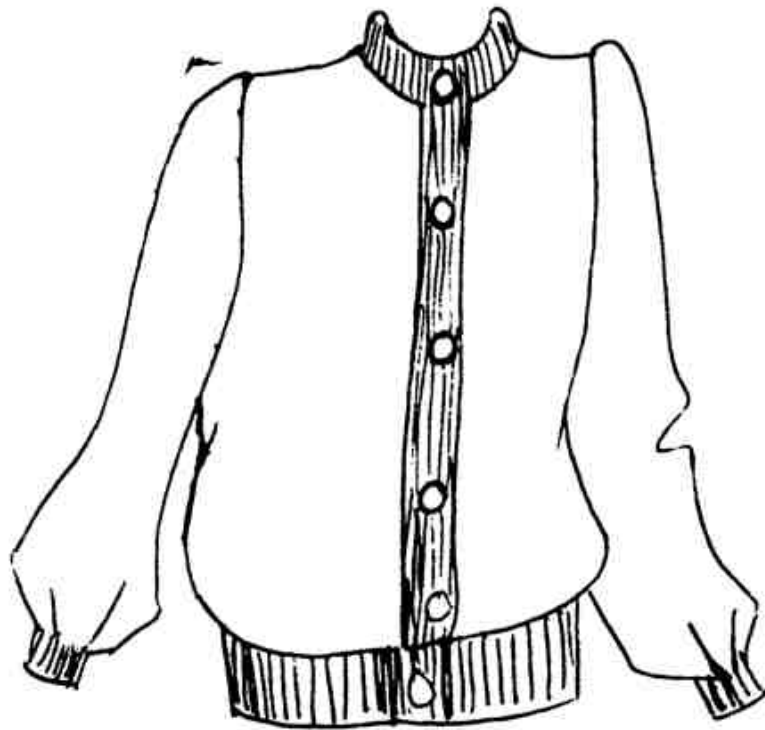
We are done with only neck finishing and a 2 inch seam in underarm left to complete this raglan pullover made from the neck down.

The principles covered here apply to other necks. There is absolutely no need to cover them. It is for you to figure out. I know you are up to it by now.

CARDIGANS

We will now cover a new idea. We have learned to chart pullovers. We will now learn to chart cardigans.

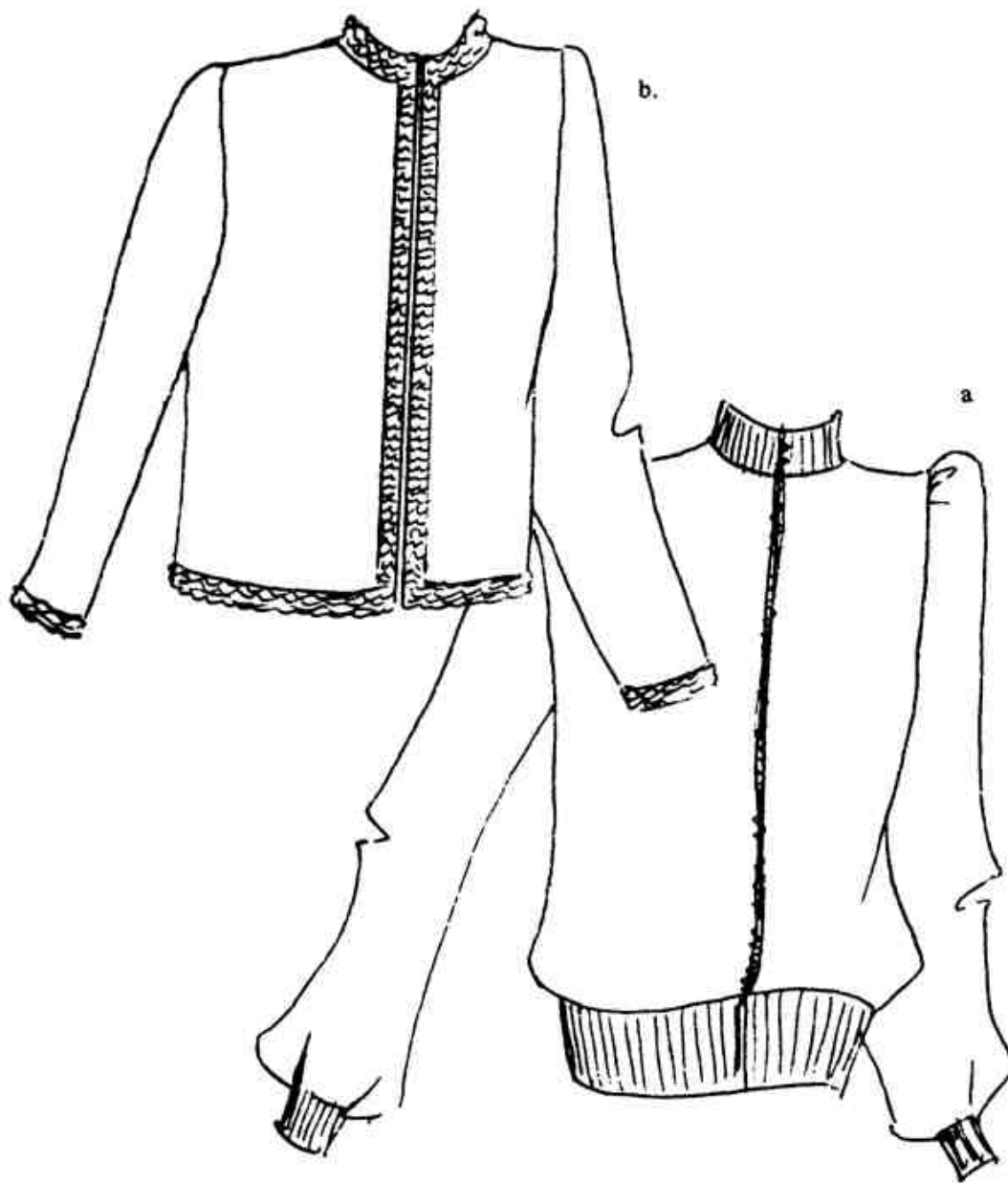
You may be surprised to hear that you already know how to chart the backs and sleeves of cardigans in a multitude of styles. These parts of cardigans are identical to those of pullovers. The differences are in the front.



