

Chapter 1- Introduction

Classification of fabrics

- Fabric category on the type of weave in to four division .
 - Fundamental weaves
 - Derivative of fundamental weave
 - Compound weave
 - Jacquard weave

Fundamental weaves

- It is a simple structure formed by two perpendicular yarns at right angle
- It allows one warp or weft over lap
- Its warp repeat is equal to weft repeat
- It is equipped with **tappet** shedding mechanism
- It is classified in to plain ,twill and satin /sateen

Derivative of fundamental weave

- It is constructed on the base of fundamental weave by changing the order of warp or weft thread, adding float
- It is equipped with dobby shedding mechanism
- It includes derivative of plain, twill and satin /sateen

Compound weave

- The weave may contain more than two set of warp and weft threads
- The threads are divided in to ground and figuring according to the function
- It needs special mechanism

Jacquard weave

- It can produce large figurative and intricate design
- The number of warp /weft thread with different interlacing reaches several thousands
- It needs jacquard shedding mechanism

WEAVE

- A woven cloth is formed by the interlacement of two sets of threads, namely, warp and weft threads.
- These threads are interlaced with one another according to the type of weave or design.
- The warp threads are those that run longitudinally along the length of the fabric and the weft threads are those that run transversely across the fabric
- For the sake of convenience the warp threads are termed as ends and the weft as picks or fillings

Method of weave representation

A weave is the interlacing pattern of the warp and weft.

Two kinds of interlacing are possible:

- (i) Warp overlap in which warp is above weft
- (ii) Weft overlap in which weft is above warp

Continue...

There are two practical methods of weave representation:

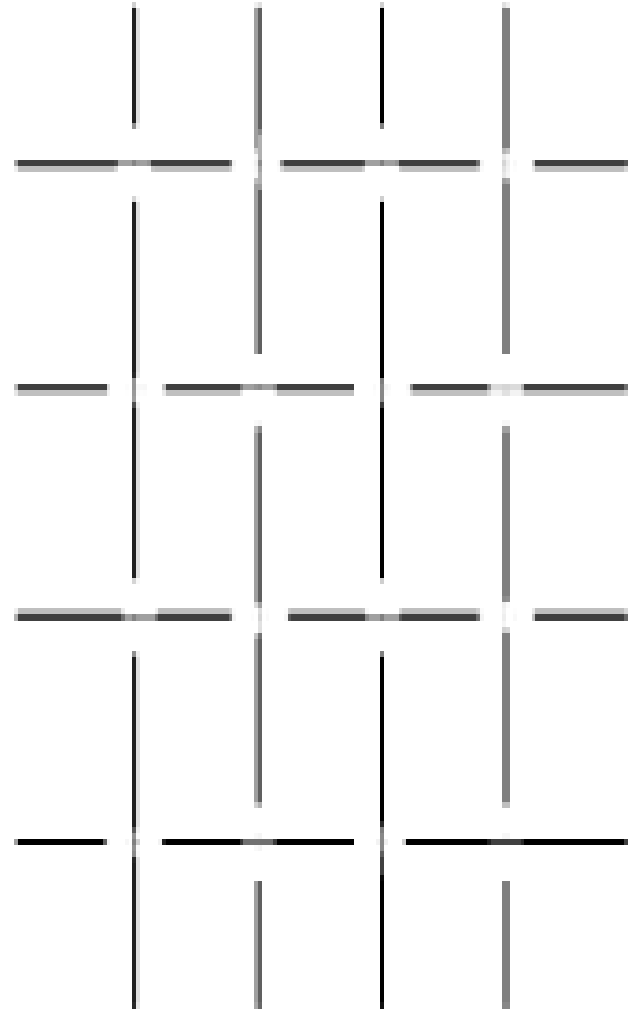
(i) Linear

(ii) Canvas

- In the linear method each **warp thread is represented by a vertical line** and each **weft thread by a Horizontal line**.
- In the canvas method, a squared paper is employed, on which each **vertical space represents a warp thread** and each **horizontal space represents a weft thread**.

Continue...

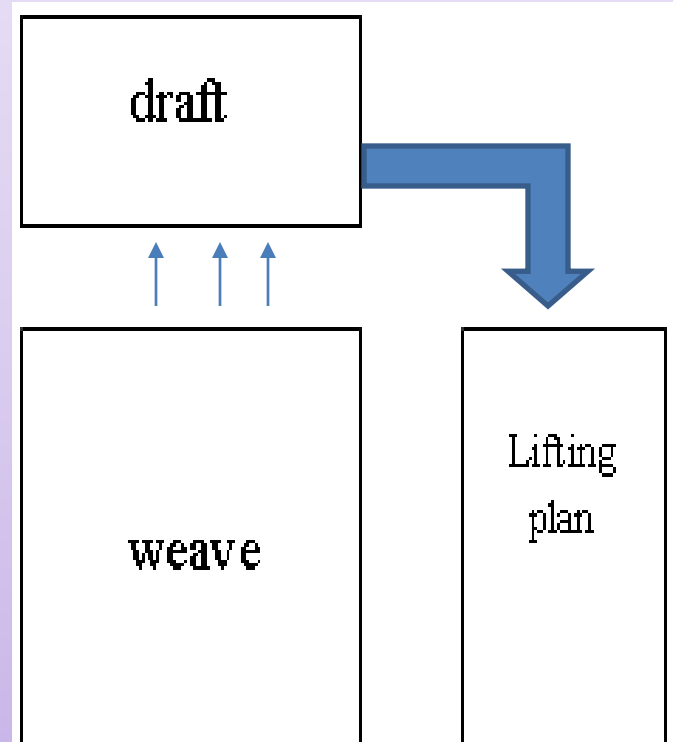
	X		X
X		X	
	X		X
X		X	



Basic element of woven design/Weaving plan/

The three basic elements in a woven design are:

- (i) Design/repeat of weave/
- (ii) Draft –in or drawing plan
- (iii) Peg or lifting plan



Weave repeat /repeat size/

- The repeat of a weave is a quantitative expression of any given weave.
- It indicates the minimum number of warp and weft threads for a given weave.
- It comprises of warp and weft repeat.
- For any weave the repeat size is the sum of the warp and weft floats.
- The design indicates the interlacement of warp and weft threads in the repeat of the design.

