cotton science





cotton science

FIRST EDITION

"Cotton Science" has been prepared to help meet the needs of the retailer, the student, the layman, teacher and others in Canada interested in the study of textiles. It combines factual information with interesting scientific tests which illustrate the properties and characteristics of cotton fibres and fabrics.

This study and exercise book will explain the processing of cotton from fibre to fabric with emphasis on how fabrics are made to meet a wide variety of end uses. A knowledge of "Cotton Science" should be of inestimable value in textile study and in everyday life.

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1 COTTON TODAY AND THROUGH THE AGES

Cotton and You

People have been weaving and wearing cotton for some 5,000 years, until today it is one of the most important fibres known to mankind. Everyone uses cotton, in more than a thousand ways in every phase of daily life; at home, in the office, the workshop or the fields and at play.

The comfort of a modern home depends on cotton; in towels, washclothes, drapes, window shades, upholstered furniture, floor rugs and numerous other everyday articles. There is cotton in telephones and electric light wire. Even the average family automobile contains about 90 pounds of cotton in various forms.

We dress in cotton made into shirts, frocks, and underwear, and the linings for suits, overcoats, shoes and rubbers. We sleep between cotton sheets, under cotton blankets, on cotton pillow cases, in cotton pyjamas and night-dresses.

Cotton supplies bandages, tents, awnings, and is a base for explosives. Cotton enters into the production of movie film and celluloid. Cotton seeds, crushed, provide oils for salads and soaps; food for cattle and poultry and fertilizer for soil.

Most uses of cotton demand special qualities in the yarn from which the fabrics are woven. Canadian mills spin many varieties of yarn and they weave these yarns in hundreds of ways to make fabrics as soft and loose as surgical bandages or as firm and strong as tarpaulins.

In the following pages cotton is traced from its first appearance as a seed pod, or "boll", through the various processes as it is turned into yarn, then fabric - - - bleached, dyed and printed.

History of Cotton

The origin of cotton is a mystery but ancient records reveal it was used in Peru some 5,000 years ago and by the Indus civilization in what is now West Pakistan. The first reference to cotton in literature was made by Herodotus, in 425 B.C.: "There are trees which grow wild there; the fruit of which is wool exceeding in beauty and goodness that of the sheep. The Indians make their clothes of this tree-wool".

About 325 B.C. Alexander the great took cotton from India to Egypt and other Mediterranean countries. Cotton growing and weaving were established in Europe early in the 8th century by the Moors in Spain and the Arabs in Sicily. The Crusades brought cotton to the north and west. Marco Polo described the growth and manufacture of cotton in China and Columbus believed he had reached India when he found cotton growing in the Bahamas in 1492.

Cotton made its debut in England in the 12th century where it later became a great factor in the English economy. In the United States cotton was cultivated during the 17th century and New England became the first centre of the U.S. textile industry. Canadian manufacture of cotton goods dates from 1845 when a mill was erected at Sherbrooke, Que. When the American Civil War paralyzed the cotton industry across the border, the Canadian industry developed to meet the demands of Canadians.

When the war ended Canadian mills found themselves capable of producing more than sufficient quantities of the basic sheetings and grey (greige) cloths needed, so they began to diversify their products, making a wide variety of goods, a policy which continues today.

Cotton in Canada

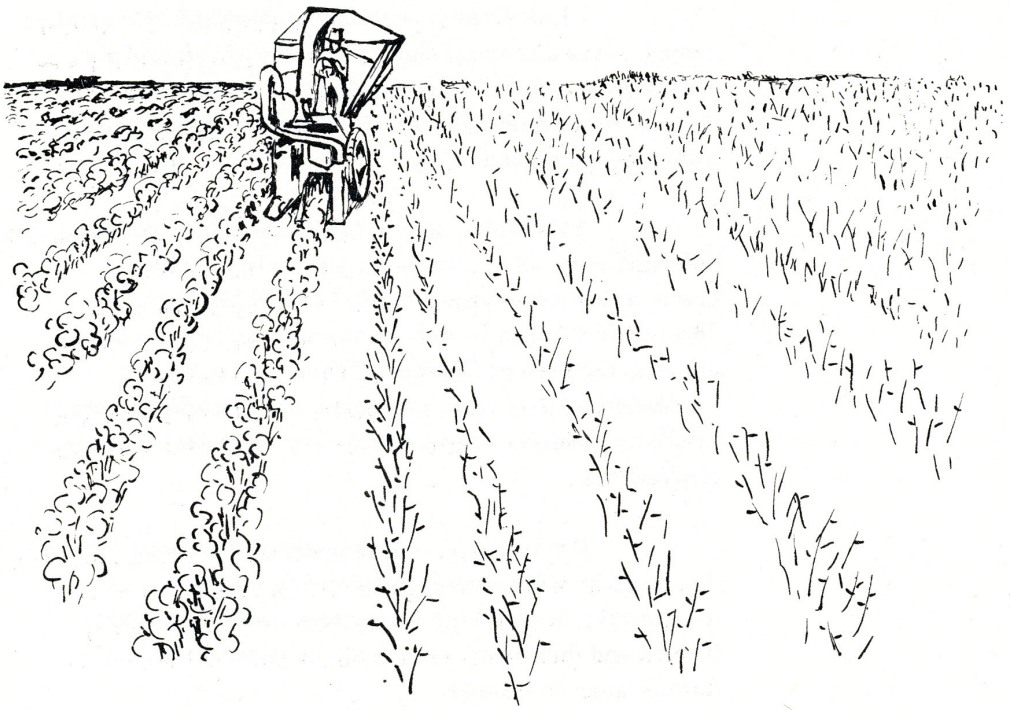
Every country with any reasonable industrial capacity has a cotton industry. As one of the world's most highly industrialized nations, is as natural therefore for Canada to engage in cotton manufacturing as, say---England or Japan.

Aside from the fact that Canadians consume over 600 million yards of cotton per year, the industry gives steady employment to 18,300 people. There are 38 mills in Canada in which cotton yarns and or cloth are manufactured or finished. These are located in the Maritime Provinces, in Quebec and Ontario and are mostly in smaller centres where they comprise the main employment.

The industry is also essentially Canadian since the severity of its foreign competition has never made it attractive to any large investment of foreign money. Profits and dividends earned and distributed are therefore retained in Canada.

The competition the industry faces has also resulted in its adoption of the most efficient methods and modern equipment. Canadian mills are recognised as being technically very advanced as well as being in the top bracket in payment of wages.

Almost half of the 600 million yards of cotton fabrics used by Canadians are supplied by Canadian mills and the other half is supplied by imports from the United States, European and Asian countries. With high labor costs, Canadian mills are able to export only a small proportion of their products--- an average of 22 million yards per year.



Questions on Chapter 1

How many apparel, household and industrial uses can you list for cotton?
How long has it been used by man?
How much cotton is used by Canadians?
How many cotton mills are there in this country?
How many people do they employ?

II COTTON – FROM FIELD TO YARN

Culture and Initial Processing

Cotton is grown in sub-tropical countries where warm, humid atmosphere and ample rainfall make the plants strong and healthy. The principal cotton producing countries are the United States, India, Brazil and Egypt with the U.S. leading world production.

The cotton plant which grows from four to six feet high, flowers annually and the remaining pod or "boll" bursts open when it is ripe, exposing the cotton. It is then ready for harvesting. There are many varieties of cotton with differing lengths and qualities of fibres. The short, medium and longer staple lengths are suitable for different end uses.

Picked in its raw state, the cotton boll contains seeds, leaf and other impurities which are removed by a process known as "ginning". A cotton gin machine has rotating discs which pull the lint or fibres away from the stem and seeds. The cotton is classed, graded and then compressed into 500-pound bales for shipping.

There are 20 different staple lengths in cotton and the grading varieties are also extensive as grades take into account the strength, density and lustre of the fibres. Mills in Canada select the cotton suitable for the types of fabrics they wish to produce. For instance, short and medium lengths are used for a great variety of fabrics while the longer fibres which allow the spinning of finer yarns are used for more closely woven and finer quality fabrics.

The cotton seeds are also used commercially to produce a variety of oil and meal products.

Processing Yarn in the Mill

Cotton textile manufacturing is generally divided into two major operations – spinning and weaving. Spinning includes various preparatory and cleaning processes during which the fibres are gradually changed into yarns ready for weaving or knitting.

The raw cotton is fed into machines called blenders, openers and pickers (combined beaters and vacuum cleaners) and comes out in mat form resembling absorbent cotton.

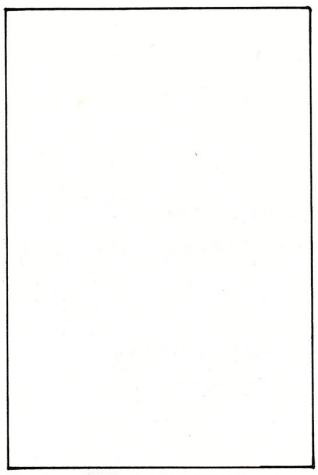
Another cleaning follows, this time in machines called "cards" which are like huge wire hairbrushes rubbing against each other. Carding removes the short or matted fibres leaving a fine web which is then drawn through a funnel shaped device that molds it into rope form called sliver (rhymes with driver).

If combed yarn is to be produced the card slivers get a third cleaning through a series of combs which eliminate all fibres under the length required for fine yarns.

