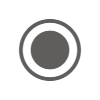
**Maths for Knitting-20241022\_120416-Meeting Recording**

October 22, 2024, 11:04AM

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 **Hannah Hodge Waller** 0:06  
Let's just turn off the transcript view in mind. There's nothing worse is there than listening to watching your AI try and decode your tone of voice.  
Perfect. So just for the recording as well, I'm Hannah Hodge Waller and I'm part of the Tuesday craft group. So this is a bit different from what we normally do. We normally are really informal group that meet up and we talk about what we're creating.  
We've got knitters, we've got crochets, embroiderers.  
You know any sort of crafts or arts or crafts that you do. Your everybody is welcome to come along and just chat.  
And we were originally an 0 NS based group, but as time's gone on, people have moved organisations and we've we've just enjoyed the craft group so much that we've kept it going. And so we're open to obviously people from O&SIPO, which is where I'm based now and all over so.  
We've we're launching a new group session starting next week.  
If you want an invite to the e-mail, you can e-mail me so it's hannah.hodgewaller@ipo.gov.uk and I can add you on and tansy. Arthur is sort of the ONS side contact.  
So if your ONS contact tansy and she'll forward it on to me, that's perfectly fine as well. Lovely. So we're having this session as a maths for Yanni session. So this is from a couple of people's interest with looking at how the maths behind knitting works.  
For just patterns and things like that. Hopefully going to take about 15 minutes that we can then open it up for questions afterwards. But I do like to go on so introduction to start off with this is hopefully interchangeable for knitting and crochet.  
It's non exhaustive. There's some additional topics linked at the end for things that you may want to go away. Look up and research. I could go on for several hours about this, so it have really tried to restrain it and cut back here.  
Bits that might be useful for you to have pen paper to hand if you want to carry on, come along with the calculations. An Excel spreadsheet if you want to do it in Excel and a calculator for some of the maths. I've also got an Excel sheet that I will upload when I upload the video as well to make it a bit easier.  
So.  
Like there we go too far. So I thought that rather than just talking it through, we'll look up an actual practical example. So this is tin can knits flax worsted pattern and why? Well, it's a free pattern. It goes in size, it is knitting, but it goes in sizes from nought to six months all the way through to sort of.  
Large adult sizes.  
It's free and it's really well written. Tin can knits.  
Specialise in writing patterns for.  
People who are beginning knitters and who may be, you know, sort of undertaking their first garment or something like that. So it's one of those things that it's it's a really useful pattern in that way. And the reason I chose this one, this is the worsted weight version. It's because worsted weight also isn't a is a fairly uncommon yarn weight in the UK. So I wanted something that we could look for substitutions for.  
So when we look at our actual pattern, couple of bits that are really important.  
In here we have the yarn, so it tells us what yarn we need, so worsted or Aron weight Aron weight being a much more common UK term.  
It tells us our gauge. So 18 stitches and 24 rounds.  
On larger needles and it also tells us the suggested needles we need. So a four MIL and A5 mil.  
When we knit things like jumpers, you'll often knit like the neck band, ribbing the cuff, ribbing the bottom ribbing on a slightly smaller needle, and then the actual body on a larger needle.  
So we need to know that we're going to try and get 18 stitches and 24 rounds for our five millimetre needle.  
So now that we've got our pattern, we know what we want to do. We may want to buy Yan or look for yarn from our stash.  
So here this is the. Hopefully that's large enough for people to see. This is the this is the size chart. So sorry, we're going to do the six to 12 months for this example, 6 to 12 months and then we've got all of these letters along here. We've got this bit here that says yardage and it's either 240 or 280. But what does C1 and C2 mean? So the important thing we can look at here is the schematic.  
Most patterns should have a schematic within them.  
The one I'm talking about most patents I'm talking about good patents here. This is the. This is the the slight caveat on that, but the schematic will show you the actual measurements of the garment. So here you can see like the letter a relates to the chest circumference, how wide it is and our C1 and C2 relates to the length of the sweater whether we want to make a cropped one or a regular length one.  