42--Closed Cardigan

There are basically 2 types of fronts.

1. Regular or buttoned cardigans. This means that the front panels overlap.
2. Open cardigans. The edges of front panels fit flush. Here we have 2 groups.
 - a. Closed with a zipper.
 - b. No closure -- usually done without rib.



43--Open Cardigans

OPEN CARDIGAN

Let's start with the open cardigans. The basic difference between the two types of open cardigans is in the finishing and in the fact that one has ribbing and not the other. All the numbers and calculations are identical. The only thing to remember is that we are taking the same number of stitches used in the back and breaking it in two; 1/2 for front right panel and 1/2 for front left panel.

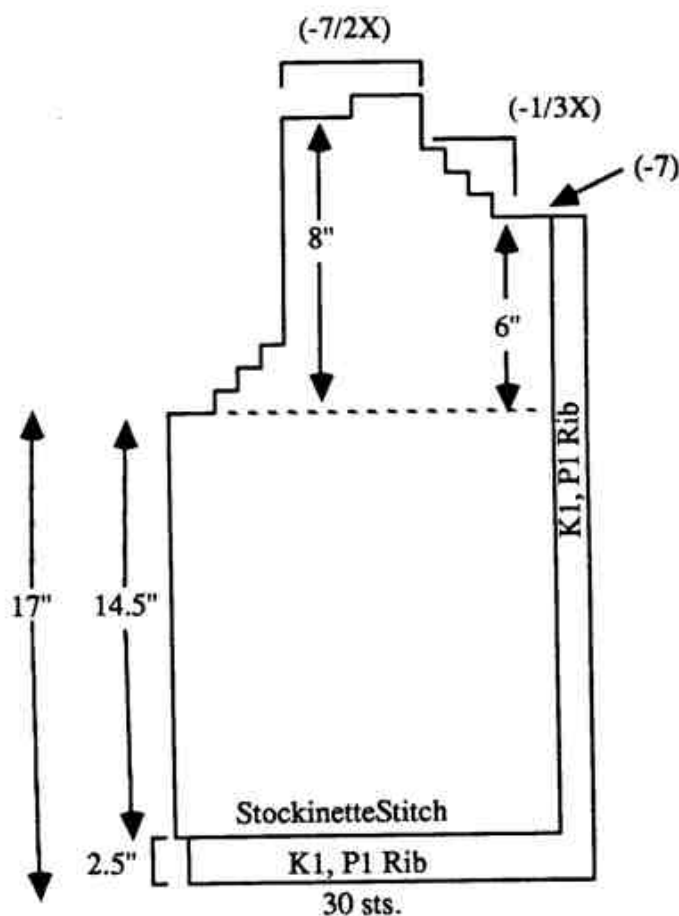
Round Neck Open Cardigan

For a round neck open cardigan (with zipper) it follows:

Front: Cast on 30 stitches on size 8 needles. Rib K1, P1 for 2 1/2 inches. Change to 10 1/2 needles.

In order for the front edges of sweater to lay flat, we will rib between 1 and 2 inches on the center edge, your choice. In this instance, we will rib for 4 stitches.

Work 26 stitches in stockinette stitch and rib K1, P1 for 4 stitches on center edge. Work this way until piece is 17 inches.



Remember that now we shape an armhole on one side only.