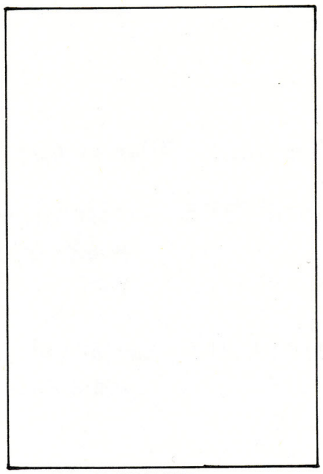
Whether the sliver has just been carded or whether it has been also combed, it now goes through a series of machines which combine six to eight slivers blending them together and drawing them out over a series of rollers which pull the fibres into parallel order.

After drawing, the cotton sliver is still loose and weak so it is given strength by twisting and further drawing out on roving frames until it resembles thick string. It is then called roving and is wound on bobbins.

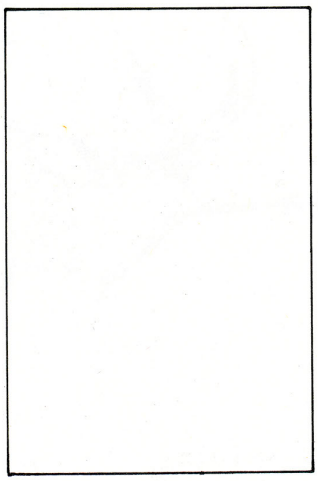
The spinning frame does the final slimming and twisting to bring the cotton to the correct fineness and strength. The final twist which can be varied from 5 to 40 or more turns per inch, converts the roving into single yarn ready for weaving. Ply yarns are two or more single strands twisted around each other. A great variety of thicknesses are produced and classified according to weight and yarn count.



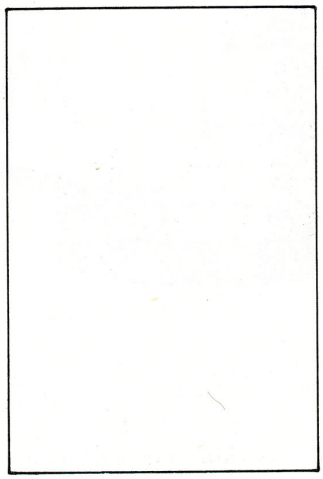
RAW COTTON



SLIVER



ROVING



YARN

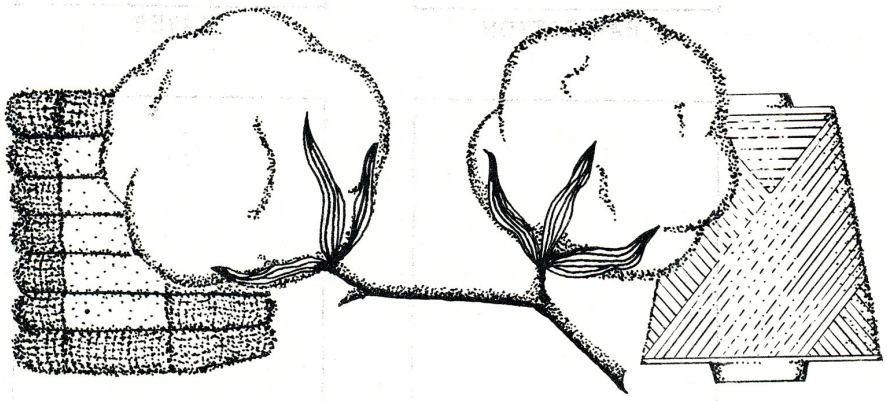
Questions on Chapter II

What part of the cotton plant is picked or harvested?
What is ginning?
List the major steps in turning raw cotton into yarn?
Why is yarn twisted?

Test No. 1: Fibre to Yarn

OBJECTIVE: To identify appearance of cotton in its stages of development from fibre to yarn.

MATERIALS: Samples of raw cotton, sliver, roving, lens, ruler and rubber cement.



PROCEDURE:

a. Examine raw cotton and explain extraneous materials which must be removed.
b. Separate and examine individual fibres.
c. Compare thickness and tensile strength of roving against sliver and explain difference.
d. Compare fineness and strength of yarn with previous samples.
e. Paste samples in spaces provided.

QUESTIONS:

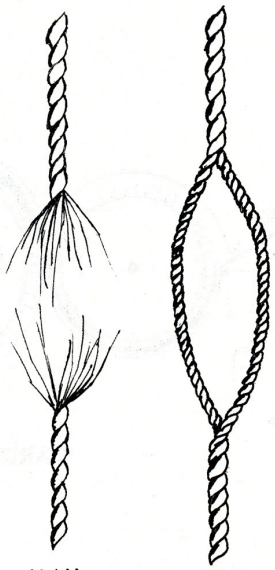
1. Are all cotton fibres the same length?
2. Which is stronger, sliver or roving; why?
3. What gives the yarn its final strength?

Test No. 2: Single and Ply Yarn

OBJECTIVE: To learn the difference between single and ply yarn.

MATERIALS: Fabric sample "A" and magnifying lens.

"A" is a single yarn. When untwisted it comes apart as fibres.
"B" is a ply yarn. When untwisted it separates into two or more finer yarns.



PROCEDURE:

a. One at a time pull three weft yarns from sample.
b. One at a time pull three warp yarns from sample.
c. Untwist the weft yarns and examine fibres.
d. Untwist the warp yarns and compare.

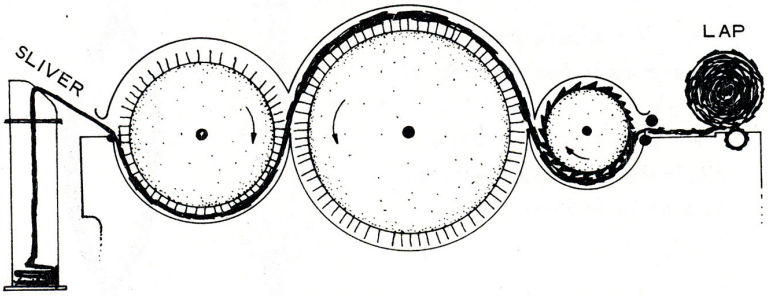
QUESTIONS:

1. Why is it wrong to say "single ply"?
2. Why is ply yarn better than a single yarn of same size?
3. What is a 2 by 1 fabric?
4. Why does plying improve fibre yarns?

Test No. 3: Carded and Combed

OBJECTIVE: To learn the difference between a carded cotton fabric and a combed cotton fabric.

MATERIALS: Fabric sample "A" and magnifying lens.



CARDING MACHINE

PROCEDURE:

a. Examine the face and back of fabric sample.
b. Separate yarns from warp and weft and compare.
c. Untwist fibres from the yarns and measure.
d. Note parallel position of fibres in yarns.

QUESTIONS:

1. What is the main difference between carded and combed?
2. Why are the best cotton fabrics made of combed yarns?
3. Why must all cotton be carded?

III KNITTED AND NON-WOVEN COTTON FABRICS

Knitted Cotton Fabrics

Knitting is the construction of a fabric with needles by the interlooping of yarn in a series of connected loops. Each chain of loops running lengthwise in a fabric is called "wale" and corresponds to the warp in woven fabrics. The chain of crosswise loops which corresponds to the weft is called the "course".

Knitted cotton fabrics range from loose, open construction like netting, to closely knitted cloth in which the loops become massed together until they look like woven goods. The yarns, spun with slack twist for softness or hard twist for smoothness, may be carded, combed and mercerized.

When knitting by hand, each loop is made separately but flat or circular knitting machines make whole rows of loops across the width of the fabric at a time, having separate needles for each loop. The machines can knit fabrics two to five times as fast as looms can produce woven goods.

Filling or weft knit fabrics are most common and are characterized by horizontal stretch. Plain, purl and rib are the three basic stitches used. Plain knit shows a wale on the face of the fabric with courses on the underside and results in smooth-faced fabrics like jersey. The purl stitch shows courses on both sides and makes fabrics particularly elastic lengthwise. The rib stitch is a combination of the plain and purl, showing wales on both sides as commonly seen in knit cuffs and sock tops.

Warp knit fabrics in which the wales run lengthwise are knitted from warp yarns alone and are always flat knits. They are stronger, more resistant to snags and do not run when a single stitch is broken. Tricot is the most common type of warp knits of which there are thousands of versions.

Non-Woven Cottons

A non-woven fabric, other than knitted, is a cloth-like material consisting of a web or mat of fibres bonded together by an adhesive agent or by simple mechanical entanglement. Relative newcomers to the textile field, non-woven fabrics lie somewhere between paper and cloth in most of their present uses, having some of the advantages of both.

Uses for non-woven fabrics range from disposable items like diapers, napkins, table cloths, polishing cloths, laboratory clothing and wiping rags to more durable goods such as drapes, lining fabrics, interlinings and similar products.

Most non-woven fabrics are made from shorter cotton fibres than those used for woven goods. The cotton card machine is the simplest and most widely used method to form the webs (see Chapter II).

Four methods may be used to bond the fibres together. The web may be impregnated with a liquid adhesive, or it may be dusted with an adhesive powder and set by heating. A third method consists of the inclusion of some thermoplastic fibres which will melt and bond upon application of heat or solvents. The last method depends on a mechanical entanglement of the fibres in order to hold the web together.

Questions on Chapter III

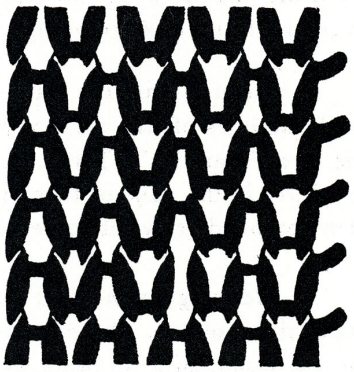
How does the knitted structure differ from the woven structure?
What is characteristic of most knit fabrics?
What are the three basic knitting stitches?
Explain the four methods of bonding non-woven fabrics.