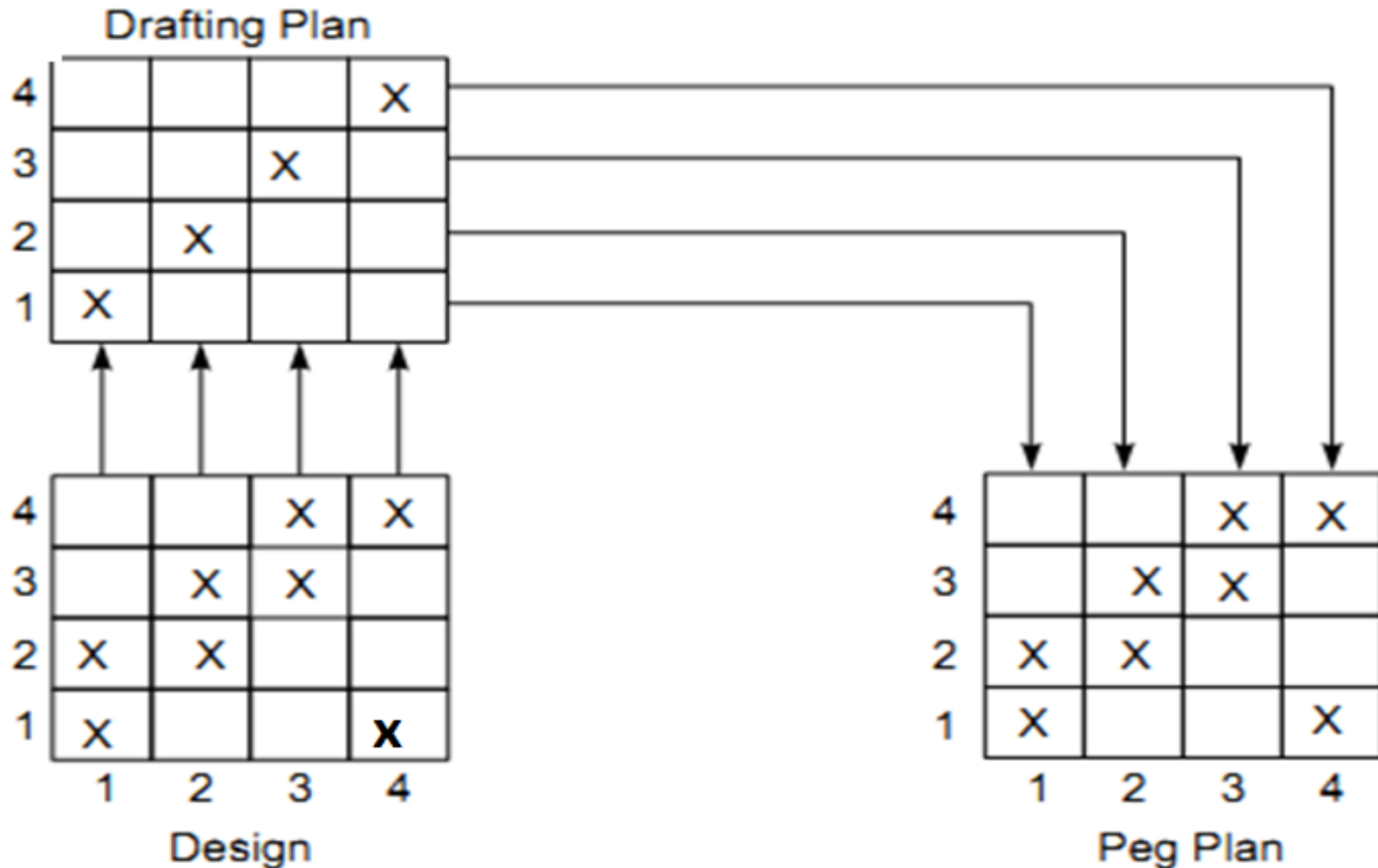
Draft /drawing plan/

- The draft or drawing plan indicates the manner of drawing the ends through the heald eyes
- It also denotes the number of heald shaft required for a given weave repeat.
- The choice of the type of drafting plan depends upon the type of fabric woven.
- In some case an additional elements of weaving plan such as drawing of the warp threads through the reed, or dents can be done .