Bind off 3 stitches at beginning of row on armhole. Decrease 1 stitch every other row on armhole 3 times. Work even until armhole measures 6 inches.

At this point we shape the neck. Remember that the back of neck is 20 stitches. This means that on the front, half or 10 stitches are on the right panel and 10 stitches are on the left panel of the cardigan. On a pullover we bound off center 14 stitches and decreased 3 stitches on each neck edge for a total of 20. For the cardigan we must bind off 1/2 of 14 or 7 stitches on each panel at neck edge and decrease the other 3 stitches. This will make the panels symmetrical. It follows:

Bind off 7 stitches on neck edge and decrease on neck edge 1 stitch every other row 3 times. Work even until armhole is 8 inches. Bind off 7 stitches at armhole every other row 2 times.

Reverse all shapings for second panel.

The cardigan is now done. Just back stitch it together.

Pick up on straight needles 52 stitches evenly around the neck and rib K1, P1 for 3/4 inch. Bind off.

Had you wanted this open cardigan to be without a zipper, to have it hang straight, all you would have to do is change your instructions to say the following:

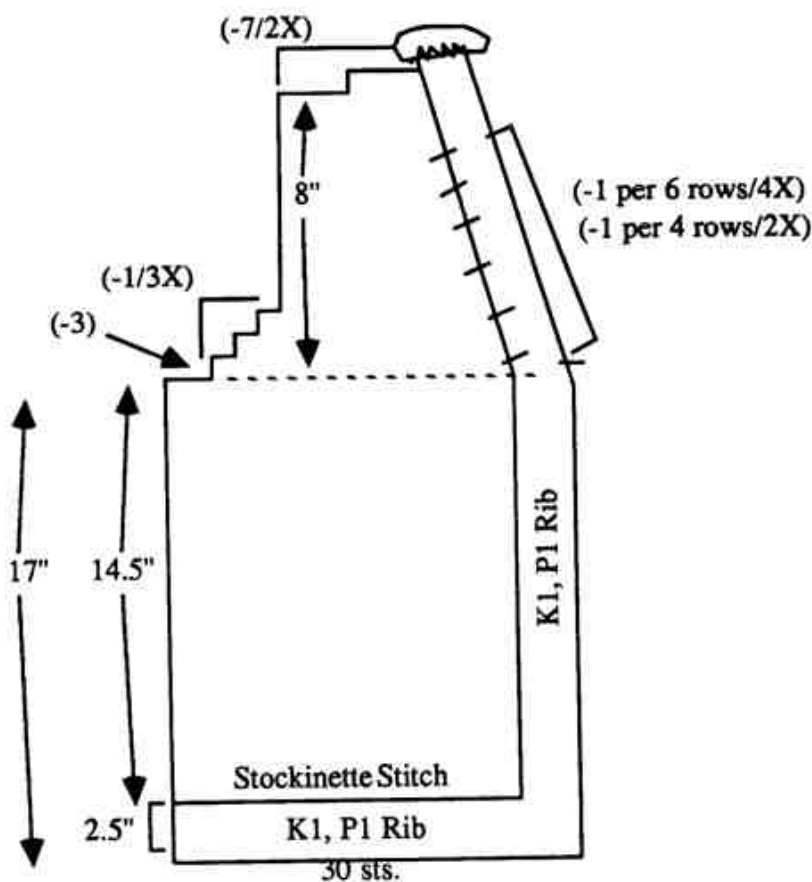
All ribbing is done in garter stitch (or any other stitch that won't pull or curl) on large (10 1/2) needles.

This cardigan can be made with all the various sleeves we studied by applying the very same principles.