Test No. 4: Knitted Cloth

OBJECTIVE: To study the structure of knitted cloth.

MATERIALS: Fabric sample "B" and magnifying lens.

Knitted cloth consists of interlocking loops formed from one or more yarns.



PROCEDURE:

a. Try stretching the sample in both directions.
b. Examine and explain knitted structure.
c. Pull a yarn at an edge of the cloth to determine if the fabric "runs".
d. Describe the stitch in the sample.

QUESTIONS:

1. How does knitted structure differ from woven?
2. What is a run?
3. For what type of garments are knitted fabrics suitable?
4. What is a gauge? Define full-fashioned.
5. Why are stockings always knitted?

CHAPTER IV WOVEN COTTON FABRICS

Weaving

Lengthwise yarns called the "warp" (parallel to the selvedges in a fabric) usually require a higher degree of twist than "weft" or filling yarns which run from selvedge to selvedge. First, severalhundred warp yarns at a time are rewound from spools onto large beams and to strengthen them against the chafing of the weaving process, they are given a bath (sizing) in a mixture of starch and gums).

After sizing, the warp yarns are drawn through the eyes of fine steel wires or "heddles" in the loom "harness". This is an exacting process, particularly in the case of fancy patterns and may be done by hand or by intricate machine.

Weaving consists of interlacing warp and weft yarns at right angles. There three basic weaves: plain, twill and satin. In plain weaving, only two harnesses are required and alternate warp threads are drawn through each harness. The harness frames are raised and lowered alternately while a high-speed shuttle containing the weft yarn passes through the opening between the upper and lower layers of yarn.

If the shuttle speed is 180 picks per minute, it means that in one minute 180 weft threads are woven into the cloth. In the case of a fabric having 60 picks to the inch, this means three inches are woven per minute. Looms can be adjusted to produce open or close weaves and to create a wide variety of patterns.

Cotton cloth comes off the loom yellowish in colour due to the natural shade of cotton and the sizing still remaining in the warp. At this stage it is called grey (greige) or unbleached cotton. It is carefully inspected for weaving defects and graded accordingly.

Cleaning and Bleaching

If the newly woven cloth is not to be sold as grey goods, it is singed over a gas flame to remove hanging thread and fibre ends. The starches that were added to the warp before weaving must now be removed in a desizing process. In the cleaning processes, natural gums, waxes and other impurities are removed.

A modern bleach house usually operates on the continuous process. This means that the cloth runs in one long length through the singer, desize process, scouring and the bleaching range. It is then washed, dried and wound on rolls, all in the same continuous operation.

Bleaching is an important process not only to obtain clear white cloth but to increase cotton's affinity for dyestuffs.

There are two types of machinery used for bleaching. Whichever type of machinery is used, the chemical treatment is about the same. The group of machines which saturate the cloth with chemicals, allow the chemicals time to act at proper temperatures and wash out the cloth after the treatments.

Actual bleaching is usually done with hydrogen peroxide after the cloth has been prepared by other treatments. The whole process takes nearly three hours with the cloth on the move all the time.

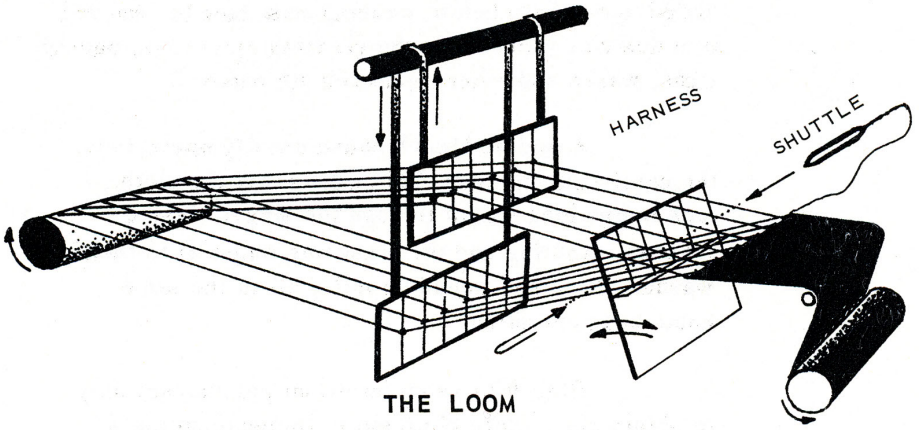
Questions on Chapter IV

Why are warp yarns sized?
How is cloth woven?
How many basic weaves are there?
Why are cottons bleached?

Test No. 5: Warp and Weft

OBJECTIVE: To find warp and weft direction of woven goods.

MATERIALS: Fabric sample "C".



THE LOOM

PROCEDURE:

a. Examine sample and note which yarns run in same direction as selvedge.
b. Try stretching cloth in both warp and weft directions.
c. Make fringe on two sides and compare closeness of yarns.
d. Untwist yarns from each fringe and test for strength.

QUESTIONS:

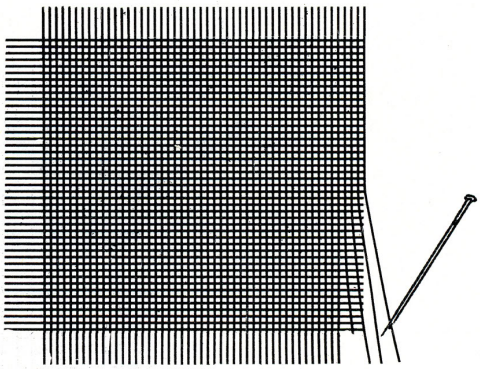
1. In which direction does fabric stretch more?
2. In which are yarns closer together?
3. If one set of yarn were ply which would it be?
4. Which yarns were sized in weaving?
5. If fabric were striped or corded in which direction would the pattern run?

Test No. 6: Construction

OBJECTIVE: To study the construction of woven cloth.

MATERIALS: Fabric sample "C" and magnifying lens.

Woven cloth consists of two systems of yarns interlacing at right angles.



PROCEDURE:

a. Note construction of sample through magnifying lens.
b. Make a fringe on all edges except selvedge edge.
c. Pull yarns one at a time from each side.
d. Measure the individual yarns.

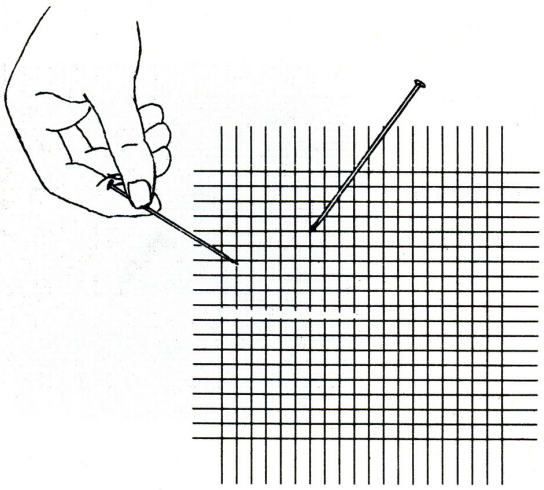
QUESTIONS:

1. What holds the yarns together in woven cloth?
2. Explain how edges differ.
3. How long are weft yarns compared to width of sample?
4. How long are warp yarns compared with length of sample?

Test No. 7: Yarns Per Inch

OBJECTIVE: To count the yarns per inch in a fabric.

MATERIALS: Fabric sample "C", ruler, pin and scissors.



PROCEDURE:

a. Make a straight fringe on the four sides of the sample.
b. From the first warp yarn in one of the fringes, measure in exactly ½-inch.
c. Insert pin in the cloth at the ½-inch mark.
d. About ½-inch below the pin, make a ¾-inch cut in the filling or weft direction.
e. Carefully pull out and count the warp yarns up to the pin.
f. In the same way count the weft or filling yarns.

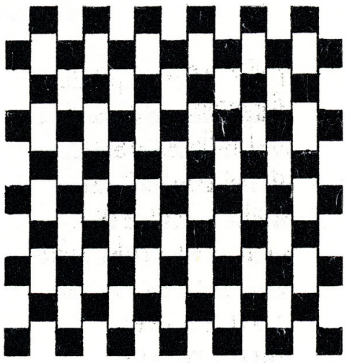
QUESTIONS:

1. How does yarns-per-inch affect fabric quality?
2. What is type 180 sheeting?
3. Is there another way to count yarns?

Test No. 8: Plain Weave

OBJECTIVE: To study the interlacing of yarns in a plain weave and reproduce with coloured paper strips.

MATERIALS: Fabric sample "D", 12¼-inch paper strips (6 of yellow, 6 of blue), rubber cement and magnifying lens.



Each warp yarn passes alternately over and under each weft yarn and vice versa. Any two consecutive warp or weft yarns weave exactly the opposite.

PROCEDURE:

a. Hold sample plain weave, face side up with warp vertical.
b. Make fringe across top and right edge.
c. With pin remove first warp yarn into centre of weft fringe on right edge of cloth.
d. Arrange 6 paper strips of same colour crosswise, one below the other, not quite touching each other.
e. Paste down right end of each strip.
f. Interlace a strip of different colour through the six weft strips to correspond with interlacing of first warp yarn.
g. Move a second warp yarn out into fringe and weave second strip of paper to correspond with interlacing.
h. Continue until all strips have been woven and paste down the loose ends.