So if you want to make a regular length one, we're going to go for the number C2.  
Which tells us that we need 280 yards of yarn.  
280 yards is 257 metres, so this is one of the the bits I always end up Googling if you put it into Google 280 yards in metres in 280 yards in metres it will spit out the answer for you. I never manually do the maths on that. Some patterns will tell you both yards and metres. Again, this is a it's a Canadian pattern. They're Canadian and American designers I believe so it's, you know, it's one of those things we have to bear with.  
Yards rather than metres.  
Some most ball bands will have both on them, but some websites will only tell you one, so you may have to do that conversion.  
So I went on well, warehouse. There's again at the end. Some places I like shopping for yarn, not an exhaustive list, but if you're quite new to yarns then it could be quite good to look at those. But this is one that I found to drop big Merino in all colours from the yarn weights. You can see that it's an Aaron yarn weight. I can highlight things. You can see that it's an Aaron yarn weight.  
And we can see from our pattern gauge, we want 18 stitches and 24 rounds.  
4 inches 4 inches is 10 centimetres and here we would get 17 stitches and 22 rows and again this is using A5 millimetre needle which is the same as what we've wanted. So we get a fairly similar gauge from this. The important things here is that.  
This is a recommended tension.  
It's not an absolute finite. You must get this tension. You your tension is individual. Everybody's tension is slightly different, and we can adjust for that with using larger needles or smaller needles. And we'll talk about that in a second. But it's really important that this just gives you a ballpark. So if this was, say, like 6 stitches and eight rows for 10 centimetres, I would know it.  
'S far too chunky of a yarn and that.  
Not be the best option for that patent.  
How much of this would I need? Our first little bit of maths so we need 280 yards. This is in metres, so 257 metres is what we need and in order to do that our equation is our metres needed divided by the ball length in metres.  
Is the number of balls we need.  
Balls, skeins, put UPS, units of yarn. So here 257 / 75 metres per ball means we need 3.4. Two of these balls. So we you would buy 4IN that case.  
Another example here. Again, this one's a little bit small, but the yarnsmith's free spirit Aaron, that is 185 metres.  
And she says that's covered that that's 185 metres. And again this is 18 stitches and 24 rows, 18 stitches, 24 rounds. So it's again, it's very similar in terms of weight.  
And our calculation there again, so 257 metres. We need divided by 185 metres, the length of the ball equals 1.39 balls of this one. So these are 100 gramme balls. So that's why we need less.  
And then lastly, in ones that could also work, King Cole Forest Arron, this is 300 metres per ball and in this we get 18 stitches and 25 rows. So again near enough are 18 stitches and a 24 rounds on the five millimetre needles. So again, we would absolutely need to Swatch, but it's good to know that this would be a decent candidate for us.  
With this one, we would need so 257 metres is what we need divided by 300 metres per ball, so we would only need nought .85. So we would get this out of one.  
I chose this one to put in here because it's an interesting one that again, I could go down the massive rabbit hole of going into the unsubstitutions and grist and all of that sort of the thing, but we get a lot more metres on this one than we do on the previous one. They're both 100 grammes. They're both Aaron weight. But this one is 300 metres per 100 grammes, whereas the other one is a lot different.  
This is partly because of the blend, so that last one was wool and this one is a mixture of wool and acrylic and things like that. And the way it's done, if you look at this picture, you can see that it's a lot looser of a spon of a spin.  
Then if I then something like this, that's quite a tightly sort of coiled implied. So again materials and things can matter. There is a post at the end linked which can talk a little bit more about that.  
So it should work, but the the texture of my jumper may be slightly different. That might be something I like that might be something I don't like, something to bear in mind.  
OK. So moving on to swatching or tension squares.  
Let's watch golden rules. You should knit or crochet attention, square or Swatch. You absolutely should. If it is something that is important to what you're making. So like a garment, then you absolutely should do I all of the time? No. But you know, it's it's the golden rule is that you should and you know something like a Shaw, where the size doesn't matter. I had plenty of yarn, something like that, not so much. But for jumpers. Yeah. Or or wearables pretty much always Swatch sometimes.  