OPEN V NECK CARDIGAN

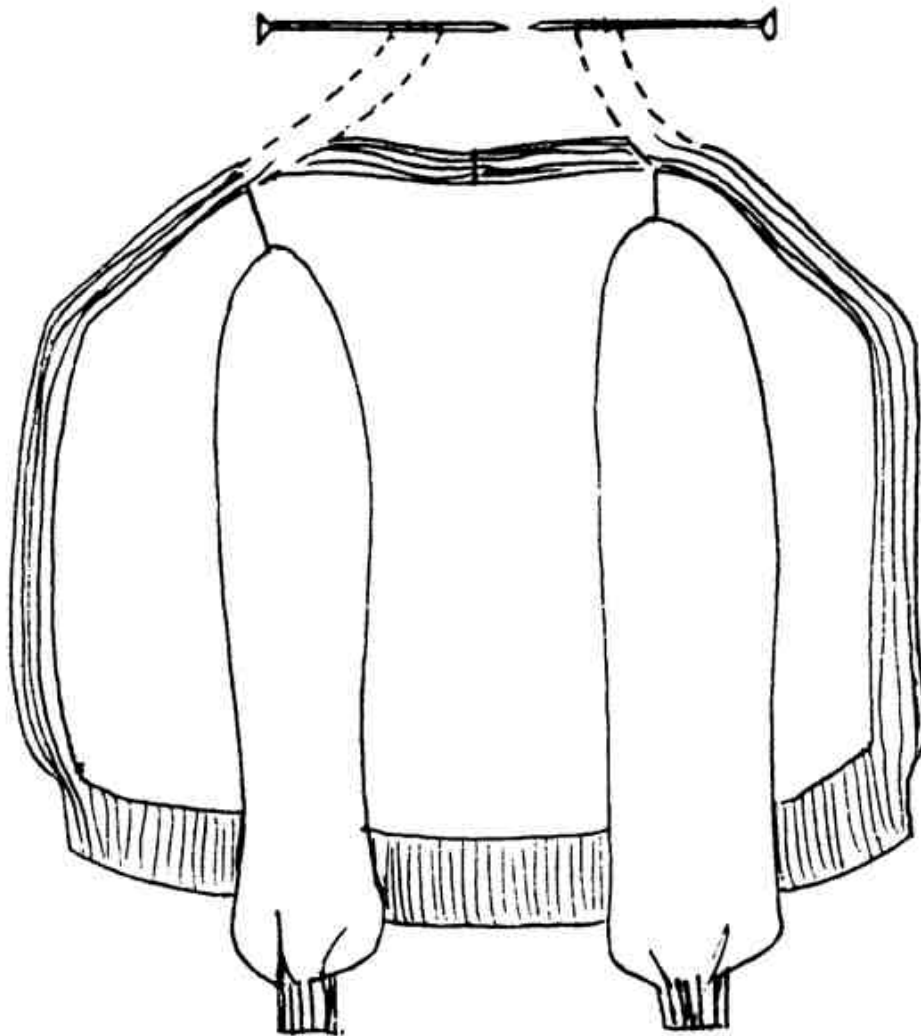
The same applies to the necks we learned to chart with the exception of the V neck. The main difference is that we do the ribbing around the neck at the same time as we work the front. We are going to bring the 4 ribbed stitches all the way to the back. The decreases will be made on the inside of the ribbing and we will decrease $\frac{1}{2}$ of the back of neck minus 4 ribbed stitches. When the shoulders will be bound off these 4 stitches will be extended on both front panels until they meet in the middle of the back of neck. Then they will be sewn down. It works as follows:

Cast on 30 stitches on size 8 needles and rib K1, P1 for $2\frac{1}{2}$ inches. Change to size $10\frac{1}{2}$ needles. Work 26 stitches in stockinette stitch and rib 4 stitches on center edge. Work even until the piece measures 17 inches. Bind off 3 stitches on armhole and decrease 1 stitch every other row on armhole 3 times. AT THE SAME TIME: On neck edge decrease 1 stitch inside of ribbing every 4 rows 2 times. Decrease 1 stitch inside of ribbing every 6 rows 4 times. (back of neck divided by 2 less rib = $20 \div 2$ less 4 = 6 times--6 decreases in 32 rows. We wish these decreases to be made on even rows--4th row 2 times and 6th row 4 times. $4 \times 2 = 8$ and $6 \times 4 = 24$ for a total of 32 rows.) When armhole is 8 inches, bind off 7 stitches on armhole 2 times. Place remaining 4 stitches on holder.



45--V Neck Open Cardigan Sketch With Data

Reverse shapings for second panel. Back stitch pieces together. Continue knitting 4 stitches of ribbing on each panel until both strips are long enough to meet in the middle of the back of the neck. Work both strips at the same time to insure the same number of rows on each side. This way they will meet perfectly in middle of back. Sew strips together and sew down to back of neck.