QUESTIONS:

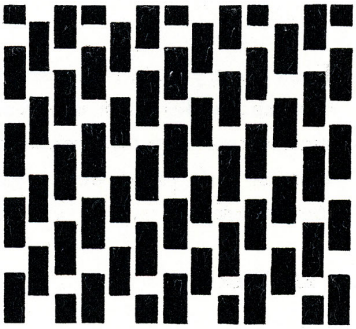
1. What is a plain weave?
2. Why is the plain weave most used?
3. Why is a plain weave firm?
4. How many harnesses are needed to make a plain weave?
5. Make a list of 10 fabrics that have plain weave?

Test No. 9: Twill Weave

OBJECTIVE: To study the interlacing of the yarns in a twill weave and reproduce with coloured paper strips.

MATERIALS: Fabric sample "V" 16 ¼-inch strips (8 yellow, 8 blue), magnifying lens, pin and rubber cement.

Twill weaves produce diagonal lines in the cloth. The direction of the twill on the back is opposite to what it is on the face.



PROCEDURE:

a. Hold sample, face side up with warp yarns vertical.
b. Make a ¼-inch fringe across top and along right edge.
c. With a pin, move first warp into centre of fringe.
d. Arrange 8 ¼-inch strips of paper of same colour, crosswise one below the other, not quite touching.
e. Paste right end of each strip.
f. Interlace a strip of different colour through eight strips to correspond with interlacing of warp.
g. Move a second warp yarn out into fringe and weave a second coloured strip to correspond with interlacing.
h. Continue in this way until 8 strips have been woven and paste down the loose ends.

QUESTIONS:

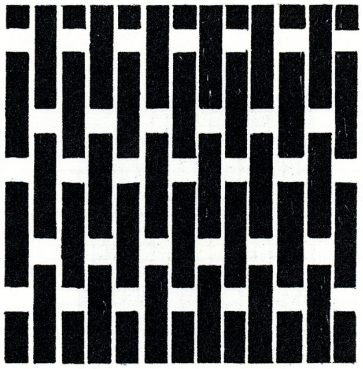
1. What is a twill weave?
2. What is a right hand twill?
3. What is the size of the angle of most twills?
4. What is herringbone twill?
5. Why does the twill weave make possible more yarns per inch than the plain weave?

Test No. 10: Satin Weave

OBJECTIVE: To study the interlacing of the yarns in a satin weave and reproduce the weave with coloured paper strips.

MATERIALS: Fabric sample "W" –twenty ¼-inch strips (10 yellow, 10 blue), pin, rubber cement and magnifying lens.

Satin weaves have few interlacings and long floats. The face consists almost entirely of warp or weft. If the warp predominates on the face the weft predominates on the back.



PROCEDURE:

a. Hold sample face side up with warp yarns vertical.
b. Make fringe across the top and along right edge.
c. With a pin move first warp yarn into centre of fringe.
d. Arrange 10 paper strips of same colour crosswise for first 10 weft yarns, one below the other, not quite touching.
e. Paste down right end of strips.
f. Interlace a strip of different colour through the 10 weft strips to correspond with interlacing of first warp yarn.
g. Move a second warp yarn out into fringe and weave second strip of paper to correspond.
h. Continue in this way until all strips have been woven and paste down loose ends.

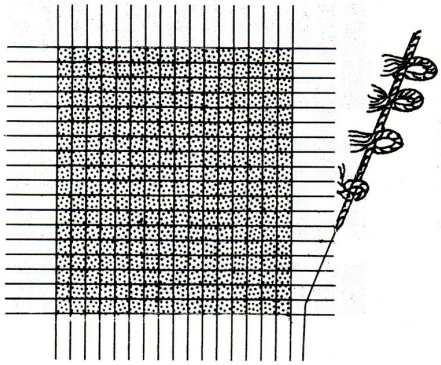
QUESTIONS:

1. What is a satin? Sateen?
2. What is a satin weave?
3. What is a warp-faced satin?
4. How many harnesses are needed for the simplest satin weave?

Test No. 11: Pile Weaves

OBJECTIVE: To study the construction of pile fabrics and to determine the shape, direction and arrangement of pile yarns.

MATERIALS: Fabric samples "E" and "F", magnifying lens and pin.



Cut pile fabric "E" is made with an extra set of either warp or weft yarns which when cut form the pile.



Uncut pile fabric "F" has an extra set of warp yarns which are held slack during weaving and form loops on the surface.

PROCEDURE:

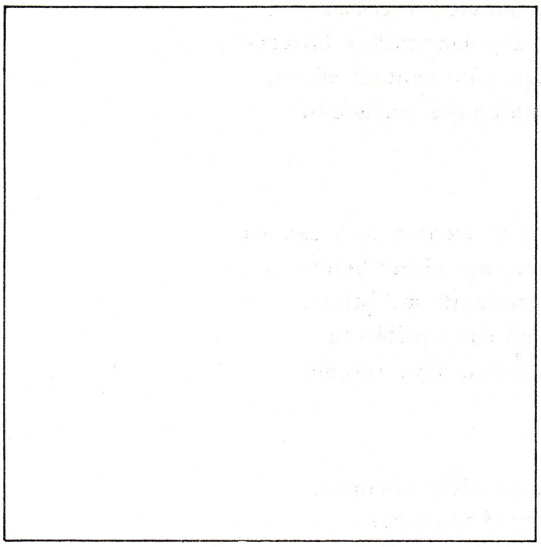
a. Make a fringe on warp and weft edges of both samples.
b. Look at samples through magnifying lens while slowly pulling warp yarns from the samples.
c. One at a time, pull out weft yarns in the same way.
d. Note to which yarns the pile yarn clings, the warp or the weft.
e. Note interlacing of ground yarns in each sample.

QUESTIONS:

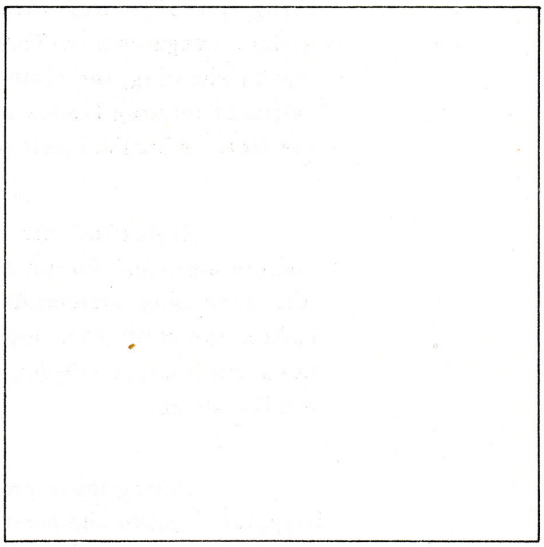
1. How is pile produced in a fabric?
2. Name three cotton cut pile fabrics.
3. Why is uncut pile used for towelling?
4. How is uncut pile produced?



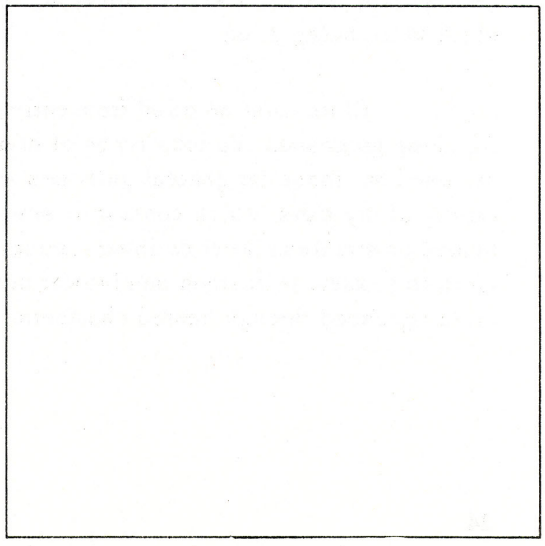
PLAIN WEAVE "G"



TWILL WEAVE "V"



SATIN WEAVE "W"



PILE WEAVE "F"

CHAPTER V DYEING AND FINISHING COTTON CLOTH

Preliminary Preparation

Certain shades may be dyed without preparatory cloth treatments, but these are generally suitable for only a limited range of uses. Because of the tremendous variety and combinations of colours and finishes possible today, processes are quite numerous and complex.

The finishing process begins with the singeing and bleaching treatments described in Chapter IV. Before being dyed or printed, the cloth is sheared to remove surface irregularities. This is usually done before bleaching. In shearing, the cloth is brought into contact with a series of rotating blades against which the surface of the cloth is brushed as it passes.

If desired, the cloth may be treated with caustic soda in a process known as mercerizing, either before or after bleaching. Mercerizing adds strength and lustre, making the cloth more absorbent and susceptible to dyes and finishes. Highly mercerized cottons assume a silky sheen.

During these processes the cloth becomes irregular in width and must be restored to proper dimensions by stretching on a slender frame. The damp cloth is run over the frame and is grasped on each side by the clips which hold it at the desired width while being dried.

Cloth must be dried frequently during the finishing processes. Various types of drying machines are used but those for general purposes are composed mostly of dry cans, which consist of several steam-heated or stainless steel cylinders around which the cloth is passed. In festoon and blower dryers the cloth is passed through heated chambers.

Dyeing

People have been dyeing fabrics for at least 5,000 years. In ancient days, dyes were rare and so expensive that purple was called "Royal" because only the very rich could afford it. Today there are dyes for every colour of the rainbow, dyes that will not fade in the sun or run in the washtub. Applying them is a highly technical affair based on applied chemistry.

