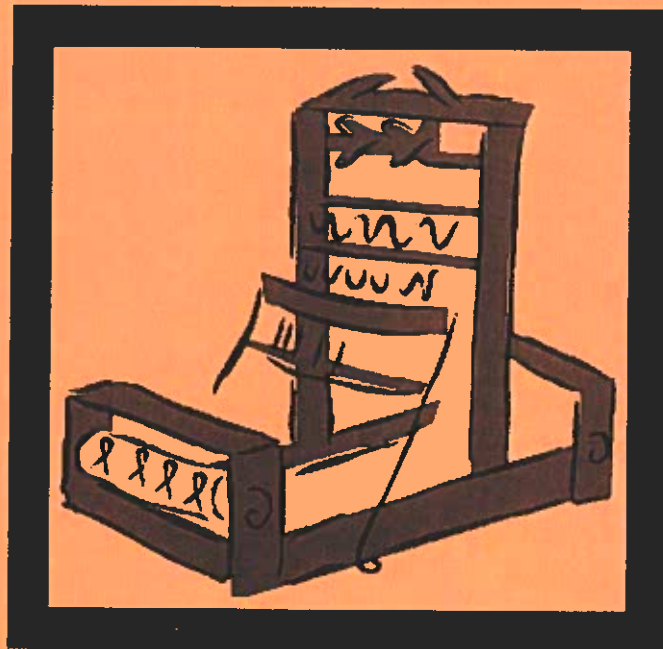


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Extension

MJ0707
Member's Manual



4-H Heritage Arts: Weaving

ACKNOWLEDGMENTS

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Introduction

Welcome to the 4-H Heritage Arts project. Without interested individuals, such as yourself, many historic arts and crafts would be lost with the passing of generations.

You will be given the opportunity, through the Heritage Arts project, to choose from a variety of fiber, fabric, yarn arts and crafts. The projects and activities you experience depend upon your enthusiasm and the availability of resources within your home and community.

Heritage Arts is defined as the practical skills passed down from preceding generations that were developed to provide basic family needs, such as apparel, home furnishings, or decorations. It also is defined as a traditional craft and the methods that have been maintained throughout history and passed on to others, often by observation and example.

Classes on traditional crafts are available in many communities, taught by skilled local artisans. The techniques taught often incorporate new techniques and materials with the old, traditional methods to enhance the craft.



P roject Objectives

The Heritage Arts project is designed to help you:

- Learn about a variety of historic arts and crafts.
- Create a craft that connects you to the past.
- Learn about historic influences on arts and crafts.
- Have fun learning.
- Gain skills that might lead to a home-based business.

P roject Expectations

Members are encouraged to learn about and try a variety of different historic crafts. Think of fun places in your community where you can learn more. Ask about interesting, creative artisans who are willing to share their skills with you. Take a field trip to local museums that feature historic fabric and yarn displays. Take a trip to the library and look up interesting facts about a craft that is of particular interest to you. Evaluate or judge fabric and yarn crafts and do a demonstration to share your skills with others. The more activities you do, the more you learn.

To complete your project, respond to all questions on the Heritage Arts Record. Check with your Cooperative Extension office for county fair requirements *if* you want to exhibit your project.

T

extile Crafts

What is a textile craft? It is defined as any method of creating a unique design with fiber, fabric or yarn. Patchwork and applique quilting are examples of textile crafts that use fabric as the main design ingredient. Needlepoint, embroidery, crochet and weaving are textile crafts that use yarns as the design tool. All textile crafts have one thing in common—they use fibers, fabric or yarn to create a design.

With some textile crafts, it means making the fabric, such as weaving, crochet or needlepoint. With other textile crafts, an already existing fabric is changed into something quite different. Quilting and embroidery can change the appearance of a fabric to create an exciting, imaginative design.

C

reating a Design

Once you decide on a heritage craft, it's time to think about the design. Many books show how to create a pleasing design. There also are many printed patterns that can be purchased. There's no better way to enjoy and understand design than to try it! Designing, like most activities, can come naturally once you understand what you are doing.

A design is really a plan—a plan for using all materials so that they look good together. To begin planning the design, examine your materials—whether they are yarns or fabrics or some other material—in a special way. For example, regardless of what materials are used, these basic ingredients are the design:

- line
- shape
- space
- texture
- color

These ingredients are called the *elements of design* and they are important to your plan because they are the visible details of a design. Without a design plan, these elements may seem haphazard or clash. Let's take a closer look at each of these elements of design.

- *Line*

Line is an element that's found everywhere around us. In a garment, lines are created by a seamline, a hem, a dart, a row of trim, a plaid or stripe. A row of embroidery stitches creates a line, as does a row of crochet stitches or the pattern in a quilt square. Some lines are straight and angular, others are curved. Some are thick and sturdy, others fine and delicate. The kind of lines used in a design will affect the character of that design.

- *Shape*

When lines are connected and overlapped, they create shapes: squares, circles, triangles, any shape imaginable. The outline of an applique is a shape, the pieces in a patchwork quilt are shapes, the outline of a garment is a shape, and so on. Just as lines create feelings, so can shapes.

- *Space*

When we talk of space, we mean the actual space an object or a design occupies. When we design, we work within a specific space; so not only must the design itself be well thought out but so must the space around it. That space might be an individual quilt square or entire quilt.

- *Texture*

Texture is the surface characteristic of an object; it may be smooth, fuzzy, soft, pebbly, scratchy, or one of many other textures. Sometimes we don't have to touch an object to know its texture—we can *see* the texture. In planning a design, texture is important to think about because each one we see has a character or feeling, just as lines and shapes do.