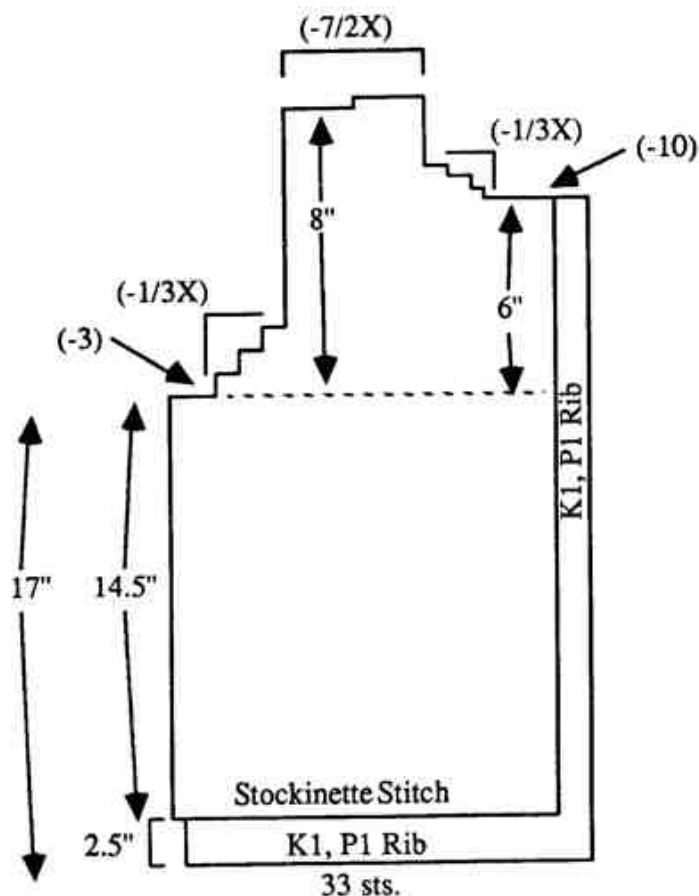


46--V Neck Cardigan Finishing

CLOSED ROUND NECK CARDIGAN

The main difference between an open cardigan and a closed cardigan is that when charting we add about 1 inch to the measurements of each of the front panels. An inch is equal to the gauge. Instead of casting on 30 stitches, for our closed cardigan front panel we will cast on 33 stitches. All this means is that when shaping the neck, we will have 3 more stitches to eliminate. It follows for a round neck:

Cast on 33 stitches on size 8 needles and rib K1, P1 for 2 1/2 inches. Change to 10 1/2 needles. Work in stockinette stitch for 29 stitches and rib remaining 4 stitches on center edge. When piece measures 17 inches, bind off 3 stitches on arm edge. Decrease 1 stitch on arm edge every other row 3 times. When armhole is 6 inches bind off 10 stitches on center edge (7 + 3). Decrease one stitch every other row on neck edge 3 times. When armhole is 8 inches, bind off 7 stitches on armhole every other row 2 times.



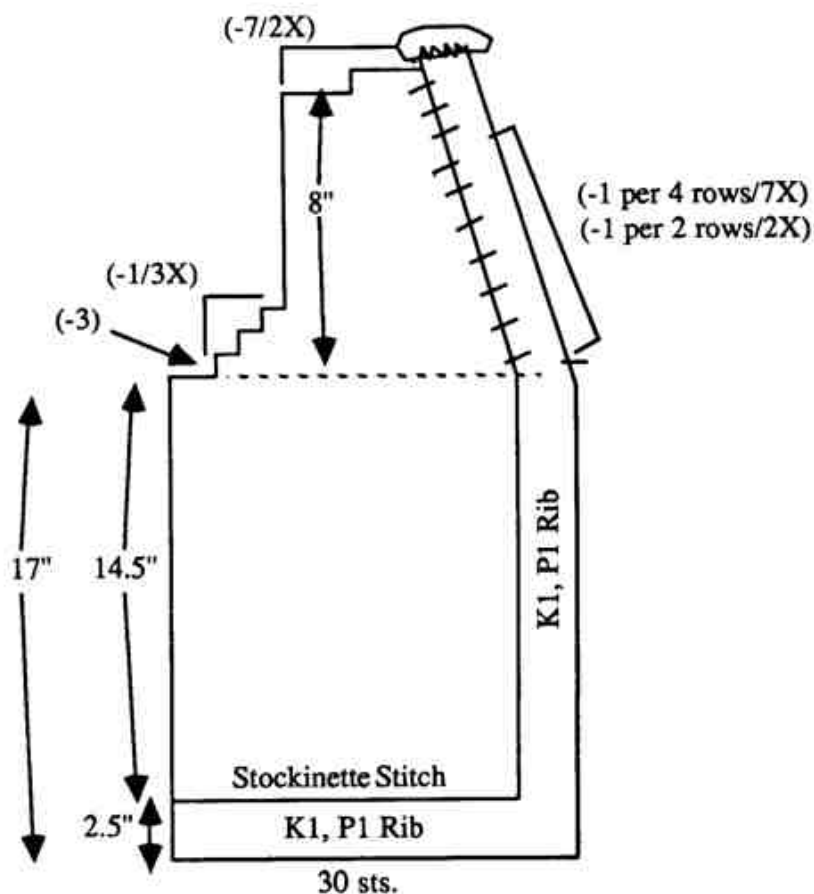
47--Closed Round Neck Cardigan Sketch With Data

V NECK CLOSED CARDIGAN

The only other style cardigan warranting an explanation here is the V neck closed cardigan. We have 3 more stitches to eliminate and so it will read as follows:

Cast on 33 stitches on size 8 needles and rib K1, P1 for 2 1/2 inches. Change to 10 1/2 needles. Work in stockinette stitch for 29 stitches and rib 4 stitches on center edge. When piece measures 17 inches, bind off 3 stitches on arm edge. Decrease 1 stitch every other row on arm edge 3 times. AT THE SAME TIME: Decrease on neck edge, on inside of ribbing, one stitch every 2 rows 2 times and decrease one stitch every 4 rows 7 times. (6 + 3 = 9 decreases.) Everything else is the same as the open V neck cardigan.