Colour is applied to textiles in any one of three stages: (1) To the loose fibres before spinning; (2) to the spun yarns before weaving or knitting and (3) to the fabric after weaving or knitting. Fabrics may be dyed in solid colours or printed with various patterns in one or more colours.

In raw stock dyeing, the cotton goes right from the bale into large kettle-like machines which pump dye through it. As a rule this is a costly method of dyeing but for certain textiles it offers advantages.

In yarn dyeing the colour also has a chance to penetrate to the core of the yarn thus yarn-dyed fabrics are usually deeper and richer in colour. The degree of colour fastness is relative to the end use of the fabric.

Dyeing cloth after it is woven or knitted is a relatively fast and simple method that permits production of any shade on short notice and because of its flexibility is the most widely used. The dye jig machine, most commonly used, winds the cloth off one roll and onto another while passing it through the dye bath. The rolls are wound back and forth until the dye is evenly applied and fixed by oxidation or some other chemical process before washing and drying.

The continuous dyeing method has all the machines required for dyeing, oxidizing, washing and drying arranged in a line. The white cloth enters at one end and the dry dyed cloth wound on rolls comes off the delivery end of the dyeing range.

Printing

Colours are printed on cotton cloth much like printing on paper. Pastes containing starch and resin which carry the dye are used instead of ink and later washed out leaving only the dye on the coloured areas. Cottons may be printed by many processes according to the effect sought or the quantity of goods desired in each pattern.

First, an artist paints a design. Then each colour in the design is printed separately by a specially engraved copper roller. There may be as many as 12 colours in one pattern. There are three ways of engraving rollers for printing cloth:

1. Photo engraving is done with special cameras which photograph each colour separately. Then the negatives are transferred to the rollers and etched in much the same way as plates are made for printing on paper.

2. Rollers for printing stripes are made by running a hard steel/mill against the softer copper of the roller.

3. Pantographing is more complicated. The artist's design is photographed on a zinc plate. Then a groove is cut along the outline of each colour. An operator with a pantograph machine then traces each groove with a pointer which is connected with a series of diamond points. These cut through a coating of varnish on the copper roller. Then the roller is put in a bath of acid which eats into the copper where the varnish has been cut away.

Screen printing is a process used extensively when the yardage per pattern is too small for economical roller printing or for exceptionally large designs. A printing screen is made of fine silk, nylon or metal stretched on a frame. The parts of the screen not in the pattern are blocked out with suitable paints. The pattern portion allows the printing paste to pass through onto the fabric.

Mechanical Finishing

After the cloth has been dyed or printed it is given the type of finish desired. This finish may be applied mechanically or chemically. Many new finishing processes have been developed over the past 25 years. Cotton can be produced to look and feel like linen, silk, taffeta or even wool. The same cotton cloth can be finished in various ways to appear as chintz, chambray, gingham or pique.

Mechanical finishing processes include calendering, which removes wrinkles and gives the cloth a smooth, ironed appearance. The cloth passes through a series of heated rollers under great pressure. As in domestic ironing, the result depends on the quantity and kind of finishing agents and on the amount of heat and pressure applied.

In some instances, engraved calender rolls are used to emboss the cloth with many fine lines which give a distinctive soft lustre. Cotton may pass through calender rolls revolving at different speeds. The friction results in a "polished" fabric. Still other types of calenders emboss cotton fabrics with various textured effects. Raised designs of almost any description may be produced.

Napping is a process which alters the final hand and appearance of a fabric by producing soft, fluffy surfaces such as those of blankets and flannels. The cloth is drawn through rollers with surfaces much like a wire brush which raise the nap.

Shrinking is a finishing process which restores the fabric to complete relaxation after the many stretchings has received it during previous processing. Throughly pre-s shrunk fabrics have been popularized under the trade-mark "Sanforized". A "Sanforized" fabric is guaranteed not to shrink more than one per cent. Cotton cloth is pre-shrunk by dampening and running it with heat over a felt blanket which shrinks and sets the width.

Chemical Finishing

Durable chemical finishes which impart such characteristics as wash and wear, flame resistance, stain and water repellency and mildew resistance are of fairly recent development but their importance is demonstrated by the variety of such cotton fabrics available today.

The term "wash and wear" refers to a special group of chemically treated cottons which have been finished to dry smoothly and retain their beauty after washing. Cottons with such qualities are labelled variously "wash and wear", "automatic wash and wear", "no iron", "minimum care", "drip dry" and other similar terms. Most such cottons have also good wrinkle resistance properties during normal wear as well as after washing.

Although cotton rainwear has always been popular because of its comfort, older water repellancy treatments were non-permanent. Now, through the use of chemical techniques, satisfactory water repellancy can be imparted to cotton fabrics. Stain repellent finishes offer additional advantage in apparel and other end uses.

Some chemical finishes are also used to give dimensional stability to fabrics. Shrinkage control comparable to that obtained by mechanical processes can be realized through the use of these finishes. All-cotton stretch fabrics are another significant development in the ever-increasing variety of new cottons.

Questions on Chapter V

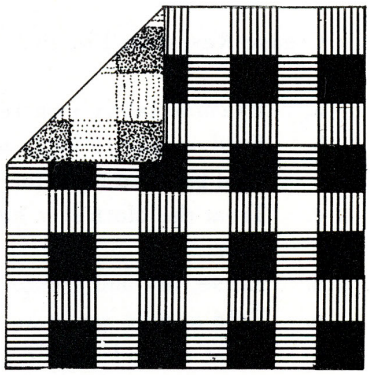
What is mercerizing?
What are the three stages in which colour can be applied?
Why is piece-dyeing most commonly used?
Can you name six recently-developed finishes?

Test No. 12: Printed or Dyed

OBJECTIVE: To distinguish a dyed from a printed fabric.

MATERIALS: Fabric samples "D" and "G", Magnifying lens and pin.

The back of a print is usually lighter than the face.
In a dyed fabric the yarns are the same colour on the back.



PROCEDURE:

a. Examine the face and back of both samples.
b. Remove three warp yarns from each sample.
c. One at a time untwist the yarns and look at the fibre through a lens.
d. Do the same with three weft yarns from each sample.

QUESTIONS:

1. How does the appearance of the back of printed fabric differ?
2. Describe the colouring of the yarns and fibres in a printed fabric.
3. How does the colouring of yarns from a dyed fabric differ?

Test No. 13: Finishes–Crease Resistant and Embossed

OBJECTIVE: To learn the characteristics and to test the permanence of crease-resistant and embossed finishes.

MATERIALS: Fabric samples "H" and "I" (2 of each), soap flakes, jar, pressing iron and carbon tetrachloride.

PROCEDURE:

Crease-Resistant Finish

a. Examine fabric sample "H" for appearance and feel.
b. Fold sample in half, and then in half again and hold pressed tight for a minute, then release.
c. Treat the cloth in a hot soap solution for ½ hour.
d. Rinse, dry and press.
e. Fold sample again as in (b).
f. Treat second sample for a ½-hour in jar containing a little carbon tetrachloride.
g. Dry, press and make the folding test as before.

Embossed Finish

a. Examine fabric sample "I" with embossed finish.
b. Save one piece for comparison, treat other in hot soap solution for half hour.
c. Rinse and dry.
d. Compare with original.
e. Dampen tested sample and press with iron.

QUESTIONS:

1. How does crease-resistant finish affect appearance and feel?
2. How did the washing affect the sample; the dry cleaning?
3. Describe appearance of embossed sample.
4. Describe results of washing and ironing.

Test No. 14: Finishes, Stiff, Glazed, Plisse

OBJECTIVE: To learn the characteristics and test the permanence of the stiff, glazed and plisse finishes.

MATERIALS: Fabric samples "J", "K" and "N" (2 of each), jar, pressing iron and soap flakes.

PROCEDURE:

Stiff Finish

a. Examine fabric sample "J" with stiff finish.
b. Treat one sample in hot soap solution for ½ hour.
c. Rinse, dry and press the sample and compare.

Glazed Finish

a. Examine fabric sample "K" with glazed finish.
b. Treat in hot soap solution for ½ hour.
c. Rinse, dry and press the sample and compare.

Plisse Finish

a. Examine fabric sample "N" with plisse finish.
b. Treat one sample in hot soap solution for ½ hour.
c. Rinse, dry and compare.
d. Dampen and press treated sample and compare.

QUESTIONS:

1. How did washing affect each of the 3 fabrics?
2. Why does stiffness come out of certain fabrics when washed?
3. What other important quality does a durable glaze finish impart to cotton?
4. Did ironing affect the plisse?

Test No. 15: Finishes–Mercerized, Napped, All-cotton Stretch

OBJECTIVE: To learn the characteristics and test the permanence of mercerized and napped finishes.

MATERIALS: Fabrics samples "L", "M" (2 of each) and "X", ruler, soap flakes, jar, pressing iron and magnifying lens.

PROCEDURE:

Mercerized Finish

a. Examine fabric sample "L" with magnifying lens.
b. Treat one sample in hot soap solution for ½ hour.
c. Rinse, dry and press the sample and compare.

Napped Finish

a. Examine fabric sample "M" with magnifying lens.
b. Treat one sample in hot soap solution for ½ hour.
c. Rinse, dry and press the sample and compare.

All-Cotton Stretch

a. Examine fabric sample "X" under magnifying lens.
b. Remove two weft yarns from sample.
c. Measure carefully the length of one yarn.
d. Try stretching the yarn and note increase in length.
e. Relax the yarn and compare length with other yarn.

