

“Straight Line” Textile Calculations

By Samuel S. Dale

Fixed Weight Counts.

Following are equivalent expressions for the principal fixed weight standards for numbering:

- Run System**
- 1600 yards per pound
- 100 yards per ounce
- 1 yard per 4% grains
- 8 8/35 inches per grain
- Cotton System**
- 840 yards per pound
- 52½ yards per ounce
- .12 yard per grain
- 4.32 inches per grain
- Worsted System**
- 560 yards per pound
- 35 yards per ounce
- .08 yard per grain
- 2.88 inches per grain
- Linen or Cut System**
- 300 yards per pound
- 18.75 yards per ounce
- West of England Woolen**
- 320 yards per pound
- 20 yards per ounce
- Yorkshire Woolen**
- 256 yards per pound
- 16 yards per ounce
- 1 yard per dram
- Metric**
- 496 yards per pound
- 31 yards per ounce
- 1000 meters per kilogram

Yards Per Ounce.

The number of yards per ounce is used in England to indicate the size of reeled silk. As this basis is 1/100th of the run standard (100 yards per ounce) it has not been considered necessary to include it in the tables of equivalents. The run equivalents of the yards per ounce count can be

the denier count equivalent to the number of grains per 638 yards.

Equivalents of the denier standard:

- Deniers per 400 aunes
- Pounds per 4,464,528 yards
- Ounces per 279,033 yards
- Drams per 17,440 yards
- Grains per 638 yards
- Demi-decigrams per 450 meters

Because of its uniformity the reeled silk thread is much better suited for indicating the size by the diameter than is yarn spun from other textile fibers. Calculations of the diameter of reeled silk from the specific gravity of the material have been made, the results being shown in the accompanying table:

Dram System for Silk.

The standard for number thrown silk in Great Britain and the United States.

- Pounds per 256,000 yards
- Ounces per 16,000 yards
- Drams per 1,000 yards
- Grains per 36 4/7 yards

Pound for Jute.

The world standard for number jute yarn.

- Pounds per 14,400 yards
- Ounces per 900 yards
- Grains per 2 2/35 yards

Reducing Yarn Numbers.

The number of yarn by one fixed weight standard can be readily reduced to its equivalent by any other standard by means of the ratio between them. For example, No. 1 cotton yarn measures 840 yards per pound; No. 1 worsted yarn, 560 yards per pound. No. 1 cotton is consequently equivalent to No. 1½ worsted. The cotton number is reduced to the worsted equivalent by multiplying by 1½, while the worsted number is reduced to the cotton equivalent by dividing by

Diameters			Diameters			Diameters		
Deniers	Microns	Per Inch	Deniers	Microns	Per Inch	Deniers	Microns	Per Inch
8	42	605	16	59	428	24	73	349
9	44	570	17	61	415	25	74	342
10	47	540	18	63	403	26	76	335
11	49	516	19	64	393	27	77	329
12	51	494	20	66	383	28	79	323
13	53	475	21	68	374	29	80	318
14	55	457	22	70	365	30	81	312
15	57	442	23	71	357	31	83	304

(25,400 microns=1 inch)

obtained from the run equivalents by moving the decimal point two places to the left. For example, 20,000 yards per ounce is equivalent to 200 runs. Likewise the run equivalents can, as is frequently done, be reduced to yards per ounce by the same method. Thus, 4¾ runs is equivalent to 475 yards per ounce.

Denier Count.

The world's standard for raw silk. Also used for thrown silk on the Continent of Europe. The denier and aune are old French units of weight and length.

The denier count of silk yarn is ordinarily indicated with an allowance of 2 deniers for the variations in the size of the silk. Thus 10-12 denier silk indicates that the average size is 11 deniers.

Variations in the weight of the denier in different parts of Europe have given rise to what are known as the French, Turin and Italian denier systems. The difference between these standards is so slight as to be negligible in practice.

The Italian standard is now generally accepted and has been adopted as a basis for these calculations. It makes

1½ or reducing the worsted No. by one-third.

$$60s \text{ (cotton)} \times 1\frac{1}{2} = 90s \text{ worsted}$$

$$90s \text{ (worsted)} \div 1\frac{1}{2} = 60s \text{ cotton}$$

Reduction of a yarn number from one fixed length basis to another is accomplished by simple proportion. For example a yarn weighing 40 grains per 50 yards would weigh double that amount, or 80 grains, per 100 yards, the reduction from the 50-yard basis to the 100-yard being accomplished by multiplying by 2. Conversely the reduction from the 100-yard basis to the 50-yard is effected by dividing by 2.

The reduction of yarn numbers from a fixed weight basis to a fixed length basis or the reverse is effected by dividing a constant number by the given yarn number. Let us assume that No. 40 cotton is to be reduced to grains per 120 yards. The cotton number indicates the number of 840-yard lengths per pound (7000 grains). As 120 is one-seventh of 840, it follows that the cotton number also indicates the number of 120-yard lengths per 1000 grains (1/7 pound). From this it is plain that the weight in grains of 120 yards is found by dividing 1000 (grains) by the cotton number (120-yard lengths per 1000 grains).

$$1000 \text{ (grains)} \div 40 \text{ (cotton No.)} = 25 \text{ grains per 120 yards}$$