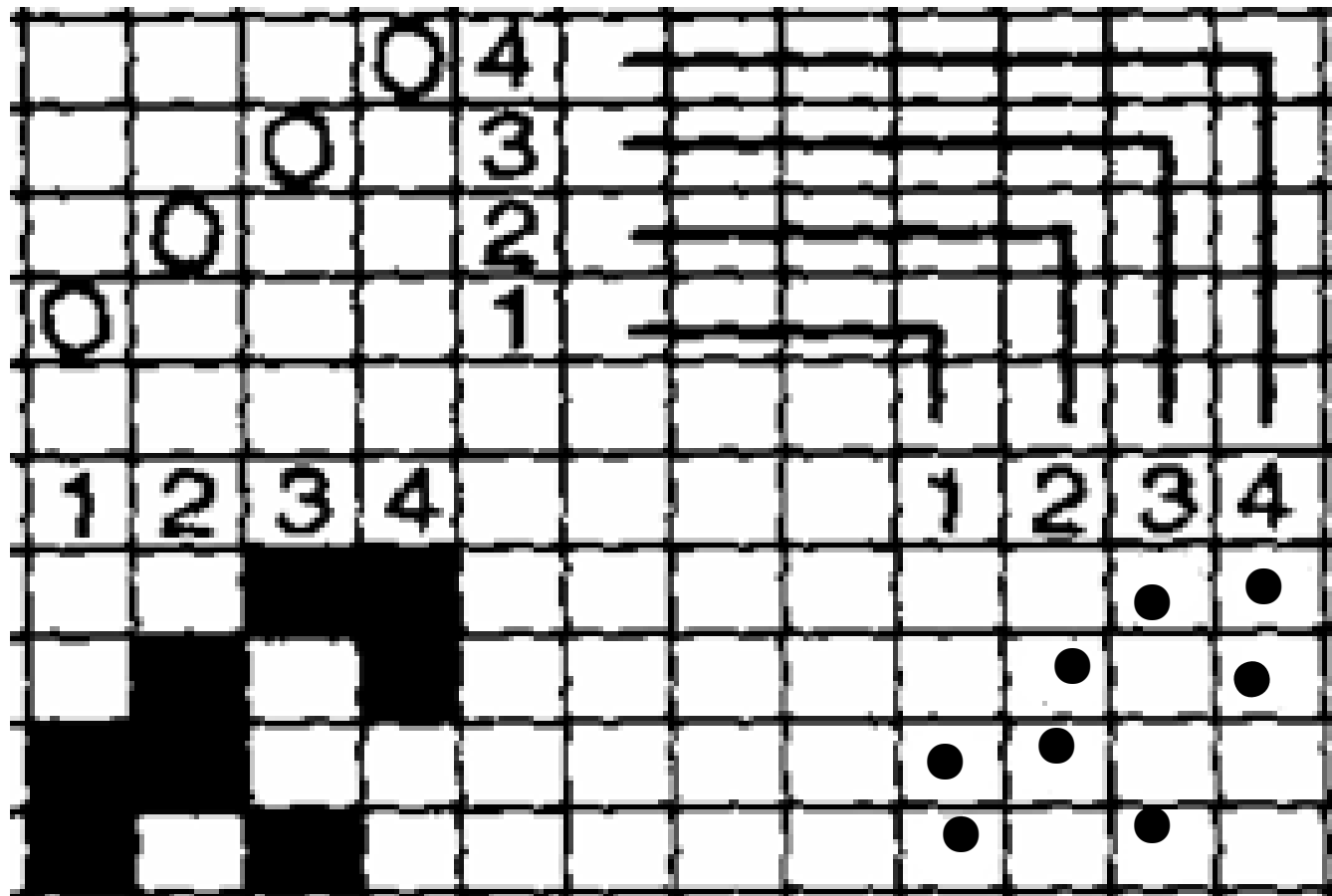
Lifting plan

- The lifting plan determined the order of lifting and lowering the shafts in the process of forming the weave.
- A blank in a square indicates that a warp goes below the corresponding weft and 'X' mark in the square indicates that the warp floats above the weft.

2.2. Basic elements of a Woven Design (2/2 twill weave)



Construction of Lifting Plan from the Given Weave and Draft.



Type of draft

- (i) Straight
- (ii) Pointed
- (iii) Skip and sateen
- (iv) Broken
- (v) Divided
- (vi) Grouped
- (vii) Curved
- (viii) Combination