QUESTIONS:

1. How did washing affect mercerized sample?
2. How did pressing affect napped finish?
3. What was the percentage increase in length of the stretched yarn?
4. Did the stretched yarn return completely to its original length?

Test No. 16: Finishes–Water-repellent, Stain-repellent

OBJECTIVE: To learn the charactistics and test the permanence of water-repellent and stain-repellent finishes.

MATERIALS: Fabric samples "O" and "Y" (2 of each), jar, soap flakes, pressing iron and carbon tetrachloride.

PROCEDURE:

Water-repellent Finish

a. Examine fabric sample "O".
b. Let a drop of water fall on surface of one sample.
c. Rub the drop on the cloth with your finger.
d. Treat other sample for ½ hour in jar containing carbon tetrachloride.
e. Dry and press sample.
f. Test the treated sample with a drop of water and compare.

Stain-Repellent Finish

a. Examine fabric sample "Y".
b. Let a drop of ink fall on surface of one sample.
c. Note whether the ink beads or penetrates.
d. Blot ink with facial tissue, rinse and compare.

QUESTIONS:

1. Describe action of water drops on water-repellent finish.
2. What is the difference between water-repellent and waterproof?
3. Will the stain-repellent finish resist all types of stains?
4. Name end uses for the stain-repellent finish other than clothing.

Test No. 17: Shrinkage, "Sanforized", "Sanforized-Plus"

OBJECTIVE: To determine the shrinkage of a fabric due to washing.

MATERIALS: Fabric samples "P" "Q" and "S" (12 inches x 12 inches), ruler, marking pencil, soap flakes and pressing iron.

PROCEDURE:

a. Place fabric samples on smooth flat surface.
b. Make two marks exactly 10 inches apart in the warp direction of the cloth.
c. Make two marks exactly 10 inches apart in the weft direction.
d. Wash the fabrics by the usual procedure.
e. Rinse, dry, then dampen and press the samples.
f. Measure exactly the distance between the two marks in the weft direction.
g. Measure exactly the distance between the marks in the warp direction.
h. Compare shrinkage and appearance of washed samples.

QUESTIONS:

1. How do you calculate shrinkage?
2. Can you determine if a fabric has been preshrunk just by looking at it?
3. How much shrinkage is allowable for "Sanforized" fabrics?
4. What is the plus factor in "Sanforized-Plus" fabrics?

VI–QUALITY CHARACTERISTICS OF COTTON

Beauty and Comfort

There is no time in the average person's life when he cannot reach out and touch cotton in some form. Cotton combines more desirable characteristics than any other single fibre and twice as many cotton products are used as those made from all other fibres combined.

Cotton is not only the most versatile and widely used fibre, it is a favourite of the fashion world for its beauty. Cotton dyes, for instance, more easily and with faster colours, making possible an endless choice of shades and patterns.

New textures, slubs, brocades and tweeds are examples of the improved styling of cotton fabrics in recent years. New finishes enhance the eye appeal of cottons with polished lustres and embossed designs. From summer sheers to corduroys and knits, cottons have become year 'round apparel fabrics.

The absorbency of cotton fibres make the fabrics unmatched for comfort next to the skin. Cotton is also a static-free fibre and its wear is specified in areas where there is danger of explosion.

Cotton can be either warm or cool depending on the way it is woven. It is made into fabrics with airy weaves for coolness or it is tightly woven to resist wind and water or loosley knitted in honeycomb style for warmth. The armed forces use cotton for both Arctic and tropical uniforms.

The fineness of cotton fibres (less than 1/2000 of an inch in diameter) results in fabrics with a soft gentle hand that won't scratch even a baby's tender skin. Another important comfort factor is the fresh cleanliness which comes from the thorough soap and water launderings that cotton takes best. Hospitals rely on hygienic and allergy-free cottons for everything from bandages to uniforms.

Lasting Value, Ease of Care

Cotton is strong---the strength is about the same as steel---100,000 pounds per square inch. Both laboratory and field tests have shown that cotton has high wear resistance in apparel fibres. Cotton strength also increases about 25% when wet, a significant factor because clothing is often subjected to its most severe strains while wet. This wet strength, plus a resistance to alkalies and bleaches is the main reason for cotton's ability to withstand repeated washings.

Cotton can be thoroughly laundered in hot water, with soap or detergent. Many modern cottons are dyed with fast colours and treated chemically or mechanically to resist shrinkage. Cotton is not sensitive to heat and high temperatures of water. A drying machine or iron will not damage the fabrics.

Special chemical treatments (resin or non-resin) can be applied to 100% cotton fabrics to give wash-and-wear qualities. These may be washed in the normal way and the fabrics will dry smoothly requiring little or no ironing. Chlorine-type bleaches are safe for white wash-and-wear cottons unless the garment tag warns specifically against their use.

Wrinkle-resistant cottons have been resin-treated to resist wrinkling and mussing. This chemical treatment is closely related to those that impart wash-and-wear qualities so the amount of ironing needed is greatly reduced. In addition to this ease of care, the wrinkle-resistant cottons crush less while being worn and wrinkles that do occur will hang out overnight.

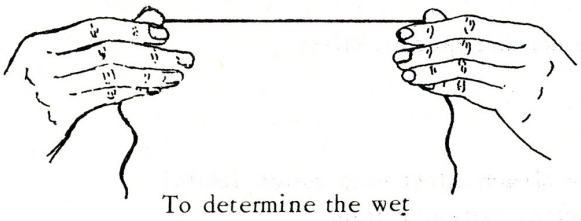
Questions on Chapter VI

1. How much cotton is used in relation to other fibres?
2. What factors give it styling advantages?
3. Name two important comfort factors in cotton.
4. Name two important chemical finishes applied to cotton.

Test No. 18: Wet and Dry Strength

OBJECTIVE: To study and compare the wet and dry strength of cotton fibres.

MATERIALS: Fabric sample "C".



To determine the wet strength of a yarn, it can be moistened with saliva and then then pulled apart between the fingers.

PROCEDURE:

a. Examine sample and pull out three yarns.
b. With your tongue, moisten a yarn and break it between your fingers.
c. One at a time do the same thing with the other yarns.
d. Repeat the test with three dry yarns and compare.

QUESTIONS:

1. How does the strength of dry cotton compare with that of wet cotton?
2. What is the percentage of difference?
3. Why can cottons be cleaned either by laundering or dry-cleaning?
4. Why are most cottons laundered?

Test No. 19: Effect of Chlorine Bleach

OBJECTIVE: To determine the effect of chlorine bleach on cotton.

MATERIALS: Fabric samples "C" and "R", chlorine bleach, cotton-tip applicator.

PROCEDURE:

a. Put a drop of bleach on cotton samples with applicator.
b. Let sample dry and examine effect.

QUESTIONS:

1. How did the bleach affect each cotton fabric?
2. Could bleaching damage cotton?
3. How is white produced on cotton?

Test No. 20: Absorbency

OBJECTIVE: To study the absorbency properties of cotton.

MATERIALS: Fabric samples "L" and "F", jar and water.

PROCEDURE:

a. Fill jar 2/3 with plain water.
b. Drop plain woven fabric into water.
c. Note time it takes to sink to bottom.
d. Drop terry sample and compare.

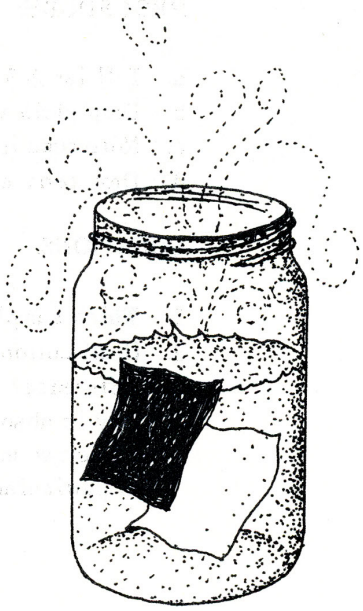
QUESTIONS:

1. Which sample sank more quickly to the bottom?
2. If all cotton is absorbent why is there a difference?
3. Why is absorbency an important property?
4. Name two major areas where this property is of particular advantage.

Test No. 21: Fastness of Colour to Washing

OBJECTIVE: To determine the fastness to mild and severe washing of coloured cotton fabrics.

MATERIALS: Fabric samples "D", "T" and "U" (2 of each), jar and soap flakes.



PROCEDURE:

a. Fill half-pint jar with warm water.
b. Add a teaspoon of soap flakes.
c. Drop one piece of white cloth and one piece of sample "D" into the soap solution.
d. Cover jar and shake for one minute.
e. After four minutes shake jar again.
f. Rinse and dry and compare with untreated fabrics.
g. Repeat the treatment with boiling water and stir every five minutes for half an hour.
h. Rinse and dry samples and compare.
i. Repeat the tests using sample "U".

QUESTIONS:

1. Why is white cotton used in the washing tests?
2. Why are some dyes fast to washing while others are not?
3. Why are fast dyes not used on all fabrics?
4. What five conditions affect the results?

Test No. 22: Stain Removal

OBJECTIVE: To test the different methods of removing stains.

MATERIALS: Fabric sample "L" (4 swatches), paper napkin, ink, toothbrush, bar soap, cotton-tip applicators, chewing gum, chlorine bleach, vinegar and cleaning fluid (carbon tetrachloride).

