

ESSS Program – May 2018
Gauge, why bother?

Do you want your finished project to:

- Be the size you planned for?
- Fit the wearer properly?
- Have a pleasing “hand” or “drape”?

If you answered “yes” to these questions, then having an accurate *gauge swatch* is what helps make that happen. Think of swatching as an investment and an adventure and gauge as the reward. Consider, an hour or so spent swatching for gauge and fabric drape against the many hours of knitting you’ll do to create your finished project. Consider the time and materials involved if it doesn’t turn out the way you planned. To begin, what is gauge exactly?

- Gauge is the number of stitches to a given measurement. Ex: A stitches and B rows = C inches of knitting. It gives the number stitches (and rows) needed to get a specific size of fabric.
- Knitting the swatch is how you determine your gauge. The swatch tells you about the best gauge for the pattern, helps you “get to know your yarn” and practice stitch patterns. It can be a great tool to use for testing finishing techniques such as how many stitches to pick up for that button band.
- You should launder your swatch as you will your finished garment and measure gauge again. If you want to take it to the professional level, you should also “dress” your swatch. This can involve hanging it to see how / if it stretches in length. This is the recommended process – however, few of us get to this stage, so I will leave this to the knitter.

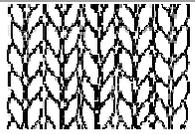
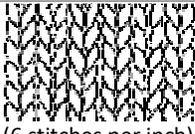
How do I knit my swatch? As a general rule, the larger the swatch, the more accurate your gauge measurements and calculations will be. The cast on row tends to “pull in”, and will distort your gauge if you measure too close to it. The best way to start a gauge swatch is with a provisional cast on or to cast on normally and knit some garter stitch rows at the bottom.

- To start: cast on a number of stitches that will give you about 6” of knitting. Knit a few rows in garter stitch and keep 3 – 4 edge stitches on each side in garter stitch. Work in stockinette stitch or the given pattern stitch for a few inches. You can take a rough measure to see if you’re “close” to the given gauge – or the gauge you like. If not, no need to bind off at this point. Just knit two rows of garter and change needle sizes. Once you have the fabric you like, measure 4 inches, count the stitches (half-stitches, too) and divide this number by 4 (it may be a fraction). *Tada!* – You have stitches per inch and from here you can calculate pretty much anything!

Knitter’s Note: When making calculations, use all the fractions and do not round up until you get to the end of your calculations. Rounding or dropping fractions too early on can have a significant cumulative effect on the end result.

Illustration

(Illustrations not to scale)

 (5 stitches per inch)	If the gauge you need is 5 stitches per inch, your stitches should look something like this
 (6 stitches per inch)	If you have MORE stitches per inch than your pattern calls for, your stitches are TOO SMALL. Try a LARGER NEEDLE.
 (4 stitches per inch)	If you have FEWER stitches per inch than your pattern calls for, your stitches are TOO LARGE. Try a SMALLER NEEDLE.

Now it's time for some 3rd grade arithmetic – so grab your calculator! ☺

Abbreviations:	in = inch or inches	× = times multiple
st(s) = stitch or stitches	ga = sts per inch	/ means divided by

1. If you know the number stitches, you can measure and calculate how many stitches per inch in a certain width. The formula for calculating gauge is the number of stitches divided by the number of inches (including fractions). Example: Using a ruler or tape measure, you count 22 ½ stitches over 6 inches of knitting. Gauge Calculation: 22.5 divided by 6 = 3.75 stitches per inch.

Formula: $\text{sts} / \text{in} = \text{ga}$	Ex: $200 / 40 = 5 \text{ sts/in}$
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2. If you know the gauge, you can calculate the number of stitches you need to knit a certain number of inches. The formula for calculating stitch count is the number of stitches multiplied by the number of inches. This will equal the number of stitches to cast on. This is the basic designing formula. Example: Your gauge swatch measures 4 ½ sts per inch and you want to make a scarf that is 8" wide. Calculation: 8 times 4 ½ = 36 sts. This is the number you cast on.

Formula: $\text{ga} \times \text{in} = \text{sts}$	Ex: $4.5 \text{ sts/in} \times 8 \text{ in} = 36 \text{ sts}$
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3. If you know your gauge, you can calculate how many inches you'll get with a certain number of stitches. The formula for calculating width is the number of stitches divided by the number of stitches per inch. Example: a hat pattern says to cast on 90 sts. The yarn you want to use knits up at 5 sts per inch. Will it work? 90 divided by 5 equals 18". That's probably ok for a child – but too small for an average adult. What can you do to change the hat size? (*)

Formula: $\text{sts} / \text{ga} = \text{in}$	Ex: $90 \text{ sts} / 4 = 22.5 \text{ in.}$
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* Examples: If the average adult hat measures about 21 – 23" you could change the gauge to 4.5 sts per inch, and get a 20" hat or to 4 sts per inch and get a 22.5" hat. Or you can cast on more sts using formula #2. (5 sts x 22" = 110 sts). Options! ☺

Help – I Can't Quite Get Gauge!