No explanations are given here on how we arrived at making our decreases every second and fourth row. But I am sure you understand the principle by now.



48--Closed V Neck Cardigan Sketch With Data

VESTS

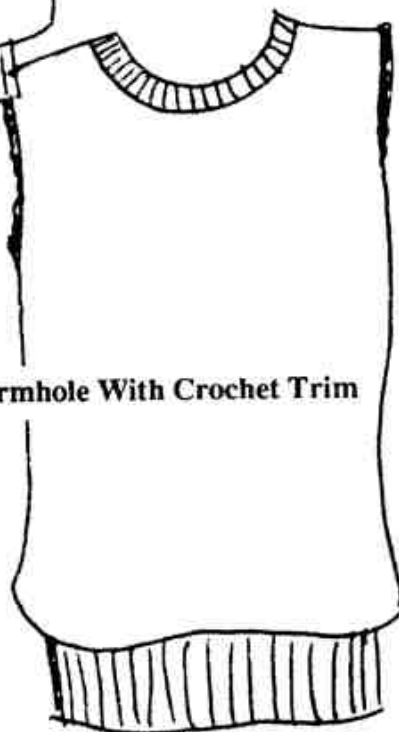
Vests are sleeveless. They can be charted as pullovers or cardigans with regular shoulders or drop shoulders. Regular shoulders imply an underarm bind off and decreases just like for a set in sleeve. A drop shoulder implies no bind off's and no decreases. They are charted exactly the same way as the sweaters with sleeves. The only difference is that we pick up stitches around the armhole and create a short rib instead of attaching a sleeve. Sometimes we may just crochet a row or two around the armhole.

So you see, you already know how to make vests.

49--Drop Shoulder V Neck Cardigan Vest With Rib Around Armhole



50--Pullover Vest With Round Neck & Shaped Armhole With Crochet Trim



YARDAGE

One of the most common problem in a yarn shop is shortage. By that I mean that a customer is sold 8 skeins for a sweater and this amount turns out to be insufficient. It is easy to understand why this happens. Most shop owners will make an educated guess at the quantity needed to knit a garment. But no matter how good one is, it is still a guess and therefore, a certain percentage of the time a mistake will be made. Please keep in mind this will have been an honest mistake. But still an expensive one, and a most aggravating one if it is compounded by the dye lot being exhausted by the time you realize the mistake. All that work and money lost.

To avoid this situation all together, I will show you how to figure out yardage. This will involve some very elementary geometry.

Before working up a swatch for your gauge, measure exactly 10 yards of the yarns you will be using for your project. Cut it off and knit all 10 yards up in the stitch pattern called for in your pattern. You will measure your row gauge and stitch gauge from this swatch.

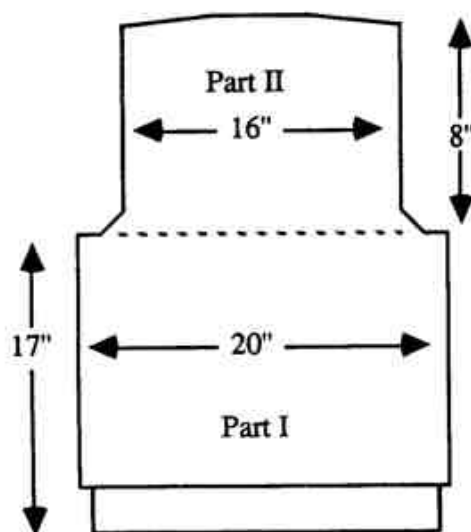
Now, to figure out the yardage, we must first determine how many square inches we were able to knit up with 10 yards. We lay the piece flat without stretching it and measure the width and the height of it. Let's say that the height was 4.5 inches and the width was 3.5 inches.

To figure out the superficie (# of square inches) of a rectangle we multiply the width by the height.
4.5 inches times 3.5 inches = 15.75 square inches.

What this tells me is that for every 15.75 square inch of sweater we want to knit, we will need 10 yards of yarn. What we need to figure out is how many square inches all together will this sweater take. So let's figure it out.

We will take as an example our very first round neck sweater. You will recall we constructed that sweater in 4 pieces. Back, front and 2 sleeves. Let's start with the back.

The back measured 20 inches across for the first 17 inches, then it measured 16 inches across shoulders for the 8 inch height of armhole. Let's make a sketch.