PROCEDURE:

Soap Method

a. Spot centre of one sample with ink.
b. Place sample stain side down on paper napkin.
c. Rub back of stain with wet toothbrush and soap.
d. As ink transfers from fabric to napkin move to clean portion of napkin.
e. When no more ink transfers, turn over and rub directly on stain side.
f. Rub stain with wet applicator to remove soap.

Solvent

a. Press small piece of chewed gum in centre of sample.
b. Place face down on paper napkin and rub back with applicator soaked in cleaning fluid.
c. Continue until no more gum is transferred to napkin, then turn over and rub directly.

Bleach

a. Spot two samples of cotton with identical ink stains.
b. Save one for comparison, place other stain side up on paper napkin.
c. Press stain with applicator–wet with chlorine bleach.
d. After a minute press the spot with applicator–wet with vinegar.
e. Alternate bleach and vinegar until stain is removed.

QUESTIONS:

1. Why is rubbing necessary with soap but not bleach?
2. Why must bleach be removed from cloth after stain is removed?
3. Why use solvent for gum?
4. Why should bleach not be used on a coloured fabric?
5. What other types of stains would require these methods?

CHAPTER VII COTTON FABRICS AND THEIR USES

Apparel Fabrics

BATISTE–Usually a mercerized, light-weight fabric of combed yarns; dyed or printed and also embroidered (i.e. eyelet) . Uses: women's and children's lingerie, dresses and linings.

BEDFORD CORDS–Strong, rib-weave fabric with raised lines or cords produced by warpwise "stuffing threads". Uses: upholstery, slacks and sportswear.

BROADCLOTH–A tightly plain-woven cotton with cross-wise rib effect obtained with medium sized warp and heavier weft. Some woven of combined carded and combed yarns. Uses: shirts and dresses.

BUCKRAM–Stiff, firm-starched, elastic-finished fabric that can be moistened and shaped. Uses: foundation cloth for millinery and interlinings.

CALICO–Plain-woven printed cloth similar to percale and often sold as such. Uses: dresses, blouses, aprons, etc.

CAMBRIC–Closely plain-woven with either soft or starched finish. Uses: softer, finer qualities for infants' wear, shirts, handkerchiefs; coarser qualities for trimmings, bias bindings and linings.

CHAMBRAY–Plain-woven with same number and weight of yarns with coloured warp and white or natural weft that gives a mottled coloured surface. Uses: shirts, dresses and children's work and play clothes.

CHINTZ–A glazed cotton, firm, plain-woven and usually printed with gay flower designs. Only durable glaze is a resin finish. Unglazed chintz is called cretonne. Uses: summer dresses and skirts also draperies and slipcovers.

CORDUROY–A ribbed, high lustre, cut-pile fabric with extra filling threads used to form the wale. The foundation may be either a plain or twill weave and many corduroys are given water-repellant finishes. Uses: apparel and home furnishings.

CREPE – Lightweight fabric with crinkled surface obtained either with hard twist yarns, chemical treatment, weave or embossing: bark crepe (rough textured like tree bark), crinkle crepe (plisse), puckered or quilted effect.
Uses: dresses, lingerie, and blouses.

DENIM – Firm, twill-weave of hard twisted yarns. Warp is often indigo-dyed before weaving with white or natural weft producing whitish tinge on blue.
Uses: overalls, jeans, work clothes, playclothes, slipcovers, etc.

DOTTED SWISS – Sheer, crisp fabric usually of lawn or voile construction with various types of woven or flocked dots. Uses: dresses, lingerie and curtains.

DRILL – Strong twill-weave similar to denim and has diagonal twill in many variations. Uses: shirts, work clothes, sportswear, foundation garments, pocket and shoe linings.

FAILLE – Soft, slightly glossy fabric in rib weave, with light flat cross-grain rib or cord. Uses: dresses and suits.

FLANNEL, FLANNELETTE – A plain weave or twill fabric napped on one or both sides in various weights and bleached, dyed or printed. Uses: shirts, sleepwear, baby blankets and interlinings.

GABARDINE – A tightly-woven, exceptionally sturdy, steep twilled cloth often made with combed yarn and two-ply warp with single weft. Uses: slacks, sportswear, uniforms, suits, women's shoes and as base for rubberized fabrics and imitation leathers.

GINGHAM – A yarn-dyed, plain-woven fabric woven in stripes, plaids and checks in various weights; either combed or carded. Uses: men's women's or children's apparel and decorative uses.

KNIT GOODS – Closely-knit fabric with somewhat less elasticity than the usual rib stretch knits; available in several varieties, including double knits. Uses: shirts, sweaters, blouses, underwear, gloves, sportswear, etc.

LAWN – Sheer, plain-woven, light-weight fabrics made from combed or carded yarns and bleached, dyed or printed. Known by other names depending on yarns and finishes, i.e. nainsook, with soft lustre, batiste, usually mercerized and muslin which is starched and calendered. Uses: women's apparel.

MUSLIN – Firm, plain-woven cloth ranging in weight from thin batiste to heavy bed sheetings. Fine muslin is soft-finished, mercerized, combed yarn (lawn type). Uses: dresses, shirts, lingerie, sheets and pillowcases.

NARROW FABRICS – These are fabrics woven with fast (selvedge) edges, not exceeding 12 inches in width. Non-elastic types include ribbons, tapes, webbing, labels and trimmings. Braided fabrics are used for shoe laces, and a wide range of trimmings for apparel, millinery and upholstery. Elastic types, either woven or braided, are for use in underwear and suspenders. Laces, which include edgings and insertions, are narrow fabrics made in a lace machine.

ORGANDIE–Thin, transparent, plain-weave muslin or lawn fabric with permanent crisp finish or starched finish which requires renewing after washing. Uses: neckwear, trimmings, women's and children's wear and curtains.

PERCALE – Medium-weight, plain-woven, carded-yarn fabric with firm, smooth finish. Percale is bleached, dyed or printed. Uses: women's and children's wear and men's shirts.

PIQUE – A ribbed or corded fabric made of carded yarns, sometimes mercerized, dyed or printed. It comes in many novelty versions, i.e. waffle pique, and birdseye pique. Uses: dresses, shirts, collars, cuffs and children's apparel.

PLISSE–Lawn or light-weight sheeting; bleached, dyed or printed, and crinkled. Uses: lingerie and dresses.

POPLIN–A durable, tightly-woven, high-count fabric similar to broadcloth but heavier rib. May be bleached, dyed or printed. Uses: dresses, coats, suits, rainwear and ski wear.

PRINT CLOTH– A basic plain-weave, carded fabric with finer yarns and heavier thread count than sheeting and with various finishes. Uses: shirts, dresses, shorts, pyjamas and blouses.

SATEEN–A soft-finished fabric of basic satin weave. In various weights and finishes, it is usually mercerized and bleached or dyed. Uses: lingerie, apparel, mattress and pillow covers and draperies.

SEERSUCKER–A light-weight fabric with a woven crinkle which should not be confused with plisse. May be laundered without ironing. Uses: summer clothing.

TERRY–Fabric covered with loops on one or both sides which is extremely absorbent. Uses: bath towels, apparel and beach clothes.

TWILL–A basic weave, with distinct diagonal lines in a variety of effects including herringbone. Uses: men's, women's and children's apparel, uniforms and work clothes.

VELVETEEN–Short, close filling of high-lustre pile on either plain or twill weave fabric. Extra filling or weft threads are cut to form pile. Uses: apparel, millinery, shoes, purses, and decorating fabrics.

VOILE– A plain, low-count, sheer and light-weight fabric in variety of constructions which may be bleached, dyed or printed. Variations include drawn-work and embroidery. Uses: summer dresses, and window curtains.

WHIPCORD–A twill weave similar to gabardine but with more pronounced diagonal rib. Uses: uniforms, slacks, children's play clothes, outdoor garments, and auto seat covers.

Household Fabrics

BLANKET CLOTH–A double-woven fabric with carded yarns; napped on both sides. It is a plain weave with hard-twist warp and soft-napped weft.

CASEMENT CLOTH–Flat, lustrous, wide curtain fabric; usually sheer. This fabric is plain-woven with combed or carded yarns. It is mercerized, bleached and dyed.

CRETONNE–A plain weave fabric similar to unglazed chintz. Uses: draperies, slip covers and upholstery.

DAMASK–A firm, glossy patterned fabric with jacquard weave; similar to brocade. Uses: tablecloths, napkins, bedspreads, draperies and upholstery.

MARQUISETTE–Light, strong, sheer, curtain goods; usually woven on plain loom with leno attachment. Sometimes dotted with heavy roving in the filling which is cut after fabric is woven. Uses: dresses as well as curtains.

MONKS CLOTH–Variation of the plain weave often referred to as basket weave and Friar's cloth. Sometimes woven with mixed yarns such as white and natural for oatmeal effect. Uses: draperies and slip covers.

PERCALE SHEETING–Smooth, fine, soft-finished, plain woven fabric with high thread count. Combed percale is finer than carded percale. Percale sheeting must have not less than 180 threads per square inch.

PLUSH–Has warp pile or so-called velvet weave but with deeper pile than velvet or velour. Usually plain woven but comes in twill or novelty versions. Uses: upholstery and draperies; lightweight qualities for clothing and toys.

TICKING–A tightly woven, heavy twill fabric; sometimes featherproofed. Uses: upholstery, cushion and pillow covers, work clothes, etc.

TOWELLING–Materials for towels include "crash" plain-woven usually with striped edge; "huck" durable with rough surface texture; and "terry" made with extra heavy warp threads woven into loops.