4			X				X				X
3		X				X				X	
2	X				X				X		
1	X			X				X			

1 2 3 4



Repeat

Chapter -2: Woven fabric s

Chapter 2 :Woven fabric s

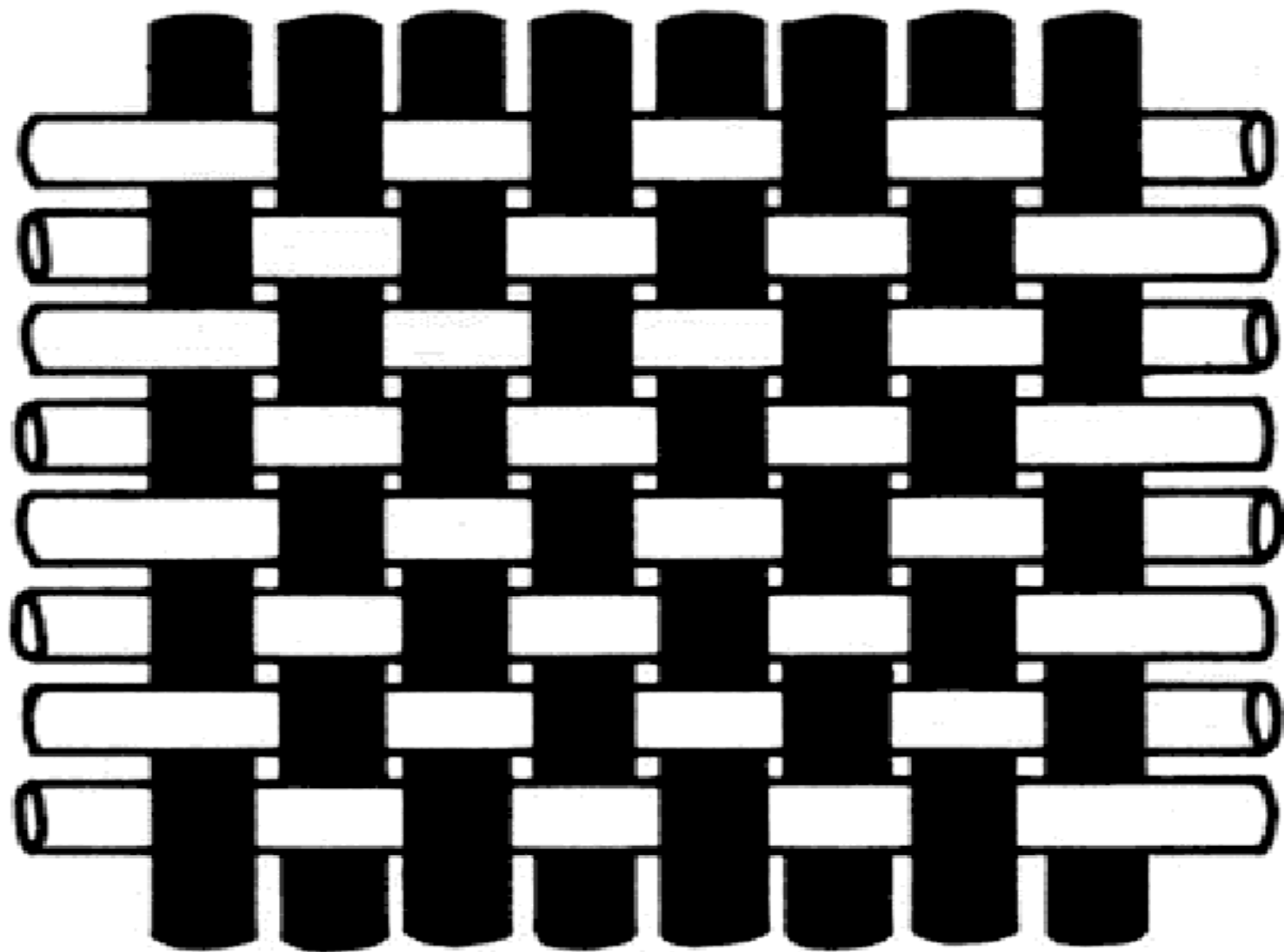
2.1. Plain weave

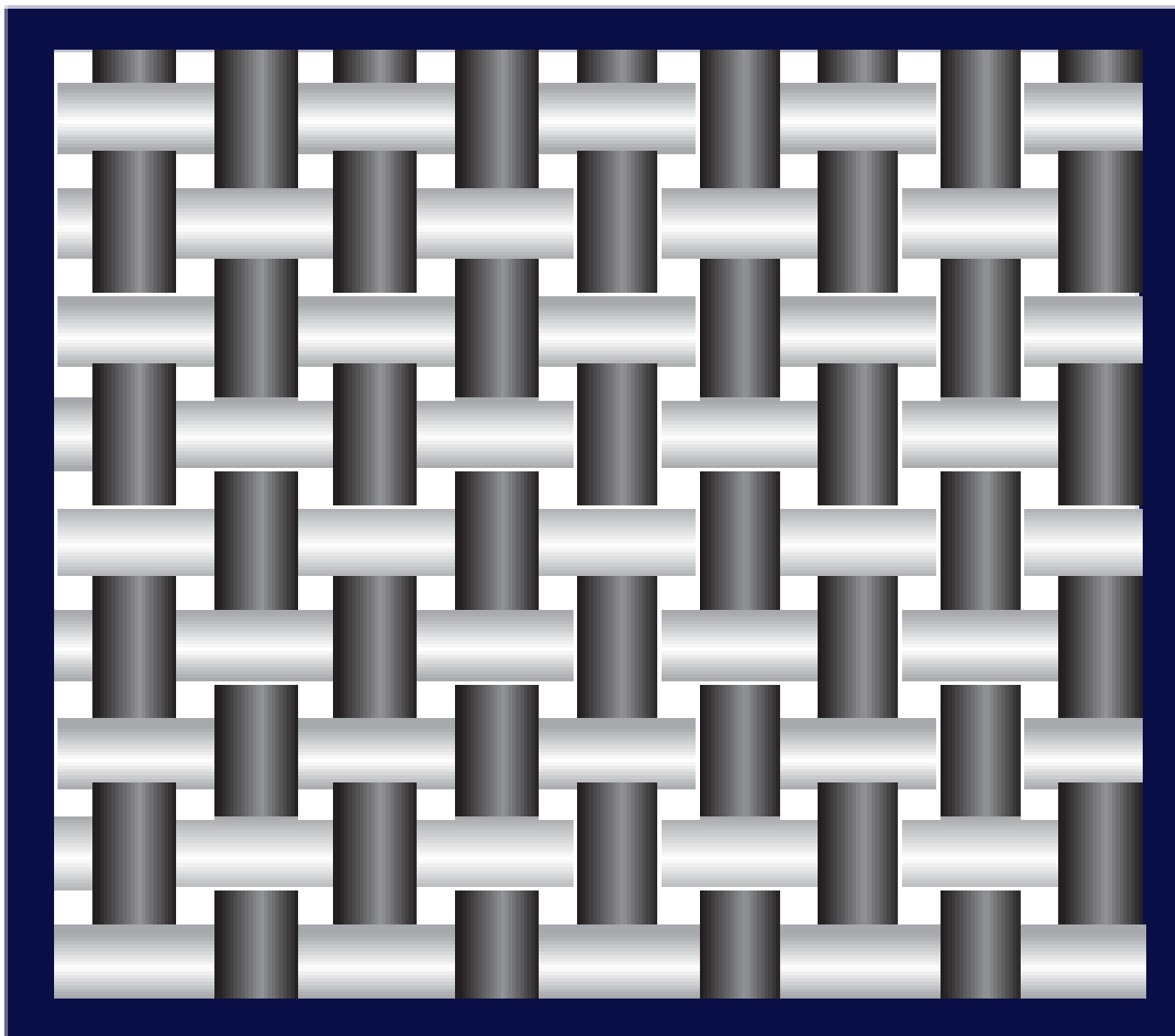
2.1.1.Introduction

- The plain weave is the simplest of all weaves.
- It is a “one by one” or a “one over one” weave (1 x 1).
- There is only a need for two harnesses in a plain weave.
- Plain weave is produced the simplest form of interlacing, it is used a greater extent than any other weave