Your actual garment can be your Swatch as well, so if you're making like a hat and and you start off and you're happy to rip it back, if it's too big.  
Fine, that. That can also work as well, but a couple of golden rules. Use the yarn you intend to use.  
Sometimes yarns can change in even, like within colours and things like that, and dilogt by by fractionally you also want to use the needles or the hooks you intend to use. Different materials can make a massive difference in terms of.  
Or a little bit of a difference in terms of sort of your tension. So using a wooden needles or a hook versus metal, that sort of thing as well. You also want to follow your pattern instructions. So they will tell you what to Swatch in. So especially if you're doing something that's got like cables or a heavy textured stitch, it will tell you if you should do your tension square in that stitch. She probably should.  
This jumper also said to us to do it to to in the round. Our tension in the round.  
When you're working the round as a knitter, you are often just knitting stitches. Working, stocking at Stitch Flat is knit a row perlero working it in the round is all knit stitches 'cause you're working in a spiral, so it's important as well because people's different people's rogue age can change whether they're working in the round or working flat, and your stitch gauge can change as well.  
You should always work a larger Swatch than the pattern says. Swatches are measured over 10 by 10 centimetres, or 4 by 4 inches. Always work one that's larger. You want to be measuring somewhere within the middle of your Swatch.  
But then measuring on the edges, because that can distort your stitches slightly.  
You still should finish it like you would a final garment. So if that's washing. So that's hand washing machine washing something like that. Because you want to. Obviously your finished garment to fit in the way you want to have after you've washed it some yarns like soup wash yarns can really grow. So you can end up with sleeves that are like sort of, you know, massively too long because.  
The yarns grown if you treat washes watch you should be aware that that can happen. So measure before measure. After finishing is my advice there.  
Something that is quite useful if you're starting out is something like this, which is a little counting frame, so it's got 10 centimetres or 4 inches across the top and down the side and you can place that on top and use it to do your sort of count. You know, sort of like 12345 etcetera. Stitches on there. This one's also a needle gauge. So you can sort of see how large your small your knitting needles are as well.  
That's from Wool warehouse, and it is LinkedIn, the presentation.  
So I've made attention square.  
My pension is off so I've got too few stitches. Eg we're aiming for 18 stitches. I've got 16, my stitches are too big. Reduce your needle size and try again.  
And I've got too many stitches. So I've got 20 stitches in my in my 10 centimetres. My stitches are too small. Increase my noodle size and try again.  
Excellent. You'll notice here about. Yep, which alias just commented on. Get engaged in One Direction, but not in the other. So.  
Read your pattern is the first bit a lot of patterns will say something like knit 4 four inches or you know the equivalent in centimetres. That's. Then if your row gauge is off, that's easy to compensate for because you're not knitting X amount of rows you're knitting until it measures a certain distance in that case.  
Your stitch count is much more important, so I always tend to prioritise stitch count over row count if that's what my. That's what my pattern traditionally is. If it's something like you're knitting sort of sidewards from sleeve to sleeve, you'd want your row count to be more accurate than your stitch count and adjust sort of that way. So normally you know, say I've got like 18 stitches and 22 rounds. That's not a problem. I'd I'd much rather be on point for.  
Which count then for my for my row gauge.  
OK, but what if I like the fabric I've created either at 16 stitches or 20 stitches? Well, then you can do it, but you've got to do some maths.  
The dreaded word.  
OK. So we're going to have a look at doing the maths now.  
So again here this is my sort of my sizing thing and we've said we're going to have a look at this 6 to 12 months. That's the size I want to net.  
Here on the schematic. Again, sorry, that might be a little bit small, but 6 to 12 months we've got all of these different measurements. So ABB.  
As and the BS all the way through.  
The one that I want to actually look at here is this chest circumference. So this is the one that's going to be most important. So that's 20.5 inches.  