VIII COTTON CARE

Sewing Tips

Cotton is easy to sew, however there are basic rules which make the job easier and more successful. These are given in the chart for machine sewing on Page 48. Here are a few other pointers:

Easy-Care Cottons

Mercerized thread is best for sewing easy-care cottons. Normally this thread requires a size 14 sewing machine needle and the stitch length should average 12 to 15 with medium, light pressure.

Knitted Cottons

Mercerized thread is also recommended for knits and the material should be stretched slightly as it is being sewn, otherwise the threads in the seams may break when any pressure or stretch is given them during wear.

Pile Fabrics

Velveteen, corduroy and suedene should be cut and sewn with the pile direction because for the best appearance the pile should stand up. Determine direction by brushing the pile with the fingers. It will be smooth when brushing with the pile and rough when brushing against. The rule is to cut all garment sections with the pile in one direction and to stitch with the pile. The latter means that dress seams are generally stitched from the bottom up.

Machine Rules

The basic rules as given in the chart simply mean that a needle must be fine enough not to mar the fabric yet heavy enough to pierce and sew. Thread, machine stitch, pressure and tension are all important because incorrect adjustments of any of these can cause puckered seams, broken needles, knotted threads and uneven stitches.

SEWING CHART

Type of Fabric	Thread Size	Needle	Machine Stitch Settings	
			Inside Seam	Top Stitching
Filmy materials, comparable to net, marquisette	100 cotton	9	15 to 20	15 to 20
Sheer materials, lawn, dimity	80 to 100 cotton	11	12 to 15	15 to 20
Lightweight materials, gingham, chambray, percale chintz, poplin, pique	50 mercerized 60 to 80 cotton	14 or 16	12	15 to 18
Medium heavy materials, corduroy, crash, gabardine	Heavy duty mercerized or 40 to 60 cotton	16	10	12
Heavy materials, sailcloth, denim, ticking	30 to 40 cotton	18	8	10

Washing Tips

Cotton's washability is one of the reasons it is so universally used. We have learned that it has high wet strength, alkali resistance; can be bleached yet holds fast colours and will not melt under the hottest iron. All cottons should be laundered frequently and soil and stain removal is easier if tackled promptly.

Conventional Cottons

Washing

1. Pre-treat badly soiled spots with soapy brush.
2. Wash cotton by hand, machine or send to laundry.
3. Wash dark and light colours separately.
4. Use soap or detergent suitable for the job.
5. For best results use hot settings on whites and fast colours.

Bleaching

1. Bleach only when stained or yellow.
2. Know and use the proper amount of bleach.
3. Always rinse bleach out of garments before drying.

Starching

1. Starch gives cottons fresh crispness.
2. Plastic starches last through several washings.
3. Always use the amount recommended by the maker.

Drying

1. Cottons can be tumble dried or hung wet on a line.
2. If hung out, place white cottons in sun, coloured in the shade.
3. If machine dried, do not let cottons become ""bone dry"".

Ironing

1. Cotton can take a hot iron.
2. Press dark cottons and sateen on reverse side.
3. Do not iron puckered or embossed cottons.

Chemically Treated Cottons

Washing	1. Pre-treat oily stains with mild detergent paste. 2. Wash by hand or machine or commercial laundry. 3. Avoid hard twisting or wringing. 4. For whites and fast colours use hot water settings.
Bleaching	Read hang tags for proper instructions before bleaching.
Starching	Do not starch treated cottons.
Drying	1. Tumble dry (not too hot), hang on line or drip dry. 2. When drip dry method used, finger press collar and seams while garment is wet.
Ironing	Many of the treated cottons require little or no ironing.

Dry Cleaning; Safe but Not Necessary

1. Some prefer to dry clean expensive cottons.
2. Some cottons are labelled "Dry Clean Only" because of dye, lining or trimmings.



APPENDIX: COMMON COTTON TERMS

The following basic definitions should clarify some of the most common terms found on labels and hang tags.

100% COTTON – Any fabric consisting solely of pure cotton yarns. Cotton fabrics are especially recommended for comfort, freshness, sanitation and ease of care.

ABSORBENT – Cotton batting made highly absorbent by chemically removing all the natural waxes.

ACALA–Mexican variety of cotton introduced into the U.S. A medium length staple grown in south-western states.

AUTOMATIC WASH AND WEAR –Cottons which may be washed and dried in any conventional way and worn with little or no ironing. The fabrics have been chemically treated to dry smooth and resist wrinkles.

CHINA – Harsh, wiry, very short length staple cotton which has limited use. Can be mixed with wool for blankets.

COMBED – Extra smooth, fine and strong cotton from which all the short fibres have been removed.

COUNT – Number of threads to the inch. An 80 square print cloth has 80 warp threads (always listed first) to the inch and 80 weft threads to the inch. Yarn count is another term used for yarn size.

CREASE RESISTANT – Cotton fabrics chemically treated to resist wrinkles in normal wear. Wrinkles that do occur will hang out.

DRIP DRY – Cottons which dry smooth when washed and hung up soaking wet. The weight of the water accumulating in the lower section of a garment helps pull the fabric straight. Chemically treated, the fabric needs little or no ironing and resists wrinkles.

DYES – "Vat Dyed"–These are the most colour fast and resistant to sunlight and washing. Vat refers to a group of insoluble dyes which may or may not be applied in vats.
"Piece Dyed"–Dyes applied to the cloth after weaving rather than to fibre or yarn.
"Yarn Dyed"–The yarns are dyed before weaving, have rich colour and tend to be more colour fast than piece-dyed goods.
"Stock Dyed"–The cotton fibre or raw stock is dyed before being spun into yarn.

EGYPTIAN–Fine, lustrous, long-staple cotton. Several varieties are cultivated and used for thread and fine fabrics.

ENDS–Warp or lengthwise yarns.

FALL AND WINTER COTTONS–Term applied to medium and heavier weight cottons constructed for warmth and comfort such as tweeds, knits, corduroys and velveteens.

FILLING–Common American term for weft yarns which are woven into the fabric by the shuttle which passes between the lengthwise warp threads on the loom.

INDIAN–Cotton grown in India, for many years the second largest cotton growing country. Generally of harsh, short staple-type for such uses as blanket filling.

INTERLOCK–A cotton knit made on a machine with alternate units of long and short needles which produce a variety of colours and patterns in a closely knit fabric.

LITTLE OR NO IRONING–The item may be worn or used after washing with no ironing but occasionally minimum ironing may be necessary.

LONG STAPLE–Cotton with individual staples averaging 1-1/8 inch to 1-3/8 inches long.

MERCERIZED–Chemically treated with caustic soda to make cotton yarns or fabric strong, smooth, more lustrous and more receptive to dyes.

MINIMUM CARE–Same as Automatic Wash and Wear.

NON-CHLORINE RETENTIVE–A fabric which chlorine bleach will not injure. (If tag states "do not use chlorine bleach" try an oxygen or perborate-type bleach.)

NON-RESIN TREATED–Cottons chemically treated to dry smooth and resist wrinkles but the treatment differs in that resins are not formed during the finishing process. The fabrics are not affected by chlorine bleaches.

NON-WOVEN COTTONS–Cloth-like material made of fibres bonded together without spinning, weaving or knitting.

PERCALE–A medium weight, plain woven print cloth such as 80 x 80, a staple dress goods. Percale sheets are high quality with a count of at least 180 threads per square inch. Most percales are made of combed yarns.

PIECE-DYED–See Dyes.

PIMA–An extra long staple cotton with soft luxurious hand or feel.

POLISHED COTTONS–Fabrics with surface lustre made durable by sizing chemicals (resins) into the fabric and mechanically buffing the surface. All durably polished cottons have wrinkle-resistant qualities.

PRE-SHRUNK–Cottons treated to minimize shrinkage. The percentage of shrinkage usually accompanies the term. A shrinkage of less than 2 per cent will not affect fit.

RESINS–Chemicals which are impregnated and fixed into cotton fibres to impart special properties and effects such as wash-and-wear qualities, wrinkle resistance, durable lustre, embossed patterns and pleats.

ROLLER PRINTED—The pattern is imprinted by engraved printing rollers under pressure, each roller printing one colour.

SANFORIZED—A trade name for the pre-shrinking process developed and maintained by the Sanforized Company. Fabrics carrying the "Sanforized" label have been tested for shrinkage and will not shrink more than one per cent.

SANFORIZED-PLUS—A wash and wear trade-mark developed and maintained by the Sanforized Company. "Sanforized-Plus" fabrics have not only been pre-tested for shrinkage but for smoothness after washing, wrinkle resistance and for wear and tensile strength.

SCREEN PRINTED—The pattern is imprinted by a dye paste pushed through a printing screen of fine silk or metal, with the parts of the screen not in the pattern, blocked out.

SEA ISLAND—Fine, silky cotton of average length staple which is spun into yarns as fine as 300s for lace. Grown on small islands off the coast of the Carolinas and in the southern lowlands. Crop is very limited.

SHRINK RESISTANT—See Pre-Shrunk.

SLUB—A thick ridge in a fabric, formed by interspersing slub yarns with ordinary yarns.

SUPIMA—Trademark for American pima cotton. See Pima.

TUFTED—Surface yarns stitched into a woven cotton backing usually by multiple-needle sewing machine.

TWO-PLY—Cotton yarns produced by twisting two single threads together during the spinning process to give greater strength.

VAT DYED—See Dyes

WASH-AND-WEAR COTTONS—See Automatic Wash and Wear.

WRINKLE RESISTANT—See Crease Resistant.

YARN DYED—See Dyes.