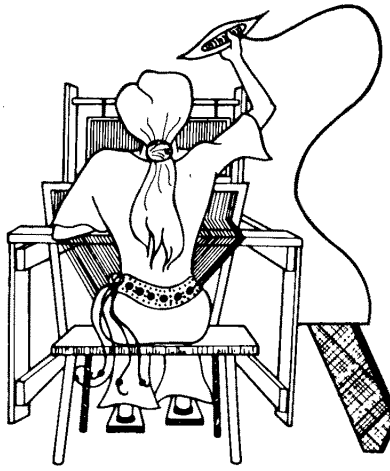
The Arithmetic



Of

WEAVING

The arithmetic of weaving is based on yarn count, or size, which by definite rules determines the yards per pound in each size. This information, when planning a project, will enable the weaver to decide on the number of threads to the inch, the amount of yarn required, and therefore the cost.

The count of cotton is based upon the number of yards that can be spun from a pound of raw cotton. When a pound of cotton fiber is spun into 840 yards of yarn, it is known as size number one. If a number one yarn contains 840 yards to the pound, a number two would be one-half the size and contain twice as many yards or 1,680 yards. A size three cotton yarn would have 3 x 840 or 2,520 yards, and be one-third the size, or grist, of the number one yarn. Carrying this further, a size ten yarn would be one-tenth, the size of number one, and have ten times the yardage or 8,400 yards. However, most cotton yarns used by hand weavers are plied. That is, two or more yarns twisted together to make one yarn, which is written with the size of the strands first, and the number that were plied second. 20/2, 20/3, 24/3, etc. We have seen that the yardage of a singles cotton yarn is 840 x the size. To find the yardage of a plied yarn reduce the count to its singles equivalent. For example: if one pound of cotton is spun into a size twenty yarn it will contain 20 x 840 or 16,800 yards. If we cut this length in half and put the two pieces together the resulting yarn will be half the length and twice the grist of the original, and will be size 20/2. To determine the yardage in a pound of this yarn divide the size by the number of plies and multiply by 840. As an example: one pound of 20/2 would contain $20 \div 2 = 10 \times 840 = 8{,}400$ yards; One pound of 24/3 would contain $24 \div 3 = 8 \times 840 = 6{,}720$ yards. Reducing plied yarns to the singles equivalent is also useful when comparing yarn sizes.

Now let us see why the grist of ten singles wool is not the same as a ten singles cotton. This difference begins with the basic size of the two yarns. We have learned that number one cotton yarn contains 840 yards to the pound, but number one wool yarn is based on another scale and contains 560 yards. This means that when one pound of raw wool is spun into a yarn 560 yards long it is called size one. Wool yarn sizes are written as for cotton or linen yarns, except that the size of the ply comes first and the number second. For example; we speak of a 10/2 cotton but a 2/10s wool. Yardage of wool yarn is figured as we did the cotton yarn, except for the basic number; size x 560 = yards to the pound. Reduce to the singles equivalent if it is a plied yarn.

Now for the count of linen and related fibers such as jute, ramie, etc. Again a different scale is used by the spinners of these fibers. Number one linen is that size which results when one pound of raw flax is spun into 300 yards of yarn. From this point on the yardage is figured and sizes written as with cotton. Size x 300 = yards per pound, again reducing plied yarns to the singles equivalent. As linen material is often woven with a plied yarn warp and a singles weft it is important to remember the relative sizes. A 20/2 and 10/1 are the same diameter or grist. This goes on through the various sizes such as 40/2 and 20/1, 70/2 and 35/1, etc.

While it is convenient to remember the yardage per pound for the most used yarns, all yardage figures can be quickly worked out if we remember the three basic numbers. Cotton 840, Wool 560, Linen 300. To find the yardage per pound of any yarn multiply the fibers basic number by the size. Remember when figuring yarn required for a project, and when ordering yarn, that these yardage figures are approximate. Variations in humidity and spinning may produce slightly more or less yards to the pound.

Silk and rayon sizes differ from the others mentioned above in that the weight varies with the size of the yarn and the length remains the same. These yarns are measured not in yards but in meters, the meter being 39.37 inches in length. A number one silk or rayon is 450 meters long and weighs ½ decigram. The decigram is another unit of measure, like the meter, not commonly used in this country. It is about 1½ grains in our system of weighing and is generally called a denier. A number two silk or rayon contains the same yardage as a number one, that is, 450 meters, but weighs two denier; a number three has the same yardage but weighs three denier, etc.