2.1.2. Parameter

- In plain weave the value of the parameter are the simplest one. i.e. $R_o=2; R_y=2; S_y=S_o=1$.
- Only two threads interlacing in a different way are used in the plain cloth.
- Tappet shedding is used to produce this fabric.

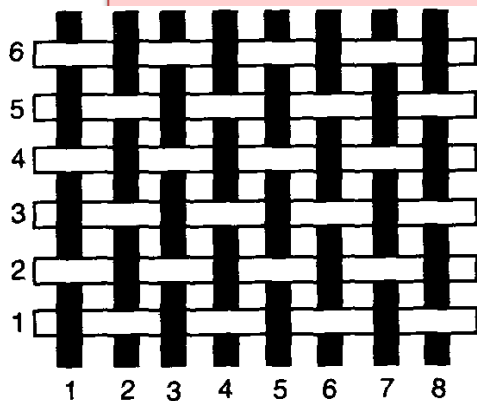




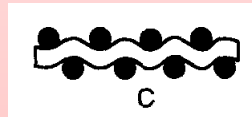


2.1.3. Methods of Weave Representation

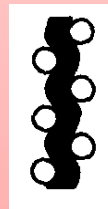
- How can you describe the structure of a fabric?
We can use different ways:



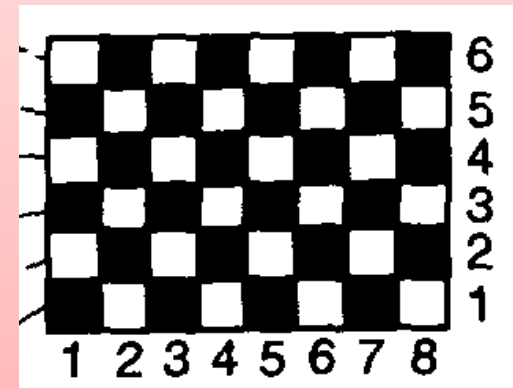
Plan diagram



Cross-section diagram



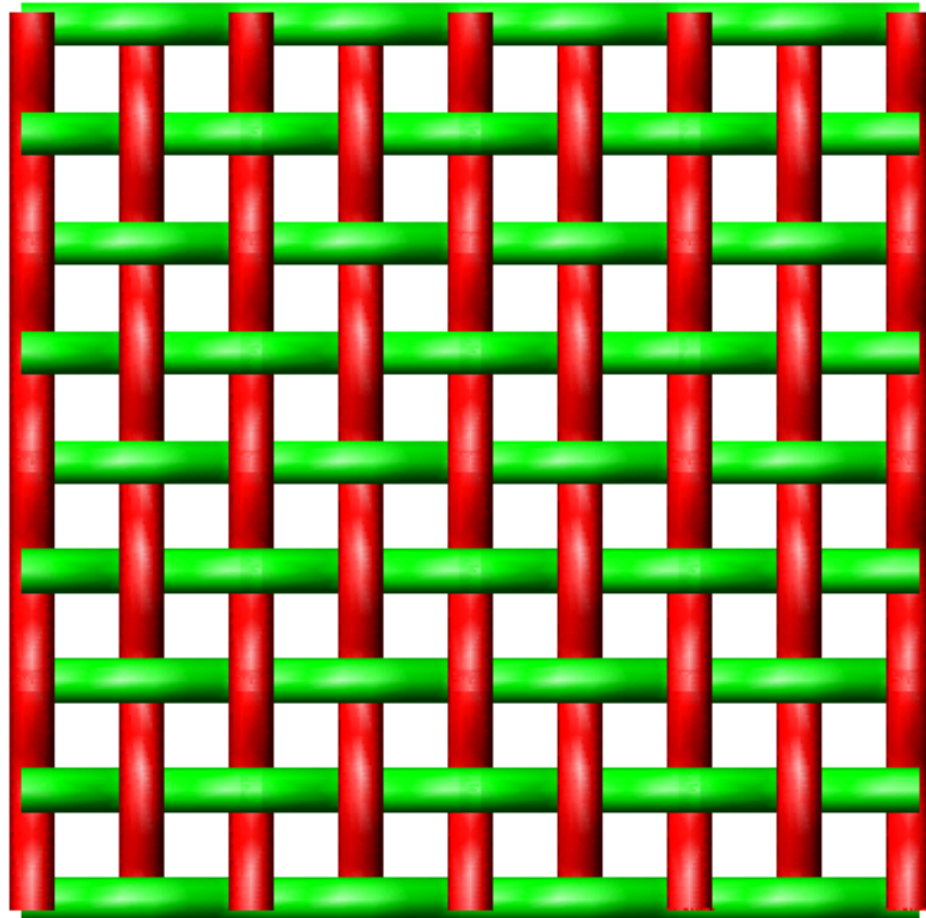
longitudinal-section diagram



Canvas method



Plan diagram



longitudinal-section
diagram

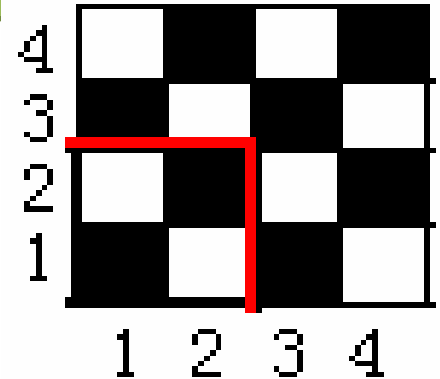


Cross-section diagram



2.1.4. Repeat of weave and shift

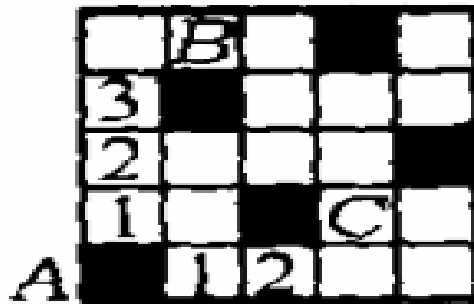
Repeat:



- 3rd warp thread has the same movement with the 1st, and the 4th same with 2nd.
- Similarly, the 3rd weft thread is same with the 1st weft thread; the 4th is same with the 2nd.
- Thus, the weave repeats after 2 ends and 2 picks.

Shift (move)

- Shift is the distance from a painted square on a thread to its corresponding painted square on its adjacent thread.
- The shift can be counted in warp way, S_o , and in weft way, S_y , (mostly in warp way)
