Knits are divided into weft and warp knits.

- **Weft knits** are produced by interlooping the yarn in the horizontal (weft or filling) direction using hand knitting needles, circular knitting machines, and flatbed knitting machines.

- **Warp knits** are produced by interlooping yarns in the vertical (warp) direction; they are manufactured on knitting machines with a warp beam, similar to that used for weaving. Warp knits cannot be produced by hand.
Knit Fabrics

- **Weft** knits can **unravel**; warp knits do not unravel.

- **Weft** knits typically **stretch** more than warp knits.

- Knitted fabrics include:
  - Knitted yard goods (fabric)
  - Knitted end products (hosiery, sweaters)

- Textile knitting mills typically produce either knitted yard goods or knitted end products.
Knitted Yard Goods

- Flat and circular weft knitting machines and warp knitting machines are used to manufacture knitted yard goods.

- Knitted yard goods are produced in narrow- and wide-width fabrics.

- These fabrics are used extensively for activewear, T-shirts, underwear, lingerie, sleepwear, and window treatments.
Knitted End Products

- Knitted end products are complete knitted products such as hosiery, undergarments, caps, scarves, sweaters, cardigans, and dresses.

- Majority of the knitted end products are full-fashioned items. **Full-fashioned** is “a term applied to fabrics produced on a flat-knitting machine, such as hosiery, sweaters, and underwear, that have been shaped by adding or reducing stitches” (Source – *Dictionary of Fiber and Textile Technology*).
Fashion Marks in a Full-fashioned Sweater
**Terminology**

- **Wale** is “a column of loops lying lengthwise in the fabric. The number of wales per inch is a measure of the fineness of the fabric.”* 

- **Course** is “the row of loops or stitches running across a knit fabric, corresponding to the filling in woven fabrics.”* 

*Source - *Dictionary of Fibers and Textile Technology*
Terminology

- **Count** (for knits) is “the number of wales and courses per inch in a knit fabric.”* Note: Count for knits is often lower than for woven fabrics.

- **Gauge (Gage)** is “the number of needles per given distance in a knitting machine. The higher the gauge, the finer the knit.”*

*Source - *Dictionary of Fibers and Textile Technology*
Weft Knits - Introduction

- **Weft knits** were originally hand knitted with knitting needles, creating a wide variety of patterns.

- The hand knitting technique was mechanized for mass production.
Weft Knits - Introduction

Two classification systems have evolved:

- The first system divides the weft knits into **single and double weft** knits based on the **sets of yarns** producing the base knit.
  - Single knits include fabrics knitted with one set of yarns.
  - Double knits include fabrics knitted with two or more sets of yarns.
  - This system, applicable to hand and machine knitted fabrics, is easier for identification of knits, and is used in this section.

- The second system divides weft knits based on **type of machine** used for knitting.
  - Single knits include only fabrics knitted on machines with a single needle bed.
  - Double knits include knits produced on machines with additional needle beds or sets of needles, even if only one set of yarns is used.
  - This system of classification is used in the knitting industry.
The four types of stitches used in weft knitting are **knit**, **purl**, **tuck**, and **float/miss**. Note: Stitch refers to each loop (green and green/orange loops shown below).

- Knit and purl stitches are used to produce the three basic knits: jersey, rib, and purl. Note: The names are sometimes confusing as knit and purl are terms that are used to describe the stitches as well as the basic knit fabrics.
Knit stitch is a stitch in which the lower part of the loop (V shape) appears on the fabric face, and horizontal ridges are on the fabric back. Also known as plain stitch. Knit stitch, used for jersey knits, is the most commonly used stitch.
Purl stitch is a stitch in which the top half of the loop (semicircle) appears on the fabric back. Purl, the second most common stitch, is the reverse of knit stitch. It is combined with knit stitch to produce rib and purl knits.
In tuck stitch the needle holds the loop from the previous row in addition to the new loop.
Miss or float stitch is a stitch in which the loop from the previous row does not form a loop. As a result, the "missed stitch" appears as a straight line on the fabric back.
Weft Knits – Jersey

- **Jersey knit**, known as *single* or *plain knit*, has rows of V-shaped knit stitches on the technical face and semi-circular loops on the back.
- It is the simplest type and requires the least amount of yarn.
- Jersey knits have a tendency to form vertical **runs**. If a yarn in one of the loops is broken during stitching or use, the whole line of wales comes unlooped (a common example is a “run” in tights or hose).
Weft Knit – Rib

- **Rib knits** are characterized by a vertical rib design on both sides of the fabric, formed by alternating knit and purl stitches in the same row.

- Rib knits are identified by stating the number of knit and purl stitches in a repeat, with the number of knit stitches as the first number.
  - 1x1 and 2x2 have the same number of knit and purl stitches in a repeat; they are **reversible** knit fabrics. Reversible fabrics are used for winter scarves.

- Rib knits are commonly used for cuffs and collars; they have excellent horizontal stretch and recovery.