When planning a fabric, one must first decide on the type of fiber best suited to the purpose. Then to determine the texture and weight of the fabric, it is necessary to select the size of yarn or yarns, decide on the spacing of the warp ends and weft picks, that is, the number of each to the square inch of fabric.

With this information it is now possible to figure the length and width of the warp, and the amount of yarn required, by a rather simple formula. As an example, let us say that we have decided to use cotton yarn, size 10/2, with a sett of 24 ends to the inch to weave a piece of material 12 yards long and 30 inches wide, **when finished.** To allow for the draw-in and lateral shrinkage, we decide on 33 inches in the reed. The first calculation would be 33 x 24 = 792. Or width in the reed x ends to the inch = total warp ends. The second calculation would be 12 + 1.2 + 1 = 14.2 x 792 = 11,246. Or finished length of material required + 10% for shrinkage allowance + loom loss or part of warp that can not be woven = length of each warp end x number of warp ends = yards of warp yarn required. (Note: An average shrinkage allowance is 10% for cotton and linen warps and 15% for wool.)

As a slightly more complicated example, let us assume that 15 place mats and 15 napkins are wanted. We have decided the finished dimensions should be 13 inches wide by 21 inches long for the mats, and 13 inches square for the napkins. 20/2 cotton is to be used for both warp and weft with a sett of 30 ends to the inch. If we assume a shrinkage and draw-in of two inches, we must warp for 15 inches in the reed. The first part of the formula is, therefore, 15 x 30 = 450 warp ends. The length of material required for one place mat will be 21 inches + 3 inches for hems = 24 inches. Material for one napkin will be 13 inches + 2 inches for narrow hems = 15 inches. One place setting will, therefore, require 39 inches of material x 15 place settings = 585 inches or 16.25 yards. To complete the problem; 16.25 + 1.63 + 1 = 18.87 x 450 = 8,496 yards of warp yarn required.

If the same yarn is to be used for weft, with perhaps a narrow border in Floss at each end of each piece, it would be well to disregard the small amount of weft replaced by Floss, as well as the one yard of loom loss, and order the same amount of yardage for weft as figured for warp.

Therefore a 50-50 weave (the same number of warp and weft threads to the square inch) would require 8,496 yards for warp and 8,496 for weft. The total 20/2 cotton to order would be 16,992 yards. Dividing this by the 8,400 yards in a pound of this size yarn converts the yardage needed into slightly more than 2 pounds. To be safe and have some for warp repairs and waste, order 2 - 1 lb. Cones and 1 - 2 oz. Tube.

To carry this problem a little further, what would be the method of figuring if these pieces were to be in an overshot pattern using the 20/2 for tabby and Lily No. 5 Pearl for pattern weft. The accurate way to figure the weft required would be to get the warp on the loom and weave four inches with left over yarn of desired size. Then count the number of pattern picks used — multiply by nine for the number of picks in a yard of weaving — then by the length of the picks. However, this is a method that is seldom used as most weavers would not want a warped loom standing idle while waiting for the order of yarn to arrive. A rough way of estimating this, so that all yarn can be ordered in advance, is generally used. Just divide the amount needed for plain weave weft in half and add 5% to each for a safety factor. In the above problem we found that 8,496 yards were required for weft. Half of this would be 4,248 yards. Adding 5% for that safety factor gives a figure of 4,460 yards. This would be approximately the number of yards needed for the 20/2 tabby and also the No. 5 Pearl pattern weft. To place the order it would be necessary to convert these yardage figures to the number of cones or tubes needed to furnish this yardage. With the help of the Lily Weaving Chart we find that two 1 lb. Cones and one 2 oz. Tube of the No. 5 Pearl should be ordered. Again from the chart we find that five 2 oz. Tubes of 20/2 must be ordered for the tabby.

As yardage figures for all yarns are approximate, and the above just an estimate, there may be yarn left over. However, with so many variable factors it would be impossible to figure exact yardage, and it is most important that all yarn needed for a weaving project be ordered at one time. This is especially true if colored yarn is being used which should all come from one dye lot. In spite of most careful control there is always a possibility of slight variation between dye lots, which can not be seen in the cones or tubes, but is noticeable in the weave. It is also very discouraging to have the loom idle while waiting for a small amount of yarn so that work can be completed. The active weaver will always find use for the left over yarns.