- The shift can be either positive or negative, depending on the direction of counting. Counting from the left to right or from low to high gives positive shift.





- The *warp repeat*----- the minimal number of warp threads after which the movements of warp threads repeat.
- The *weft repeat* ----may be defined analogically.
- The *Weave repeat*---- a complete element of the weave.

The plain weave has the following characteristics:

- (i) It has the maximum number of binding points
- (ii) The threads interlace on alternate order of 1 up and 1 down.
- (iii) The thread density is limited
- (iv) Cloth thickness and mass per unit area are limited.
- (v) It produces a relatively stronger fabric that is obtained by any other simple combination of threads, excepting that of “gauze” or “cross weaving”.

a) Favorable attributes of a plain weave

- For a given yarn size, the plain weave produces the lightest weight fabric.
- Plain weaves tend to wear well (abrasion resistance).
- For down proof fabrics the plain weave is the tightest weave as the warp and weft yarns have the least amount of space between the yarns.

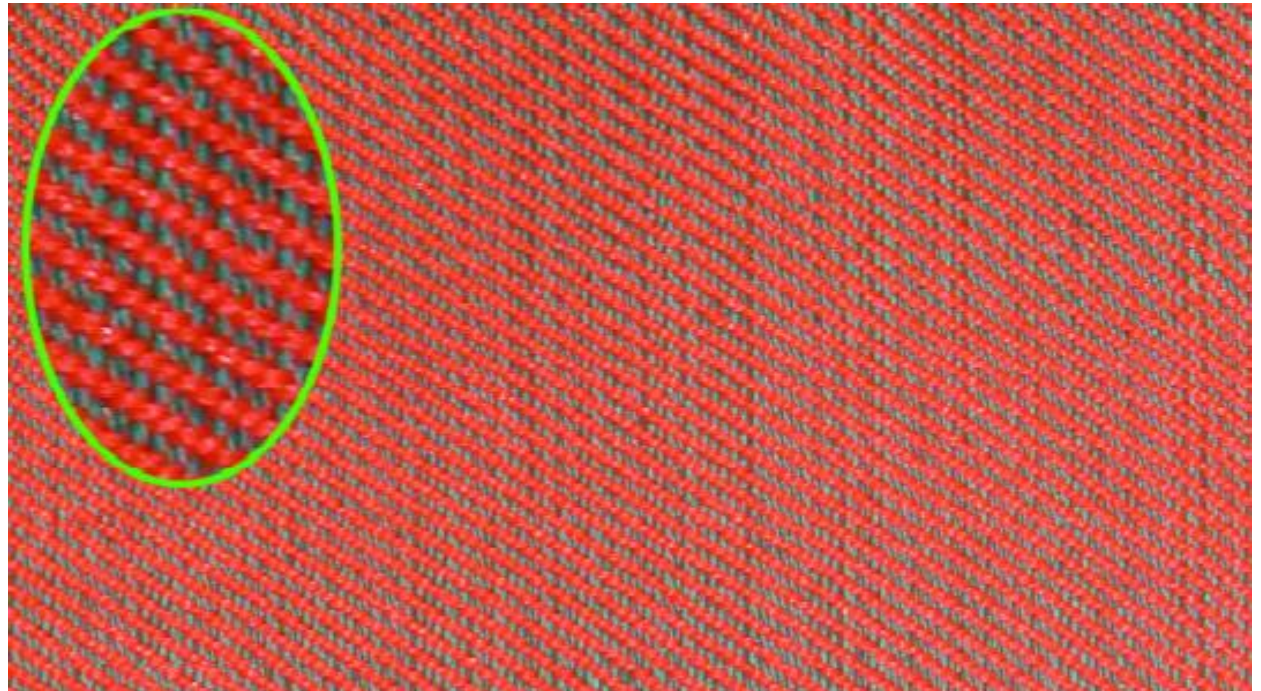
b) Unfavorable attributes of a plain weave

- Plain weaves tend to wrinkle more than other weaves
- No woven patterns can be made in a plain weave
- The tear strength is lower in a plain weave than in other weaves.