- *Color*

When we think of colors, we usually think of color names (or hues) like red, green, yellow or blue. We can create different feelings in a design on the colors we use together. For instance, a design in yellow and green will give you a different feeling from the same design in purple and blue. But, there are other ways we use colors to give a design the feeling we want. The way we use color *values* also can affect a design (value refers to the lightness or darkness of a hue). The same hue can have lots of different values.

Think about all the different kinds of blue (baby blue, light blue, sky blue, peacock blue, navy blue and royal blue). Value can affect the feeling of a design too. Try to visualize a design in all light colors (like lime green, pink, light blue, lemon yellow). Now visualize that same design in dark green, navy blue, dark red, and gold. Does it seem different? How about the same design in lime green and navy blue? Does it seem different in style? The *intensity* of the hues we use in a design also affect the feeling we get from it. Intensity refers to the brightness or dullness of a color. Imagine a design in all bright colors—usually a design made of bright colors is more than our eyes can take! So, use bright colors sparingly!

Evaluate Your Plan—Pattern to Follow

Take a look at the materials you plan to work with—fibers, yarns, fabrics, or threads. What kind of feeling do you want to create with your design? Do the materials create that feeling in their textures and colors? Can you create the kinds of lines and shapes you want with your materials? Are the materials suitable for the space in which you've chosen to create? If you can say "yes" to these questions, you're on your way to a well-designed piece.

But it doesn't stop there. Because even with all the right materials together, designers still need some guidelines on *how* to use them together. You can think of these guidelines as a recipe for deciding just how much of each ingredient (colors, textures, lines, and other elements) to use and where to add them. These guidelines are called principles of design.

Principles of Design

- *Proportion*

Proportion is the relationship of all the parts of a design to each other and to the whole garment or article. Each part needs to be in proportion to the rest of the design. No part should overpower the others. If a garment does not have proportion, one part of the design might be too big for the rest of the design. Or, the design may be too big or too small to look good on the garment, or, there may be too much bright, shiny color that overpowers the other colors. Or, if the design is the entire garment or article, it may lack proportion because it is too overpowering for the person wearing it, or the decor in which it will be used.

- *Balance*

Balance is a feeling of steadiness, of everything in the design looking like it belongs. Balance can be formal (each side of the center is identical) or informal (the sides are different, but “weigh” the same).

- *Emphasis*

Emphasis is the creation of a center of interest. Without the center of interest, a design may seem cluttered and busy, or boring and uninteresting. If a design is not well-planned and is missing emphasis, it may be cluttered with too many colors, different textures, different lines, shapes or sizes. Or, there may not be sufficient contrast to attract attention.

- *Rhythm*

When we look at a design, the eye follows a certain route around the design. It notices differences in lines, shapes, textures, colors, and spaces. The route the eye follows is known as rhythm. In a well-planned design, the eye is led from one to another to the point of emphasis. That rhythm is created in a design by repeating something throughout the design—color, texture, shape, or size. If an item misses rhythm, it may have too many unrelated parts—too many unrelated colors or textures, shapes, lines or sizes. Or, the design may be placed so that it is spotty or scattered and doesn't seem to fit together.

- *Unity*

When we say that a design has unity, we mean that it is complete. Unity is the all the materials fitting together in a pleasing combination. If unity is missing, the characters of colors, textures, lines, shapes and spaces are not compatible, or there may not be a central theme.

Inspiration Sources

Now that you have learned something about a well-planned design, it's time to begin thinking about developing your *own* designs. How do you start?

Actually, there are several ways to begin. One of them is to become aware of the design of the objects around us. Take a good look; there are examples everywhere! Look at the grain of the wood on a table top. What kind of lines or shapes are created? How does the rhythm in the grain move your eye over the design? Can you create a similar design—perhaps with weaving or needlepoint or with embroidery?

There are many places to get ideas. Look outside at the patches of grass for ideas on shapes and colors, look at the sunsets and clouds for shapes and colors, or the cracks in sidewalks, the frost on windows, the bark on trees. Everywhere you look, there are ideas for colors and textures, shapes and lines. Design examples aren't limited to nature. Look at designs in things around the house like baskets or pictures. Perhaps there's a design on pottery that you'd like to try in embroidery, or the shape of an old bottle gives you an idea for an applique. You can find ideas in magazines, wallpaper and comic books. There are ideas everywhere if you'll just use a little imagination!

Doodle on paper to develop and crystallize a design, or try arranging yarns or scraps of fabric. Try cutting out shapes from construction paper to experiment with a design. It does not matter how, but it is important to plan a design first!

The designer whose work shows fine quality, adapts and stylizes a design to suit the materials used. A designer does not attempt to imitate real objects, such as flowers using thread. Instead, if a flower idea is chosen as a theme for the design, the designer alters it to suit the shape of the article, its purpose and the limitations of materials and tools.

Resources

There are lots of good sources to help you with the "How-to's" of the textile crafts. Your Cooperative Extension agent can help you locate commercial leaflets available for 4-H members on specific textile crafts. You may want to supplement the leaflets with films and slides. Some are available through your county Cooperative Extension office.

Your talents are an excellent resource for the club. Share your know-how and special interests to help others. Bring the tools and let everyone experiment. Bring in others from the community to share their craft knowledge. A local craft or fabric store may work with you or help you contact someone with an interest in a specific textile craft. Members may decide to make a sampler, shawl, handkerchiefs, or monograms utilizing the various techniques.