TABLE OF YARN COUNT

Size	Cotton		Wool		Flax, Jute Ramie, Hemp		Size	Silk, Rayon, Etc. Weight		Length	
1	840	yds.	560	yds.	300	yds.	1	1	denier	450	Meters
2	1,680	"	1,120	"	600	"	2	2	"	450	"
3	2,520	"	1,680	"	900	"	3	3	"	450	"
4	3,360	"	2,240	"	1,200	"	4	4	"	450	"
10	8,400	"	5,600	"	3,000	"	10	10	"	450	"
20	16,800	"	11,200	"	6,000	"	20	20	"	450	"

Lily's Weaving Chart

THREAD SETTING

Cotton furnishes us with threads of many sizes and textures. Those who use threads for sewing, crocheting, knitting or weaving should know just where each thread will serve to the best advantage and yield the most satisfying results. It is only thus that we can hope to produce hand-made articles of convincing loveliness, and repay us for time spent creating and for money invested in threads.

In weaving especially, very pleasing results are possible if the right thread is chosen for the right setting. If warp threads are set too far apart for their size, the weft slips between them and the resulting material is too loose for practical purposes, and will not survive laundering. If warp threads are set too close together, the resulting fabric is ridgy with weft threads concealed and too much warp showing. Every warp thread gives best results when threaded for what might be called a perfect tabby setting. This chart has been prepared to aid the weaver in finding that best threading, or just the right number of threads per inch to make perfect tabby.

In a perfect tabby rendering of a thread, both warp and weft are of the same material or the same size material. If the warp is properly set, the resulting fabric will have as many weft threads per inch as there are warp threads per inch, and the lay of the threads will be perfectly balanced always, with tiny squares between interlocking warps and wefts. For every thread also, there may be a loose-mesh tabby and a closely woven tabby, the setting varying by a dent or so more or less per inch. The weaver regulates his beating to obtain the same number of weft threads.

COLOR, YARDAGE, ETC.

The color range of a thread is also important to the weaver. If he can see at a glance how many colors or shades he can choose from, he can plan a more subtly attractive article. It s important too for him to know how many yards come in a pound of each kind of yarn. He can then plan his piece to a certain size, and be sure of finishing with enough material. All this information is given in the following chart, as well as the most popular uses for each kind of thread listed.

Lily's Weaving Chart

Art. No.	Name of Thread	Yds. per Pound	Yds. per Tube	No. of Colors	Reed Setting	Use as Warp and Tabby Weft	Use as Pattern Weft
Art. 114 Lily Mercerized Pearl Cotton Yarn	Pearl Size 3	1260	155 2 oz. tube	42	12-15	Warp in Blankets, Belts, Bags, Coats, Drapes, With Heavy Linen, Hot Mats.	Weft in Purse, Heavy Coverlets, Drapes, Runners, Couch Throws.
	Pearl Size 5	2100	263 2 oz. tube	42	16-18	Belts, Medium Texture Coverlets, Luncheon Sets, Drapes, Bookmarks.	Purses, Bookmarks, Coverlets, Dress Trim, Vase Mats.
	Pearl Size 10	4200	525 2 oz. tube	42	22-24	Lunch Cloths, Guest Towels, Dress Material, Curtains, Fine Belts, Coverlets.	Bookmarks, Fine Dress Trim, Dress Material, Vanity Sets.
	Pearl Size 20	8400	1050 2 oz. tube	42	30-40	Curtains, Luncheon Cloths, Place Mats, Napkins, Runners, Dresses, Skirts.	Use as single weft in lace weave.
Art. 121 Lily Mercerized Six Strand Floss	Floss	2080		White Ecru Black	20-24	Drapes, Scarves, Texture Weaves, Mostly as Weft.	Finger - Weaves, Pillows, Purses, Mats, Borders.
	Floss		260 2 oz. tube	66	20-24		
Art. 214 Lily Mercerized Cotton Yarn	16/4	3360	410 2 oz. tube	White Natural	12-18	Upholstery, With Heavy Linens, Coats and Trousers, Luncheon Sets.	Drapes, Coats, etc. Use as single weft.
	20/3	5600	700 2 oz. tube	White Natural	20-30	Use instead of 20/2 when heavier material is wanted, Heavy Coverlet.	Use as single weft.
	24/3	6720	840 2 oz. tube	White Natural	18-24	Coverlet, Pillows, Runners, Curtains, Luncheon Sets, Dress Material, Half Linen.	Single Weft in Twills and Texture Weave.