You have a pattern and want to use a different yarn or you're knitting with the pattern yarn and can't quite get their gauge. The conversion factor may help you adapt your yarn choice to your pattern choice. Swatching is the key – yarns differ and even at the same weight, not all yarn is an appropriate substitute. Drape and stitch definition along with other "factors" should also be considered. In general you can use the conversion factor to make changes to pattern calculations to fit your gauge. Row gauge is not as critical in some garments, but the same calculations can be applied to row gauge. If yarn is very different in gauge you should definitely apply the conversion factor to row calculations – I usually do this anyway just to be sure. Make a swatch to see how your yarn "behaves" or where it seems most "comfortable." Take your best swatch and measure the gauge for the number of stitches and/or per inch. This number equals **A**. Take the gauge given in the pattern for stitches per inch. This number equals **B**.

Knitter's Note: We're focusing on stitches, but rows are measured and calculated using the same formulas. Remember, nothing's perfect – and this is will not work well if you are more than 15-20% out of gauge alignment ☺.

Formula: $A/B = C$ (conversion factor)	Your gauge is 5.5 sts = 1 in. Pattern gauge is 5 sts = 1 in $5.5/5 = 1.1$ (Conversion factor is 1.1)
Calculate pattern changes:	Pattern says CO 100 sts so $100 \times 1.1 = 110 \text{ sts}$

OR

Formula: $A/B = C$ (conversion factor)	Your gauge is 5 sts = 1 in. Pattern gauge is 5.5 sts = 1 in $5/5.5 = .90$ (Conversion factor is .90)
Calculate pattern changes:	Pattern says CO 100 sts so $100 \times .90 = 90 \text{ sts}$

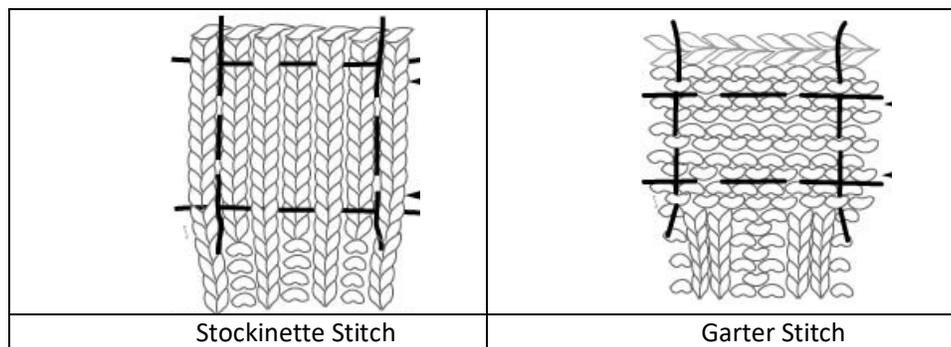
As a Reminder

• Heavier yarn = fewer sts per inch (Compare: Worsted, bulky super bulky)	• Finer yarn = more sts per inch (Compare: Lace, sock yarn, sport weight)
• Larger diameter needle = larger sts	• Smaller diameter needle = smaller sts
• Bigger stitches = fewer sts per inch	• Smaller stitches = more sts per inch

Independent Exercise:

Try this if you have time or inclination – for fun and maybe to give you an “ah ha” moment. ☺ This will help you to “gauge your gauge” – a visual and tactile experiment in gauge and drape. With a smooth worsted weight yarn, and US4 or 5 needles, CO 20 stitches and knit 10 – 15 rows in stockinette stitch (knit one row, purl one row). Knit two rows in garter stitch. Repeat this, changing needles sizes upward after every 10 – 15 rows separating each change with 2 rows of garter stitch. Change needles as many times as you want – US6, 7, 8, 9, 10, etc. Experiment with different fibers -- wool, bamboo, silk, etc. so you can see the different characteristics of how these yarns behave when knit.

Another option for accurate measuring is to mark the swatch. This is a trick taken from machine knitting and it makes accurate counting much easier. It is particularly helpful for fibers that don't give good stitch definition such as highly textured or fuzzy yarns. It also eliminates the distortion issue that you get at the edges of your knitting – top, bottom & sides. It helps you 'see' your stitches and rows more clearly.