Libraries can be an excellent source of information. You can broaden your knowledge of why and how heritage crafts began by reading through historic publications. Magazines are also a terrific source of ideas. Internet web pages provide lots of interesting information as well. Perhaps you will want to clip and file ideas to share and talk about. There also are many craft magazines and pattern books that can be good sources too. Craft Organizations and Councils often provide specific information that may be helpful. Check with your county Cooperative Extension office, library or craft store for contact information.

Sharing What You Have Learned

Now that you have learned many new things about a heritage craft, why not share? This helps you learn more about the topic and become more comfortable teaching others. Making an exhibit to show at the county fair is another way to share with others. You also may share your knowledge by giving a demonstration and show how to do something.

Demonstration

Select a topic that relates to something you learned about your project and plan a demonstration. Some ideas include:

- Use of design principles and elements
- Selecting fabric or yarn for a project
- Sharing the history of a craft
- Purchasing supplies
- Steps to complete a craft item
- Can you think of others?

Evaluation or Judging

Learn the standards of quality for your craft. The exhibit item will be compared to these standards at a fair or during craft competitions. Standards are printed in the 4-H craft project guidelines, or may be found in craft publications or fair judge's guides available through your county Cooperative Extension office. When you apply the standards to a craft item, you judge or evaluate that item against the standard of quality. Evaluating your project yourself will enable you to see how well you applied the skills you learned. How well did your item compare to the standards? What did you do well? Where can you improve? Answers to these questions will help you do a better job next time.

Community Service

You can learn a great deal about your community when you get involved to help others. You can:

- Make lap robes for elderly people or AIDS victims
- Make quilts for a homeless shelter
- Work on a fund raiser for a local cause
- Go to a local nursing home and visit residents
- Help an elderly or lonely neighbor with household chores
- Help younger members with their projects
- Can you think of others?

Fair Exhibit

Remember to record all of your activities during this year. It's easier to write them down as soon as you do them rather than wait until the end of the year and try to remember them. Be sure to include in your story not only the things you made, but the experiences you had, special things you learned and how you felt about them.

You must complete the History Page of the record. Plan early to begin your search for historic information. You have several options as to what you can learn about and share. You can find historic information on:

- the craft itself,
- tools used,
- new techniques developed,
- special uses of the finished items,
- influences of wars or trade,
- interesting artisans within the community, or
- any other related topic.

The key is that the information you provide is directly related to the craft you are exhibiting.

Two photos of your finished product(s) are optional. However, photos of Heritage Arts exhibits enable judges to see how well the items fit your intended use.

Projects will be divided into three age categories for exhibit based on age of the exhibitor as of December 31 of the year prior to the show. Age categories are:

- Junior— 8 to 10 years of age*
- Intermediate— 11 to 13 years of age*
- Senior— 14 to 18 years of age*

All exhibit items are to be fiber-, fabric- or yarn-based arts and crafts. Crafts exhibited must be those traditional crafts which have been passed down through generations. For a complete listing of Fair Exhibit Requirements, see page 2 of your *Heritage Arts Record Book*, RJ0700.

Introduction

Through weaving you will learn to express your creativity in a constructive way while developing a skill that is relaxing and fun. You will also have the opportunity to learn more about the history of weaving, when and where it originated, how it has passed down through the ages, and more.

Weaving is a process of making fabric from two sets of yarn that interlace at right angles to each other. The lengthwise or vertical yarns are referred to as the warp and the crosswise or horizontal yarns are called the filling or weft. Weaving is done on a loom, which allows the interlacing yarns to create a pre-arranged pattern

You may want to experiment with different yarns to make unusual articles for yourself, others and your home. Visit with weavers in your community to discover how they learned to weave, what projects they have made and what suggestions they would give to a beginner. Check for additional resources in your local Cooperative Extension office, the Internet, library or yarn shops to get new ideas. Most importantly, have fun!

P roject Evaluation

Hand woven garments or articles should be evaluated on:

Overall Appearance

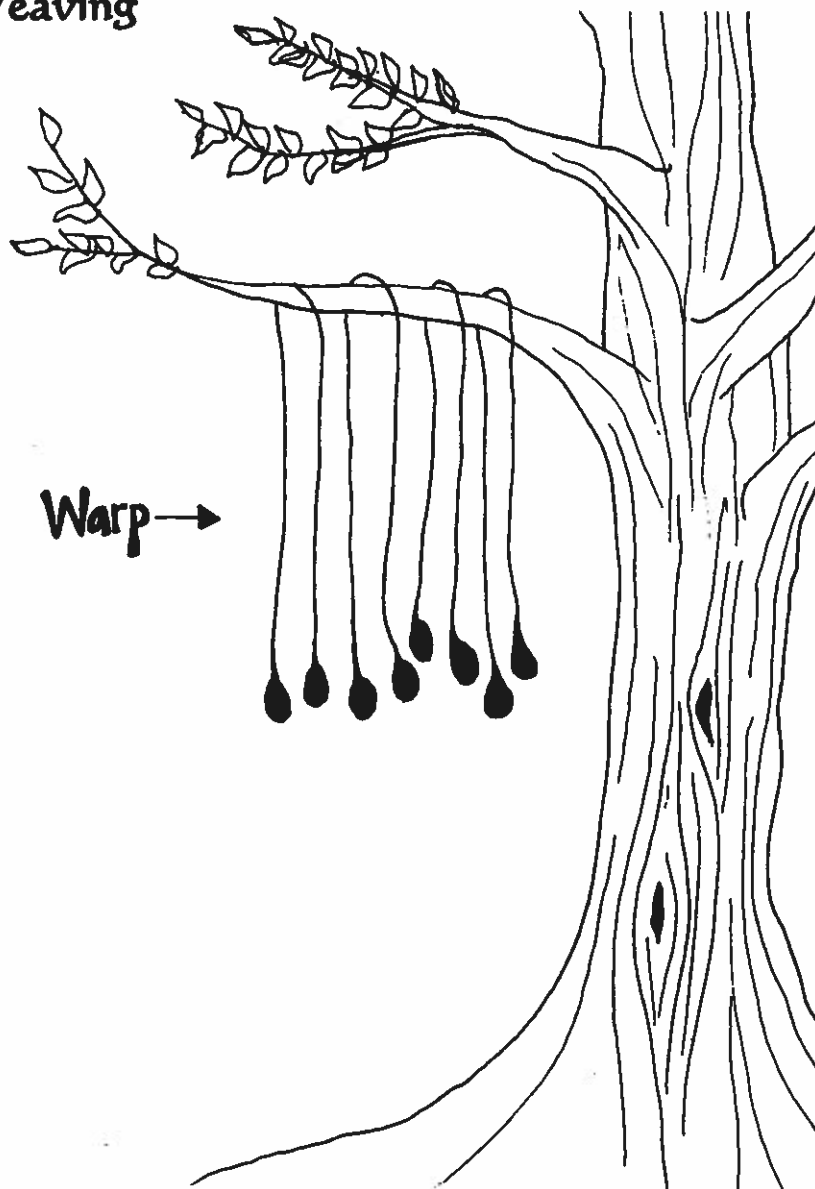
- Clean and neat
- Design elements and principals utilized
- Color, design, texture are harmonious, uniform

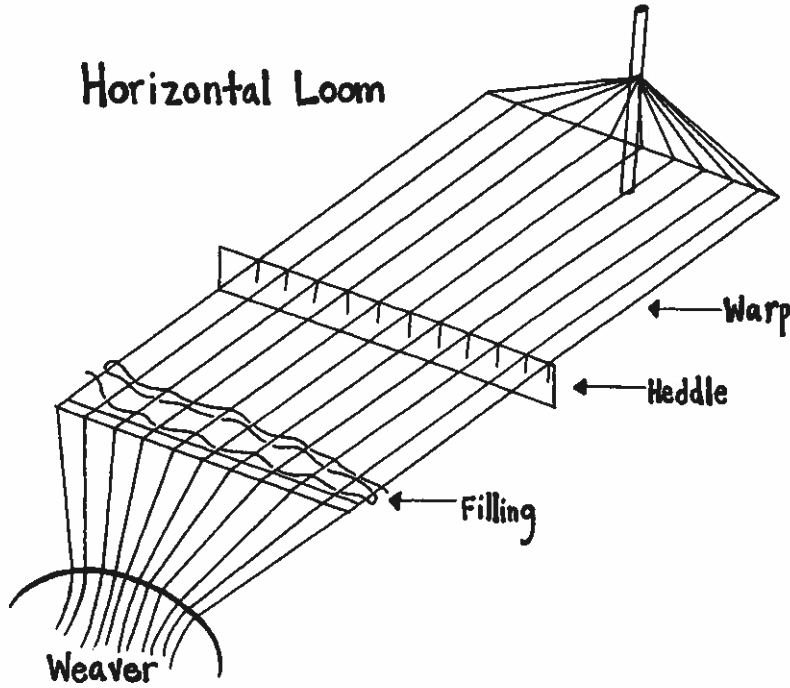
Workmanship

- Even and consistent tension
- Even and consistent weaving
- Straight yarns
- Joining and raw edges hidden
- Straight, even selveges
- No broken yarns
- Consistent pattern
- Ends finished securely

History of Weaving

The earliest looms consisted of warp yarns hung vertically from a beam. The weaver interlaced the filling yarns by manipulating them in an over-under movement. The first improvements on this system consisted of attaching stones or metal weights to the ends of the warp yarns to provide tension and improve the quality of the woven cloth.

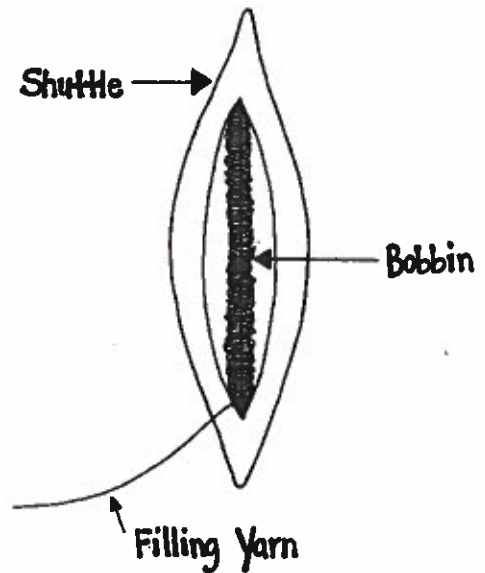




Horizontal looms were used by the early Egyptians nearly 7,000 years ago. In its simplest form, this type of loom had a bar holding the warp yarns that was anchored to the ground. A bar at the opposite end of the warp was attached to the weaver who used the weight of her body as a source of tension for the warp. The filling yarns were inserted by the weaver in an over-under motion from a sitting position. Primitive weavers improvised a device called a heddle that enabled alternate warp threads to be raised together. This created a shed, or an opening between the groups of raised and lowered warp yarns, through which the weft yarn could be passed more efficiently.