Lily's Weaving Chart

Art. No.	Name of Thread	Yds. per Pound	Yds. per Tube	No. of Colors	Reed Setting	Use as Warp and Tabby Weft	Use as Pattern Weft
Art. 314 Lily Unmercerized Cotton Warp Yarn	5/2	2100	262 2 oz. tube	Natural	10-18	Bath Towels. With Heavy Linens, Coats, Skirts, Hangings, Knitting Bags.	For Pattern Weft use this size in Art. 114. 42 Colors.
	10/2	4200	525 2 oz. tube	White Natural 12	22-24	Drapes, Curtains, Upholstery, Dress Material, Guest Towels, Drapes.	Dress Material, Bookmarks, Aprons, Drapes.
	20/2	8400	1050 2 oz. tube	White Natural	30-40	Fine Coverlets, Curtains, Place Mats, Runners, Dress Material, Bridge Covers.	Weft for Towels. Twill and Lace Weaves.
	20/3	5600	700 2 oz. tube	White Natural	20-30	Medium - weight Curtains, Towels, Half Linens.	For Pattern Weft in Twill and Lace. For colors in this size see Art. 214.
	24/3	6720	840 2 oz. tube	Natural	18-24	Half Linens, Towels, Curtains, Runners.	Pattern Weft for Lace Weaves and twill.
Art. 714 Lily Three Strand Mercerized Cotton	10/3	2800	350 2 oz. tube	20 Colors	16-20	Belts, Double Weave, Book Covers, Table Mats, Handbags, Pot Holders, Drapes.	Coverlets, Pillows, Dress Material.
Art. 414 Lily Cotton Carpet Warp	8/4	1600	800 8 oz. tube	25 Colors	10-16	Rag Rugs at 12 to the inch. Bath Mats, Curtains, Place Mats.	Used as coarse Tabby, Twill Weave, Colored Bands.
Art. 612 Lily Rug Filler 25% Rayon 75% Cotton			75 8 oz. skeins	27 Colors	Rug Filler		Rugs, both Pattern, plain and with cloth strips.
Art. 814 Lily Rug Weave Yarn 100% Cotton			80 2.5 oz. skeins	35 Colors	Rug Filler	Flossa loops, Very heavy tabby for Rugs, Bath Mats.	No - tabby Rugs, Bath Mats, Hot Pads.
Art. 1014 Lily Four Strand Filler 100% Cotton			100 2 oz. skeins	28 Colors	Use as filler	Tabby for heavy Rugs, Stripes for Seat Covers and Outdoor Pillows.	Hot Mats, Bath Mats, Wall Hangings, Heavy Purses.

Lily's Weaving Chart

Art. No.	Name of Thread	Yds. per Pound	Yds. per Tube	No. of Colors	Reed Setting	Use as Warp and Tabby Weft	Use as Pattern Weft
Art. 111 Lily Weaving Wool		3000	375 2 oz. tubes	33 Colors		Warp ends to the inch vary according to weave. Stoles, Baby Things, Dress and Suit Material.	Pattern Weft in Overshot, etc. For plain weave across warp of same yarn.
Art. 402X Lily Wintuk 100% Orlon Acrylic		1124	281 4 Oz. skeins	27 Colors		100% Orlon Acrylic for Heavy Warp.	For weaving Afghans, Blankets, Pillows.
Art. 107L Lily Linen Warp Yarn	10/2		750 8 oz. tubes	Oyster White	10-18	For Heavy Place Mats, Runners, Table Cloths, etc. Dress Material.	
	20/2		1500 8 oz. tubes	Oyster White	18-24	Medium Place Mats, Dress Material, Towels, Runners, Hangings.	
Art. 107A Lily Linen Rug Warp	8/5		240 8 oz. tubes	Natural		For Heavy Linen Warp.	Generally used as Rug Warp.
107B Lily Econo-Linen Rug Warp	8/5		210 8oz. tubes	Natural		For Heavy Linen Warp.	Generally used as Rug Warp.
Art. 207L Lily Linen Weft Yarn	10/1		1500 8 oz. tubes	Oyster White			Use as Weft with 20/2 Warp. Art. 107L
Art. 50x Lily Double Quick Mercerized Cotton			115 yd. skein	18 Colors			Use as Warp and Weft.

Lily Novelty Yarns For Special Effects

Art. 47	**Lily Jute-Tone**	20 Colors	4 oz. Tubes	Approx.	70	Yards
Art. 909C	**Lily Cotton Novelty Yarn**	16 Colors	8 oz. Cones	Approx.	525	Yards
Art. 3872	**Lily Cotton Lace Yarn**	14 Colors	8 oz. Tube	Approx.	950	Yards
Art. 106	**Lily Cotton Chenille**					
	3 Cut	16 Colors	4 oz. Skeins		60	Yards
	6 Cut	16 Colors	4 oz. Skeins		125	Yards

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