2.Twill Weaves

- **2.1. Concept:**

The most characteristic of twill is that they have diagonal lines on the cloth.





2.2. Parameters:

$$R \geq 3; S_o = S_y = \pm 1$$

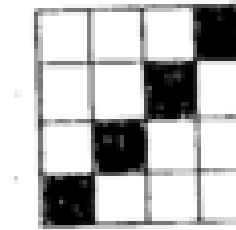
- The twill weaves are expressed in the form of a fraction.
- The numerator of the fraction is equal to the number of warp overlaps and the denominator is equal to the number of weft overlaps within the repeat.
- The sum of the numerator and denominator of this fraction is the repeat of the twill.
- If the shear is positive the twill has inclination to the right /right hand twill /and if it is negative ,to the left /left hand twill /.

Continue...

- Twill weave has warp and weft effect. Eg. twill 3/1 has the warp effect while the twill 1/3 represents the twill with weft effect.
- The twill with warp effect has the density on warp much more than on weft .
- on the contrary the twill with weft effect has the density on weft much higher than on warp .



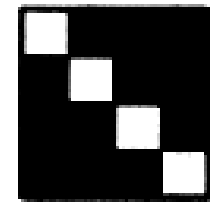
- Such as 3/1, 1/3, 2/1, 4/1.
- Some concept about the twill weaves:
- warp-face twill,
- weft-face twill,
- right-hand twill,
- left-hand twill.



Weft-face &
right-hand
twill

$$R=4$$

$$S_y=1$$



Warp-face
& left-hand
twill

$$R=4$$

$$S_y=-1$$

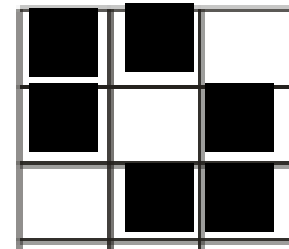
2.2.4. Weave diagram drawn



- ① Calculating the repeat R, drawing the outline, and giving the number.
- ② Drawing the first end according to the fraction given.
- ③ Drawing the other ends depended on the shift.

Example : Draw a twill weave of 2/1↗

a: repeat $R=3$, and draw the outline



b: draw the first end

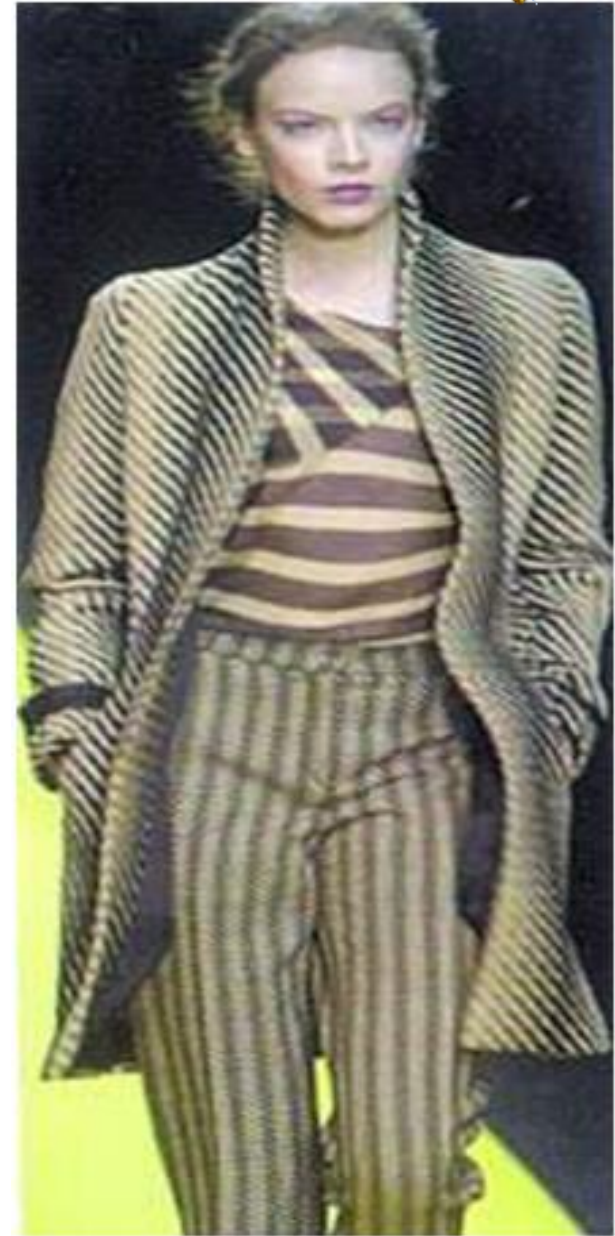
c: and the other ends

4) Weaving plan

Straight draft

5) Properties:

- Good aesthetic properties;
- Used for ornamentation;
- Softer than plain weaves



....Twill weave

- Twill weaves are the weaves that find a wide range of application.

The basic characteristics of twill weaves are :

- (i) They form diagonal lines from one selvedge to another.
- (ii) More ends per unit area and picks per unit area than plain cloth.
- (iii) Less binding points than plain cloth
- (iv) Better cover than plain weave
- (v) More cloth thickness and mass per unit area.

Factors determining the relative prominence of twill weaves

- (i) Nature of the yarn
- (ii) Nature of the weave
- (iii) The warp and weft threads/inch, and
- (iv) The relative direction of twill and yarn twist



Applications:

- denim, jean, flannel, gabardine, whipcord, glen check, drill.



Same samples



T/C Blended twill





T/C Blended Drill

activity:

1. Drawing the following weave diagrams, and indicates the warp face twill or weft face twill.

$1/3↗$, $4/1↖$ $2/1↗$, $3/1↗$



2.3 Sateen/Satin Weaves

2.3.1.concept:

The characteristic of the sateen/satin weave is that they have a smoothness and lustrous fabric surface.