![1x1 rib face and rib back](image-url)
2x2 Rib Knit

- knit stitch
- purl stitch

Magnified view
1x1 Rib Knit, Acrylic Winter Scarf Knitted with Low Twist Spun Yarns

Note: Reversible knits are often used for winter scarves as both sides are seen when the scarf is used.
Weft Knit – Purl

- Purl knit is a reversible knit characterized by semicircular shapes that form “waves” on both sides of the fabric.

- Purl knit is relatively expensive; it is not as common as jersey and rib knits. Designers use the technical back of a jersey knit as the design face to imitate a purl knit.
  - Compared to purl knits, imitation purl/reverse jersey knits are cheaper and less bulky.

- Purl knit is used for winter scarves as it is a reversible knit; it is popular in baby sweaters, classic cardigans, and golf sweaters for men.
Sweater Knitted with Imitation Purl (Reverse Jersey) Knit

- **face**
- **back**
Weft Knits – Single Knit Jacquards

- Single knit jacquards are produced by using different types of yarn (including different colors), stitches, and loop formations (including transferring loops from one needle to another). Both circular and flat knitting machines can produce single knit jacquards.

- Examples:
  - **Jacquard jersey** is produced by using different colored yarns, stitches, and loop formations; float stitches are used to carry the different colored yarns when they are not being looped to form the design. The float stitches are seen on the back.
  - **Intarsia** is produced using different colored yarns too, but the colored yarns are not carried as floats. Examples include argyle patterns commonly seen in sweaters and cardigans. Jacquard jersey (not intarsia) is used to create argyle designs in socks.
  - **Cable knits** are produced by using loop transfer to create a cable pattern. Jersey, rib, or purl can be used as the base knit.
  - **Pointelle** is produced by increasing and decreasing stitches and loop transfer to create a pattern with holes (open spaces).
Jacquard Jersey Used for Children’s Socks
Intarsia Knit – A 100% wool sweater with an argyle pattern
Mock Intarsia - Jacquard jersey knit with argyle pattern
Pile Jersey Knits

- **Pile jersey** knits are produced by:
  - Including an **extra set of yarns** on one or both sides of the jersey knit base.
  - **Inserting fibers (from slivers)** as tufts while the stitches are formed. High pile knits, or sliver knits, produce artificial furs with slivers.

- Pile jersey knits have the ability to stretch and have different end uses compared to woven piles. Pile knits (knit terry) are often used for baby clothes and sportswear, where the fabric’s ability to stretch is a desirable property.
Pile Jersey (Velour) Knit

tufts removed to show base knit

face  back

side view

cut pile tuft  loop
Faux Fur - Pile jersey knit produced by inserting fibers from slivers
Double Weft Knits

- Double weft knit is a **heavier, more stable weft knit** construction; each course is produced by **interlooping two sets of yarns** into two inseparable layers of loops. Pulling a yarn unravels only one set of loops without splitting the fabric.
  - Examples: double jersey, interlock, (double) rib knit, double knit, and jacquard double knit.

- Categories vary considerably. Some people call double jersey and interlock simply, “double knits.” Variations of interlock and double jersey are considered double knits by some and jacquard double knits by others. (Double) rib knits are rarely called double knits.

- Double weft knits are produced on flat or circular rib knitting machines with two sets of needles and needle beds, as well as by electronic jacquard knitting machines.
Interlock and Double Jersey Knits

- Both are reversible fabrics that resemble jersey knit from both sides.

  - **Interlock** is produced with alternating long and short needles in both needle beds.
    - It is slower, as both sets of yarns do not operate simultaneously.
    - Traditionally used for casual clothes made with cotton or cotton blends.

  - **Double jersey** is produced on rib knitting machines with two needle beds, each with the same size needles. The needles in one needle bed are positioned in the gap between the needles (not directly behind) on the second needle bed.
    - It is faster to produce than interlock.
    - Traditionally used for dressier clothes made with wool or synthetic fibers.
Double Knits

- **Double knit** describes a variety of double weft knit fabrics. Double jersey and interlock knits are the basis for double knit fabrics. Various stitch types are incorporated in double jersey to add design and texture. An example is piqué knit, common for polo and golf shirts.

Note: Pulling a yarn unravels one set of loops without splitting the fabric.
Polo Shirt – Cotton, spun yarns, piqué (double knit)

[Image of a green polo shirt with a magnified view of the knitted pattern]

- Face
- Back

Magnified view
Jacquard Double Knit

- **Jacquard double knits** have complex patterns; they resemble designs woven on a jacquard loom.
  - Jacquard double knits are produced by varying the yarns, stitches, and loop formation.
  - Jacquard double knit designs may resemble woven fabric designs such as herringbone and houndstooth.
  - Two very different designs can be knitted on each side.

![herringbone design]
Sculptured knits, blister knits and raised design knits are terms used for double knit jacquards in which the two layers can be separated in certain areas.
Jacquard Double Knit - Two separate layers in certain areas