At some time before the Middle Ages, tribes in what is now Great Britain constructed a frame for weaving that included a warp beam to hold warp yarns and a cloth beam to hold the woven cloth. The weft yarn, which had been moved through the shed as a ball of yarn or wound around a stick, was placed in a spool. This boat-shaped device was known as a shuttle, and it allowed the weaver to control the weft as it passed from side to side during the weaving process.

It was not until 1733, during the Industrial Revolution, that the first modern improvements on the hand loom were made. Weaving became faster and more efficient with the introduction of the fly shuttle and innovations that made it possible for one weaver to manipulate several shuttles at a time.

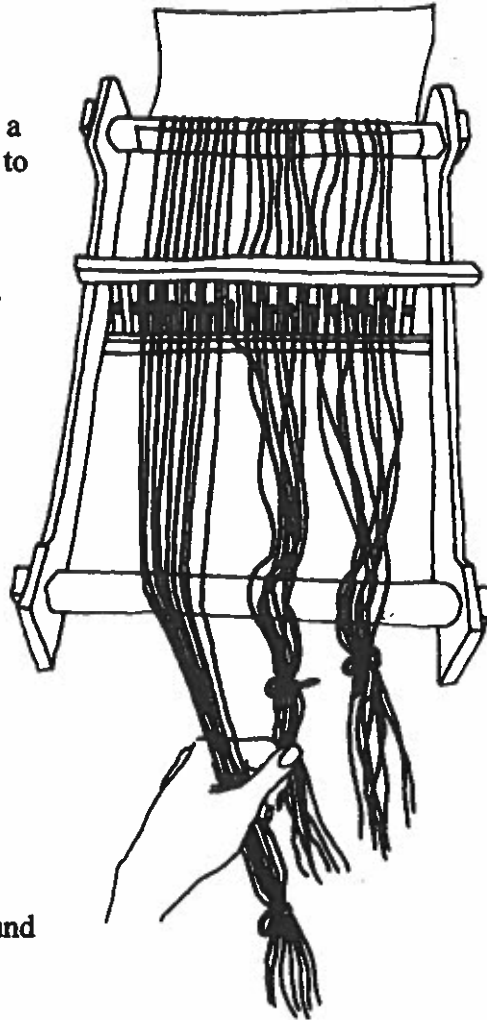


Weaving Basics

The Weaving Process

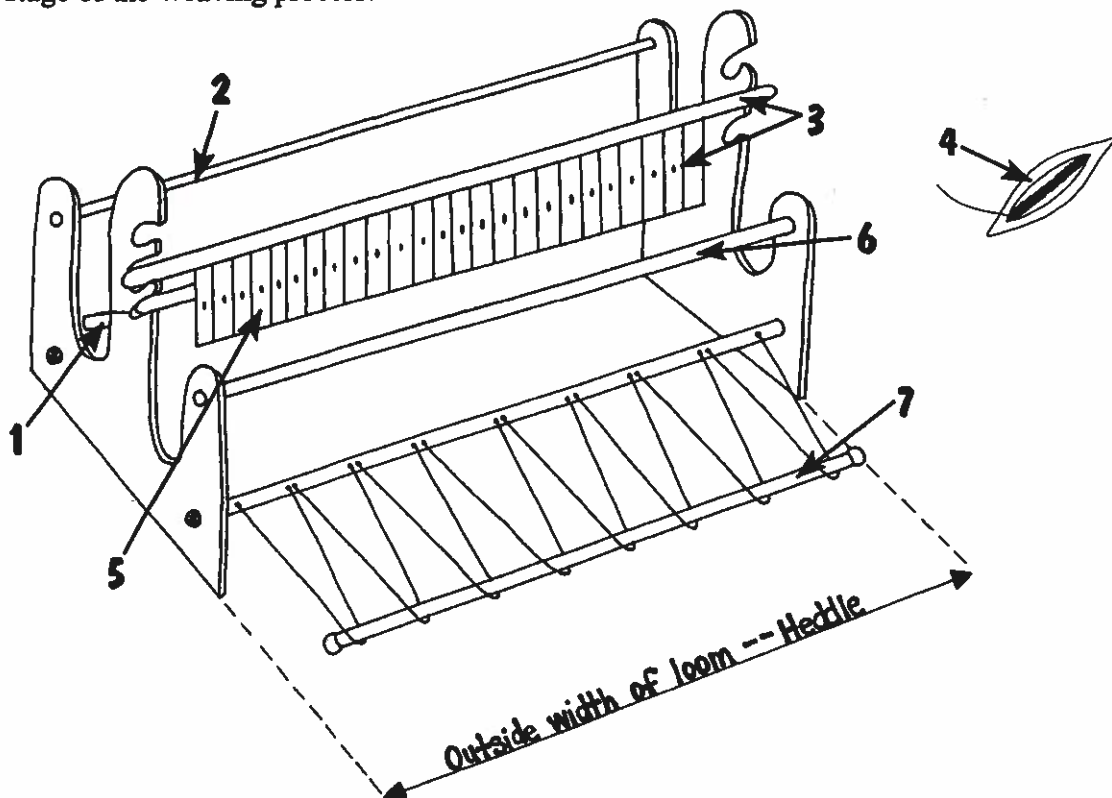
A simplified explanation of the weaving process involves the following steps:

1. *Preparation.* The warp yarn is wound on a beam. All the yarns are arranged parallel to each other.
2. *Warping.* From the warp beam, the yarns are led over a whip-roll, through the eyes of the heddles in the harness, and then through the splits or dents of the reed. This makes it possible to manipulate the various warp yarn according to a pre-arranged plan to create a pattern.
3. *Shedding.* By using the harness and heddles, the warp yarns are separated into two layers, creating an opening called a shed.
4. *Picking.* The shuttle and bobbin, containing the filling yarn, is passed through the shed.
5. *Beating-in.* The filling yarn is beaten into place in the cloth by the reed.
6. *Take-up.* As the fabric is woven, it is wound around the cloth roller at the front of the loom.