- Sateen weaves have a weft effect and satin weaves have a warp effect
- Satin is a warp faced rearranged twill and sateen is a rearranged weft faced twill.
- Thus satin is the reverse side of sateen weaves



2.3.2.parameters:

$R \geq 5$ and $R \neq 6$

$1 < S < (R-1)$

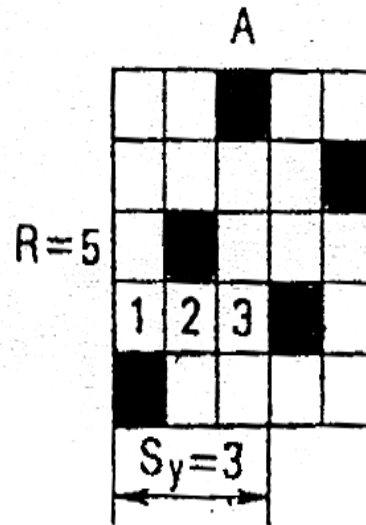
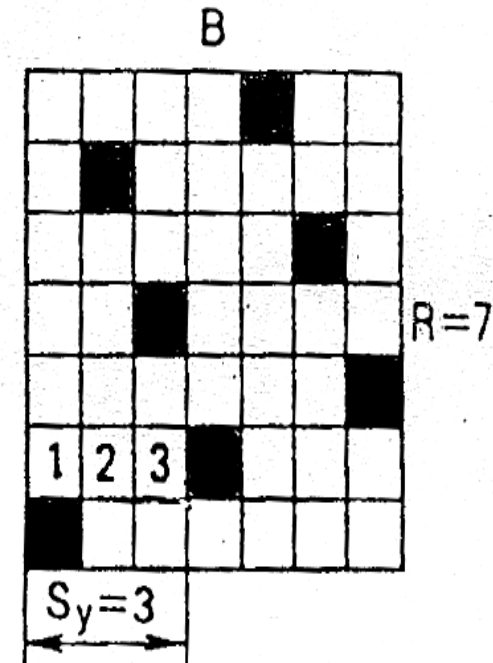
R and S must be expressed by prime numbers

- The sateen weave is denoted by a fraction. But the meaning is different from that of twill.
- The numerator of this fraction is equal to the repeat of weave.
- The denominator is equal to the shift (S_y) of overlaps.



Examples:

Figures A, B represent sateen 5/3 and 7/3.



A — Sateen 5/3 B — sateen 7/3

- And they are also called 5 ends(5 shafts) sateen and 7 ends (7 shafts) sateen.

Rules for the Move Number of Sateen/Satin Weave

- In choosing move numbers for the construction of satin/sateen weaves, the following rules are to be adopted:
 - (a) The move number should not be equal to the repeat of the weave
 - (b) It should not be one less than the repeat size
 - (c) It should not be a factor of the repeat size
 - (d) It should not be a multiple of the factor .

Examples of Sateen Move Number

<i>Repeat No</i>	<i>Move no. excluded</i>	<i>Possible move no.</i>
5	1,4	2,3
6	1,2,3,4,5	None
7	1,6	2,3,4,5
8	1,2,4,6,7	3,5
9	1,3,6,8	2,4,5,7
10	1,2,4,5,6,8,9	3,7
11	1,10	2,3,4,5,6,7,8,9
15	1,3,5,6,9,10,12,14	2,4,8,11,13

Regular sateen and Satin

		X		
1	2	3		X
	X	1	2	3
2	3		X	1
X	1	2	3	

D

					X		
		X	1	2	3		
1	2	3					X
				X	1	2	3
	X	1	2	3			
2	3					X	1
			X	1	2	3	
X	1	2	3				

E

X	X	X	X	X	•	X	X
X	X	•	X	X	X	X	X
X	X	X	X	X	X	X	•
X	X	X	X	•	X	X	X
X	•	X	X	X	X	X	X
X	X	X	X	X	X	•	X
X	X	X	•	X	X	X	X
•	X	X	X	X	X	X	X

X	X	•	X	X
X	X	X	X	•
X	•	X	X	X
X	X	X	•	X
•	X	X	X	X

Satin and Sateen weaves

- They are used in combination with other weaves, particularly in case of ornamented fabrics.
- The striking feature of these weaves is their bright appearance and smooth feel.
- The basic characteristic of satin/sateen weaves are
 - i. They are either warp or weft faced weaves.
 - ii. Have no prominent weave structures
 - iii. Only one binding point in each end or pick
 - iv. No continuous twill lines

Continue...

- (v) Have poor seam strength due to thread mobility
- (vi) More thread density is possible in warp and weft
- (vii) More mass per unit area is possible
- (viii) Have less binding points and more float lengths
- (ix) Use of move numbers (intervals of selection) is necessary to construct these weaves.

Some samples



Class work:

- Drawing the following weave diagram:
5/3 sateen, 8/3 sateen, 11/3 sateen.

Sateen

1. Repeat =7, Possible move $M=2,3,4$ or 5
2. Repeat =5, Possible $M=2$ and 3

Comparison of Basic Weave Properties

Weave	Surface Effect	Lustre	Tearing Strength	Snag Resistance	Wrinkle Resistance
Plain	Flat	Poor	Low	Good	Poor
Twill	Twill lines	Fair	Medium	Good	Fair
Satin	Smooth	Good	High	Poor if long floats	Good

Assignment I

- Demonstrate the fundamental weave (plain ,twill and satin)with hard paper using plan diagram and canvas methods