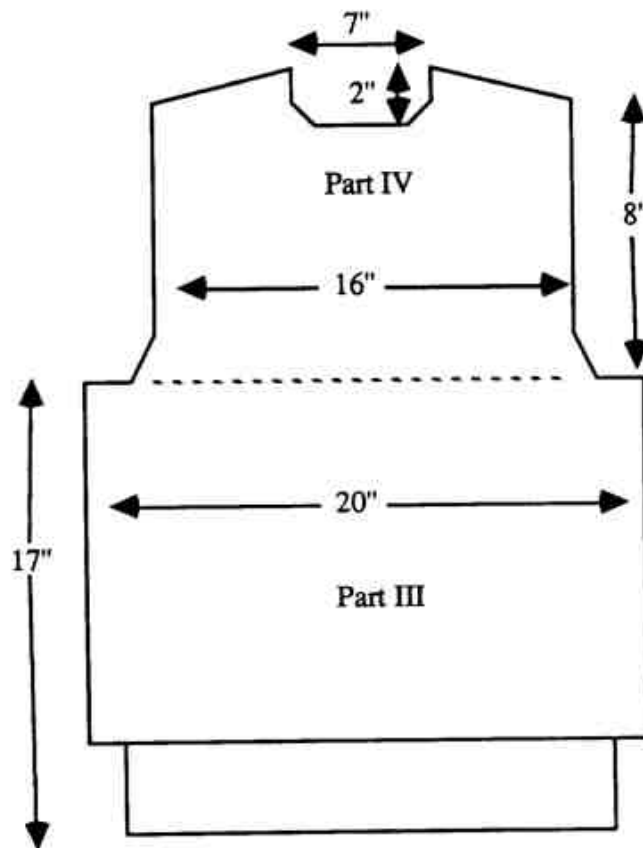


51--Back

Part I is a rectangle 20" X 17" so $20 \times 17 = 340$ square inches.
 Part II is a rectangle 16" X 8" so $16 \times 8 = 128$ square inches.

THE FRONT

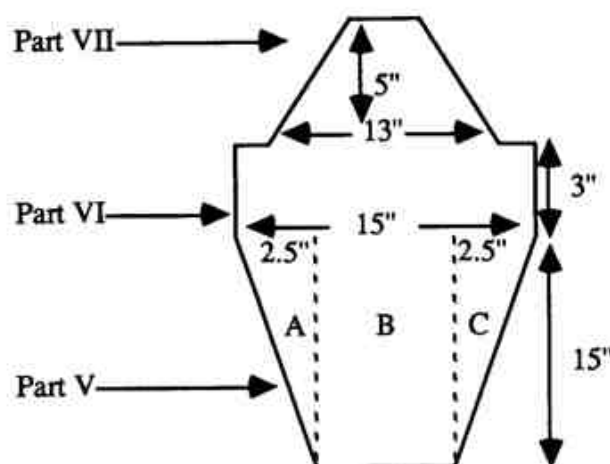
The front also measures 20 inches across for the first 17 inches, then it measures 16 inches across the shoulders for the 8 inch height of the armhole. The only difference is that we cut out a piece for the neckshaping measuring 7 inches wide by 2 inches deep.



52--Front

Part III is a rectangle 20" X 17" or $20 \times 17 = 340$ square inches.
 Part IV is a rectangle 16" X 8" from which we took out a small rectangle 7" X 2" = 14 square inches.
 $16 \times 8 = 128$ square inches less 14 square inches = 114 square inches.

THE SLEEVES



53--Sleeve

Let's sketch one.

This sleeve is made of 3 parts--V, VI, & VII. Part V is broken up into 3 sections--A, B, & C. B is a rectangle that measures 10" X 15" = 150 square inches. On either side of B we find a triangle (A & C) each measuring 15" (bicep) - 10" (wrist) + 2 (2 triangles).

$$\frac{15 - 10}{2} = \frac{5}{2} = 2.5 \text{ inches at the base}$$

To measure the superfic of a triangle we use the following formula. The base (2.5") X the height (15") + 2 = 18.75 square inches. We have 2 triangles and each is 18.75 square inches. So part V measures A + B + C or 18.75 + 150 + 18.75 or 187.5 square inches.

Part VI is a rectangle 3" X 15" or 45 square inches.

Part VII can be figured out as a triangle 5" high with a base of 15" less 2 inches for bind offs or 13 inches.

$$\text{Formula for triangle superfic is } \frac{\text{base} \times \text{height}}{2} = \frac{13 \times 5}{2} = \frac{65}{2} = 32.5 \text{ square inches.}$$

So part V is 187.5 square inches X 2 sleeves = 375 square inches.

Part VI is 45 square inches X 2 sleeves = 90 square inches.

Part VII is 32.5 square inches X 2 sleeves = 65 square inches.