This pattern starts from the top down and I know that no additional shaping is done after the divide for the sleeves because I've read it. So I've read the pattern so when we get to here we'll take off the sleeves and then this is all the same just round and round and round and round until we get to the ribbing.  
So I need to then go through and read my pattern. So after I split for the sleeve so there will be 980-9200 blah blah blah body stitches on the needles. So that's the first size, the nought 6. This is mine 6:00 to 12:00. So I know that 92 stitches.  
Is point a on my diagram and I know that that should measure 20 1/2 inches, so A is 20 1/2 inches and that's 92 stitches. So 92 stitches is 20 1/2 inches.  
Sometimes this is then easier to work backwards. We now know all of our variables here, and it's often easier to work with stitches per inch rather than stitches over 4 inches, so 18 stitches per four inches is 4 1/2 stitches per inch, 18 / 4.  
What we need to do in order to get to our stitch count is take our stitches per inch, so 4 1/2, multiply it by our finished size 20 1/2 inches which will give us approximately 92 stitches, slightly fractionally out, but that's fine. So we now have this equation so SBI stitches per inch multiplied by finish size equals the stitch count.  
And now we can work it backwards. So our small attention is 16 stitches per four inches, which is 4 stitches per inch.  
Our stitches per inch multiplied by the finish size equals our stitch count, SO4 stitch per inch multiplied by question mark equals 92.  
Flip that equation stitch count divided by stitches per inch is the finished size 92 stitch count divided by 4 stitches per inches. 23 inches. So if I work it according to the pattern, I would actually have 2 1/2 my jumper would be 2 1/2 inches too large.  
That might be fine. That might not be fine.  
Obviously this again remember is for a child's jumper 6 to 12 months. If you think that fraction increases exponentially as you multiply it. So if you were that out for a larger grown up jumper, it would be a lot bigger the IT would be, you know, sort of 7-8 inches too big.  
OK. So if we take our small attention, one of the things we can do is we can knit it, but using our nought to six month size instead.  
So here we'll change this and substitute it in so our smallest size is 80 stitches at point a. So flip the equation again. Stitch Count 80 now divided by 4, our stitches per inch will give us a size of 20 inches. So if we knit with our gauge at 16 stitches, we can work instead the.  
Not to six month size and get 20 inches, which is much closer to the actual measurement that we wanted. So in that case if I wanted the 16 stitches, I would probably knit the smaller size in order to make that work.  
You can also do things like create your own custom patterns as well here again using this same equation. So I want to knit a hat head circumferences 60 centimetres by tension. Square is 40 stitches over 80 rows for 10 centimetres.  
My finished size of my hat multiplied by my stitches per centimetre, will give me my cast on so 60 my head circumference multiplied by four stitches per inch tells me to make a.  
Hat for a 60 centimetre head I would need to cast on 240 stitches.  
Something in here that isn't talked about is obviously adjusting patterns.  
And things like that. So you would need to look into things like negative ease and things like that as well.  
Oh, there we go. Next slide. So caveats. Most patents have ease how tight or how loose something fits, and that would need to be something that you would take into account when you're making your equation.  
Is 60 centimetres. That hack is going to fit perfectly on your head with no negative eaves. You might want your hat to be a little bit tighter so that it fits to your head a little bit better.  
Excellent. We only got 5 minutes left, so I will try and go in for questions and things, but there's some resources at the end. Kate Athleis books are perfection and amazing.  
She has a Guinness Guide to writing knitting patterns that can help with calculations and things like that, and custom socks knit to fit your feet is 1 that I actually own. It's somewhere in the house. Oh Nope, there it is.  
There's I own highly recommend this one. It's a really good book for being able to calculate the maths behind knitting socks.  
Edie Eckman is also an excellent designer as well, and then just as quickly, scroll through the rest. There's a couple of pages of resources in there as well for anybody who wants to pick up any of the additional sort of topics I've talked about there, right. OK. So I'm going to start recording and open up the floor for questions.

 **Hannah Hodge Waller** stopped transcription