P arts of the Loom

1. *Warp Beam*. The roll or cylinder around which the warp yarns are wound in a uniform and parallel arrangement.
2. *Whip Roll*. This is a guide roller which directs the warp yarns on their way to the heddles.
3. *Heddles and Harnesses*. The heddles are short vertical steel wires or plastic bars that control the warp yarns. Each heddle bar controls one warp yarn that is threaded through an eye in the center of the heddle. The heddles are set into a harness, or rectangular wooden frame, that allows groups of warp yarns to be raised and lowered together. As the harness frames are raised and lowered, they produce a shed so that filling yarn can be passed through.
4. *Bobbin and Shuttle*. The filling yarn is wound on a bobbin, which sets into a boat-like shuttle or bobbin container. As the shuttle passes back and forth through the warp shed, it releases yarn from the bobbin and forms the cloth.
5. *Reed*. This is essentially a comb made up of steel wire rods set vertically into a frame. The spaces between the wires are called splits or dents. The warp yarns pass through these reed dents and are kept even and parallel. The reed also beats the filling yarn into place in the cloth.
6. *Breast Beam*. This is a bar at the front of the loom over which the cloth passes on its way to the cloth beam.
7. *Cloth Beam*. The roller on which the cloth is wound as it is woven. It is controlled by a take-up gear that holds the beam in place until the weaver moves it and completes the final stage of the weaving process.



Deciding on a Project

Answering the following questions will help you decide what type of woven project you want to make:

What type of loom do you have?

Rigid heddle and four-harness table looms are most frequently used by beginners. On a rigid heddle loom, the heddle is also the reed. This means that the slots and holes in the heddle separate the yarn and form the shed, and the heddle is also moved forward on the weaving to beat in the filling yarn. A plain weave fabric can be created on a rigid heddle loom.

A four-harness table loom has four separate harnesses, each with heddles that separate the yarns. On this type of loom, each yarn is threaded through a heddle eye in one of the harnesses. The harnesses are raised and lowered with a series of levers on the side of the loom to create the shed. The reed at the front of the loom moves forward to beat in the filling yarns. On this type of loom, you can produce a plain or twill weave fabric.

The weaving instructions in this project are for a rigid heddle loom. Page 18 contains instructions for making this type of loom. If you are using a four-harness table loom, you will need to consult one of the books in the reference section for specific warping instructions.

What do you want to make and how will it be used?

The type of fiber, yarn and weave structure that you choose will be very important for your project. For example, household items such as table runners or place mats must lie flat on the table and be washable. A plain weave fabric made from a medium weight cotton yarn would make a good table runner or place mat. A scarf or muffler that will be worn must be comfortable and drape or hang well. Soft wools spun into fluffier yarns and loosely woven cloth are good choices for such a project.

Warp yarn, for any project must be firmer, stronger and smoother than the filling yarn so it will not break during weaving. Yarns with a lot of surface variation, such as designer or fancy yarns, are not strong enough to so use them only in the filling direction.

P reparing the Loom

There are several necessary steps in preparing your loom before weaving. These steps include:

- figuring the amount of yarn needed for your project,
- measuring the warp and securing the cross that will separate the yarns so that the shed can be formed during weaving, and
- attaching the warp yarn to the loom, a process that is generally called warping the loom.

F iguring the Amount of Yarn

The *sett* or *dent* on a rigid heddle loom is the number of slots or dents and eyes or holes in one inch of the reed. Reeds come in a variety of setts. A twelve-dent reed means that each woven inch of fabric would contain 12 warp yarns. The dent or sett may also be called the ends per inch or e.p.i.

A twelve-dent heddle would make a fairly tightly woven fabric suitable for the place mats or table runners that we talked about in our last example. An eight- or six-dent reed would make a more loosely woven fabric and be appropriate for a muffler or scarf, especially if you use designer yarns in the filling.

The amount of warp yarn needed for your project equals the total length of your item, plus extra yarn that is used to tie onto the loom. This extra yarn is usually called the *wastage*, and it is generally about 12 inches — six inches in front and six in back. You will also need to include extra warp yarn to account for the weaving process. This amount is referred to as the *weaving take-up* and is generally about 10 inches on a small project. Also include any yarn you need to separate projects if you warp your loom for more than one item. Here is an example of how to figure the warp for a project.

Step 1. Calculate the total number of warp yarns in the width of your project

$$\begin{aligned} &(\text{number of dents per inch on the heddle}) \times (\text{width in inches of project}) \\ &= \text{total number of warp yarns} \end{aligned}$$

Step 2. Calculate the total length of the warp in inches

$$\begin{aligned} &\text{First compute the length of the project:} \\ &(\text{length of the item}) + (\text{amount of yarn separating items}) + (12 \text{ inches for tie-ups}) \\ &+ (10 \text{ inches for weaving take-up}) \\ &= \text{total length of the project in inches} \end{aligned}$$

$$\begin{aligned} &(\text{total number of warp yarns, from step 1}) \times (\text{length of project in inches}) \\ &= \text{total length of warp in inches} \end{aligned}$$

Step 3. Since most yarn is sold by the yard, not the inch, calculate the number of yards of yarn needed.

$$(\text{total length of warp in inches from step 2}) \div (36 \text{ inches per yard})$$

Step 4. Determine how many skeins of yarn you will need.

$$(\text{total number of yards}) \div (\text{number of yarns in a skein}) \\ = \text{number of skeins of yarn}$$

Example:

Suppose you want to make two 10 by 16 inch place mats and your reed has 12 dents per inch.