Our grand total is (340 + 128) for back + (340 + 114) for front + (375 + 90 + 65) for sleeves = 1452 square inches. The total superfic of this sweater is 1452 square inches. We know that 10 yards gives us 15.5 square inches. To determine how many 10 yard units we will need to make this sweater, we simply divide the number of square inches in the whole sweater by the number of square inches in the 10 yard swatch (15.5). So: $\frac{1452}{15.5} = 93.7$ units of 10 yards

To figure out the yardage we multiply the number of units of 10 by 10 or $97.2 \times 10 = 972$ yards. But don't stop here. We have to add some more yarn to sew the sweater with, to rib around the neck and to give us a little insurance. I suggest as a rule of thumb to add about 5% extra. $972 \times .05 = 48.6$ yards. I would therefore get $972 + 48.6 = 1020.6$ yards or 1021 yards minimum.

To figure out how many skeins to buy, we take the total number of yards and divide it by the number of yards in one skein. Let's say 97 yards. $1021 \div 97 = 10.5$ skeins. We round up always and get 11 skeins.

There are other ways of figuring out quantity but because of the simplicity of this method and the fact that we do not require scales or other not easily available and not always accurate instruments, I strongly recommend this method above all others.

STITCH PATTERNS & MULTIPLES

Up to this point we have not touched upon stitch patterns. This aspect of knitting is creative and decorative. There are thousands of stitch patterns in use today and thousands more that will be created in the future. You can see why we are better off not going into the specifics of stitches. For the purpose of charting, it suffices to understand the principle upon which these stitch patterns are built.

A stitch pattern is a specific number of stitches worked in a specific order. This number of stitches has to fit evenly across the row of our work. This means that the total number of stitches we will work with must be divisible by the number of stitches required to produce one unit of the pattern. We refer to the number of stitches required to produce one unit of the pattern as the **stitch multiple**.

Many stitch patterns can be done in a multiple of 2. This means that the number of stitches you will need to work with will have to be divisible by the multiple 2. Let's say you arrive at 45 stitches to work in a pattern calling for a multiple of 2, you must then change this number to 44 or 46 stitches.

Many patterns can be done in a multiple of 3. Here the number of stitches will have to be divisible by the multiple of 3. Let's say you arrive at 47 stitches to work in pattern. $47 \div 3 = 15$ and that leaves 2. $3 \times 15 = 45$. We are now faced with a dilemma. We have two possibilities.

First, we could eliminate the 2 left over stitches and adjust the number down to 45 stitches in order to make it compatible with the multiple and pattern or,

Second, we could add one stitch to the total number and make it $(47 + 1) = 48$ stitches. $48 \div 3 = 16$.

My choice will always be toward the number that will require the minimum amount of adjustment. Therefore in this instance I will favor the second choice and make it 48 stitches by adding 1 stitch to the total.

Multiples for stitch patterns can be any number. But understand that the pattern may call for a sequence of numbers within each multiple. For example, a multiple of 9 may represent a cable over 6 and 3 purl stitches. The two parts here are combined to form a multiple of 9 and the overall pattern must be divisible by 9. So we go back to the example where we had 47 stitches. $47 \div 9 = 5$ and that leaves 2. I can eliminate these 2 stitches or I can add 7 more stitches to adjust my number of stitches to the multiple. Again, I prefer to work with the smallest adjustment.

But now let's take a look at the pattern we are working with:

(P3, C6) (P3, C6) (P3, C6) (P3, C6) (P3, C6)

Please note that on one edge we started with P3 but we end the row with the cable at the other edge. That is not good. We need to have P3 also on the second edge. The multiple of 9 does not change. But to indicate that now we must add 3 stitches to second edge we say that the multiple is no longer 9, but rather $9 + 3$. So to determine our number of stitches we take our 47 stitches and divide them by 9. $47 \div 9 = 5$ and that leaves 2. $9 \times 5 = 45$ stitches.

The number of stitches we need is 45 plus the additional stitches from multiple (+3) or 48 stitches. Therefore, we add one stitch to our 47 stitches to make it compatible with the $9 + 3$ multiple.

Please note that if we have properly worked and centered our pattern from the start, it will not matter if during the course of increasing and decreasing we no longer end our rows with complete patterns. The important thing is that the pattern follows the work started in the rows below.

At this point, I would recommend that you go back to the beginning and start again. After a careful second reading of this book, I believe that you should have a clear understanding of its content. What is most important is that the principles demonstrated here be understood and remembered. For the details, you can always refer to notes or books. But the principles go beyond that. Armed with these principles you can tackle any charting job. You can break down any style into simple shapes that can be achieved by simply adding or decreasing. It all boils down to making use of these principles outside the confines of the styles we covered here.

You can chart sweaters sideways, or in one piece. You can chart long tunics or coats. You can chart any shape at all. Analyze the shape and then chart it. You can do it now!

HAPPY CHARTING