Note: Pictures for illustrative purposes only - swatches do not match instructions below. (TKGA)

Your swatch will have a 6 row border at the bottom and a 3 stitch border on each side. This helps to minimize the curl of stockinette stitch and avoid distortion when counting stitches.

Materials: Swatch yarn, appropriate needles, four 8-12” pieces scrap yarn in contrasting color, tapestry needles, tape measure, calculator.

To Begin: Cast on 32 stitches. Knit in garter stitch for 6 rows. Begin body of swatch.

Row 1: Set up row: Knit 6 stitches. Cut an 8 - 12” strand of scrap yarn in a contrast color and lay it across the yarn between the needles. Knit 20 stitches and lay a second strand of yarn between the needles. Knit the last 6 stitches. These vertical strands of contrast yarn will be used to isolate the 20 center stitches and create the boundary of our stitch gauge for measuring.

Row 2 (WS): Knit 3, purl across to the last 3 stitches (ignoring the yarn strands for now). (Note: the k3 on each side creates the garter stitch border for the swatch).

Row 3(RS): Knit across

Row 4: k3, purl to last 3 sts, k3.

Repeat Row 3 & 4 four more times. (8 rows total)

Thread a tapestry needle with another strand of contrast yarn and weave it in *between* the stitches of the row. 2 stitch intervals is a good rule. The yarn is just lying on top of your working yarn and the weaving holds it in place while you knit your next row. This creates the boundary for the row gauge.

On the next RS row, knit 6, flip the first strand you laid over the yarn in the set up row between the needles. You're flipping it over your knitting to the back of the work. Knit 20 stitches, and flip the second strand over. Knit 6. Continue knitting the swatch as established, flipping the yarn strand over the knitting every other row. Knit 24 rows. You should be able to use the yarn strands to count the number of rows.

Work 8 more rows to match the bottom of the swatch. Knit 6 rows in garter stitch, BO. After blocking it's easy to measure the number of stitches and rows between the horizontal and vertical strands of contrast yarn.

Calculating the length of yarn tail for long tails cast on

This is a compilation of various methods people use to calculate the required tail length for long tail cast on. The methods also vary with the weight of the yarn. It's smart to always 'add a bit' just to be on the safe side. Here are a few suggestions you can try:

1. Wind yarn loosely around needle as many times as the number of stitches you need, then let the loops go – that's the length you need.
2. Leave a tail that is 3 times longer than the finished knit. Example: if the piece you're knitting is 20" wide, the tail should be $20 \times 3 = 60"$. (Plus a bit)
3. Cast on 10 stitches, then take them off the needle, measure the length of tail you need for 10 stitches. Divide this length by 10 and multiply by the number of stitches you need. Example: 10 stitches used 10" of yarn. Your piece is 20" wide. $10/10 = 1$ multiplied by 20 stitches = 20" of yarn for the cast on. (Plus a bit).
4. Formula: # of stitches $\times 1.1 + 15 =$ length of tail in cm. Example: you need 50 sts, tail should be $50 \times 1.1 + 15 = 70$ cm (27.5") long. This works well for sport and worsted weight.

NOTE: To maximize the tail length, cast on with your tail yarn on your thumb and the main yarn on your index finger – you will use less tail yarn for the cast on.

Yarn Tail Estimator for Long Tail Cast On by Nancy Wynn

This is an estimator only – always add a bit to be safe!

Yarn Weight	US Needle Size	Measure / stitch
Sock/Fingering	1 to 3	1/4" per stitch plus 10"
Sport/Baby	3 to 5	1/2" per stitch plus 10"
DK/Light worsted	5 to 7	3/4" per stitch plus 10"
Worsted/Aran	7 to 9	1" per stitch plus 10"
Chunky	9 to 11	1 1/4" per stitch plus 10"
Bulky	11 to 13	1 1/2" per stitch plus 10"
Super Bulky	13 to 19	1 3/4" per stitch plus 10"

Helpful Links:

Free Gauge Pamphlet from Craftsy: <https://www.craftsy.com/knitting/guides/getting-gauge/498350>

Gauge / Yarn Weight Info from Craft Yarn Council of America (CYCA):

Article on Knitty.com: <http://knitty.com/ISSUESpring03/FEATswatchout.html>

Interweave knits articles: <https://www.interweave.com/article/knitting/knit-swatch-swatching-smarter/>

Amy Herzog – Practical Tips on Swatching: <https://amyherzogdesigns.com/2014/12/19/practical-tips-on-swatching/>