Step 1. Calculate the total number of warp yarns:

$$(12 \text{ dents per inch}) \times (10 \text{ inch width of place mats}) = 120 \text{ total number of warp yarns}$$

Step 2. Calculate the total length of the warp in inches:

Compute the length of the project:

$$32 \text{ inches for place mats (16 inches for each place mat)} \times 2 + (4 \text{ inches between place mats}) + (12 \text{ inches for tie-ups front and back}) + (10 \text{ inches for weaving take-up}) \\ = 58 \text{ total inches in length}$$

$$(120 \text{ total warp yarns}) \times (58 \text{ total inches in length}) \\ = 6,960 \text{ inches, total length of warp}$$

Step 3. Convert inches to yards

$$(6,960 \text{ inches total warp}) \div (36 \text{ inches per yard}) \\ = 193.34 \text{ yards of warp yarn, rounded up to 194 yards.}$$

Step 4. Determine how many skeins of yarns you will need:

$$(194 \text{ yards of warp}) \div (150 \text{ yards per skein}) = 1.2 \text{ skeins}$$

Note: You will have to buy two skeins because a portion of a skein is usually not available.

Filling or Weft Yarn

As a rule of thumb, approximately the same amount of filling yarn is needed as warp yarn. Finer yarns require more yardage, so if you use a different yarn for the filling than the warp, be sure to pay attention to the size of the yarn you choose. In the place mat example, you would need two skeins of yarn for the filling making a total of four skeins of yarn for the project.

Basic Weaving Terminology

- Arc* A weft yarn laid in an open shed in a bow-like manner. Thicker yarns require more yarn to go over and under the warp, therefore a wider or higher arc is necessary. If the weft comes down tight and draws in, the arc isn't high enough. If there is a loop at the selvage, the arc is too big.
- Beam* Front and back stationary loom support. The *warp beam* carries the warp at the back of the loom and the *cloth beam* carries the cloth at the front.
- Bobbin* Carries the weft yarn in the shuttle.
- Dents* Holes and slots in the heddle between the reed wires.
- e.p.i. or Sett* Ends per inch, also referred to as sett.
- Gamp or Swatch* A weaving sample.
- Heddle* Looped cord of varnished string with an eye in the center through which a warp end is threaded in the shafts. Also used as a beater to secure weft yarns and as a reed to keep them properly spaced.
- Ratchet* Gears to secure roller tension bars in place on loom.
- Reed, Beater or Batten* .. Used to secure weft in place and also keeps warp properly spaced.
- Selvage* The firmly woven edge of a cloth; finished sides or edge of weaving.
- Sett* Equals 1 inch on a heddle. On a rigid heddle, this is predetermined.
- Shed* The opening, between the upper and lower warp yarns when separated (in which the shuttle is inserted).
- Shuttle* Implement used to carry the weft through the shed. Weft yarn is wound on a bobbin in the shuttle.
- Square Knot* Made when crossing two ends. Cross left over right, then right over left. This knot is used in front and back warp tie-ups. A reef knot or weavers knot is also used.
- Tie-up* Warp thread ends are tied in groups of four or six warp yarns in a square knot. They are tied to the warp rod secured to the roller tension bar.

- Warp* Yarns running vertical or lengthwise of the cloth. Warp yarns should be strong enough to be pulled and tied firmly on the loom. There is much friction, so use a firm, smooth yarn for the warp.
- Warp rods* Warp yarns secured to rod with square knot.
(front and back)
- Warp Roller* Warp yarn is rolled on the back roller; woven fabric is rolled on the
(tension bars) front roller.
- Weft or Filling* Threads that run from selvage to selvage across the cloth; horizontal or crosswise yarn. Weft yarn can be just about any type depending on project.

Building a Rigid Heddle Loom

Loom Supply List:

- (1) high grade of three-quarter inch plywood, 24 feet by 32 inches to make sides of loom.
 - (2) 1-inch dowels, the width of the heddle plus 2 inches for front and back stationary beams.
 - (2) 1-inch dowels the width of heddle plus 2 inches for front and back roller tension bars.
 - (4) ratchets to hold tension bars in place.
 - (4) strong rods the size of the inside width of the loom (width of heddle times 1 inch) for front and back warp rods, and at least two small shed sticks (shed sticks should be 2 inches wide, one-quarter inch thick and the length of the width of the loom; sand until smooth and tapered at each end).
 - (5) yards of chalk marking cord or similar strong cord to secure warp rod to roller tension bar.
 - (1) heddle in one of the standard widths available from a weaving supply store.
- Shed sticks, 2 inches wide, one-quarter inch thick and the length of the outside width of loom.
- Several shuttles, 2 inches wide, less than a quarter-inch thick and one foot long of any fine grain wood. Cut out and sand.
- Reinforcement board, 1 inch wide by 8 inches long, and as wide as the inside of the loom.

Assemble Loom

If planning to make a loom, purchase the heddle first. The heddle comes in various widths. The width of the heddle determines the width of the loom. It must be smooth so yarn does not snag as it passes through its eyes and slots.

After obtaining supplies, assemble loom.

Prepare Sides of Loom

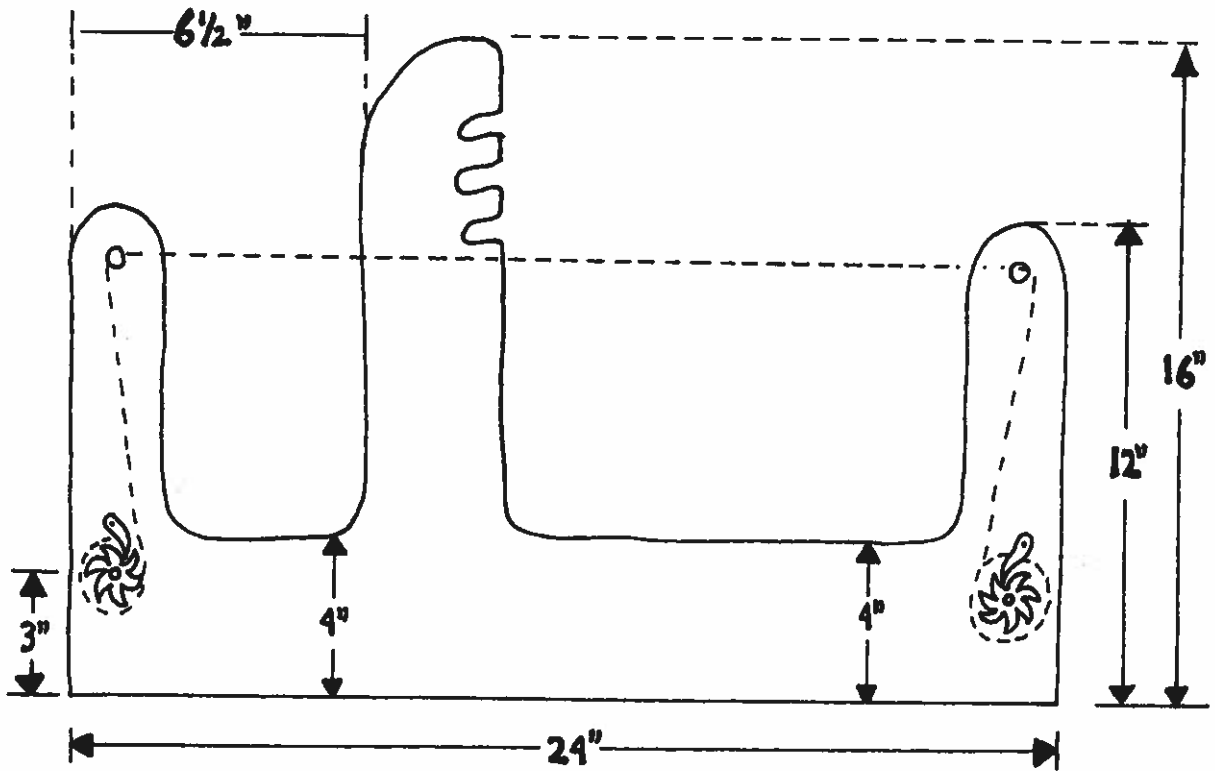
Draw the pattern on newspaper, cut it out and trace it onto the plywood. Cut two sides out of the plywood. Sand to very smooth so yarn will not snag.

Drill Holes for Dowels

Dowels may not be a true inch wide, so check their width before drilling. Drill four holes on each side. Insert the dowels in the holes for the beams. Front and back beams should be snug but warp roller tension bars should turn freely.

Drill one-eighth inch wide holes about four inches apart through the dowels for the roller tension bars. Drill through the dowel from front to back. Make sure your holes are large enough to allow cord to pass through.

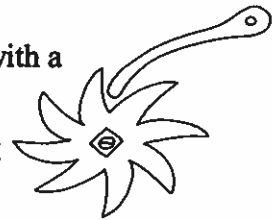
Insert four dowels on one side of the loom, then connect the other side.



Assembly

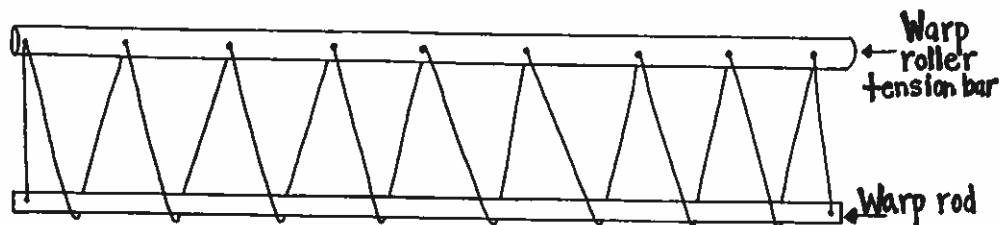
Front and back beam. Glue in the beams in place and secure them with a screw.

Warp roller tension bars. Attach four ratchets, clockwise, according to the directions received with them at each end of dowels. Ratchets with square inserts work best.



Warp rods. Drill one-eighth inch holes an inch in from either end. Divide five yards of cord in half. Use 2½ yards for front warp rod and 2½ yards for back warp rod. Secure at one end of the rod, thread through bar, around rod, through bar, and continue across ending with the hole in the rod. Secure with a square knot. The warp rod should be approximately 8 inches from the warp roller tension bar. The rod hangs loosely until the warp yarn is secured to it.

Reinforcement may be put across the bottom center from side to side. Screw the reinforcement board in place. Screws are better than nails because nails work loose.





4-H PLEDGE

I pledge my head to clearer thinking,
my heart to greater loyalty,
my hands to larger service,
and my health to better living,
for my club, my community, my country, and my world.