

Maximizing Lumber Cuts

Subject(s): Math/Science

Grade Level: 4th - 6th

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Time Required: Two 60 minute class
periods

Lesson Objectives:

The students will learn that many factors are involved in how lumber companies manage to get the most out of each tree. They will also think creatively to project future technologies.

Materials Needed:

Two large pieces of newsprint for every 2-3 students, 3 board diagram cutouts, marker, ruler or straightedge, sample cuts of finished 2 x 4 lumber, and rough cut lumber. (Possibly acquire historical and current saw blades to illustrate thickness changes.)

Overview

-Students will organize 2" x 4" rectangles on an 18-inch circle to simulate boards in a tree. We will compare for most economical layouts. After discussions about saw blade allowances, students will repeat using 2¼" x 4¼" cutouts. Examples on the evolution of saw blade thickness will lead to discussion.

-Students will be given a sample of finished 2 x 4 lumber to measure. Discussion on planing technology will follow as well as saw limitations. Students will make final cutting diagram using 1¾" x 3¾" cutouts. They will then use marker and straightedge to diagram where the first four cuts will be made.

Procedure (including background information):

Day One

Each group of two or three students will be given a large piece of newsprint. They will mark a point in the middle and, using their ruler and a pencil, will mark points nine inches out from center. They will then connect the points to make an 18" circle. Given a cutout of chipboard 2" x 4", groups will try to trace as many pieces this size on their circle as possible (representing lumber cut from a tree). We will compare and discuss afterward.

One flaw with these diagrams is that they make no allowance for the thickness of the saw blade. They will be given a second layout of chipboard, this one 2¼" x 4¼". This represents the original 2" x 4" lumber with the width of the saw blade needed to cut it out. The extra ¼" will be outlined on the chipboard. The students will be asked to turn their newsprint over and try again with the new size. One new rule is that the ¼" on the outside of the layout may overlap that of another so that only ¼" total space is between each piece of lumber. Demonstrations will be needed to illustrate this point. We will again compare and discuss afterward. The evolution of the saw blade will be included in the discussion. In the last century, blades have gone from ½" thick to band saw blades barely 1/8" thick. (Actual samples of saw blades will be very helpful.)

Day Two

Groups will be given a sample cut from the end of a finished 2 x 4 to measure. They should find that the finished dimensions are 1½" x 3½". Planing technologies will then be discussed. Originally, a ¼" allowance was made on each side of the rough board to plane the surface, resulting in a finished dimension of 1½" x 3½". Today, planing technologies have improved so that only about 1/8" is needed for each side to be finished smooth. This means that the original cut size now needs to be only 1¾" x 3¾". This, combined with the narrow blade allowance of 1/8" per side, means that we can go back to the original 2" x 4" layout and the 1/8" blade allowance can overlap! Demonstrations will be needed to illustrate this point. Students will be given another piece of newsprint and the new layout to begin again.

One critical point when making the new layout, however, is the saw limitations. When the saw blade cuts through the log, it must cut all the way through in a straight line. Care must be taken so that the diagram isn't laid out in such a way that boards get cut in half when a cut is made. Demonstrations will be required to illustrate this point. When students complete their final layout, they will be required to take their straightedge and marker and draw a straight line where the first four cuts will be made by the saw.

Discussion:

1. How does this new layout compare with your first two?
2. What kind of math problems do lumber people need to be especially good at?
3. If lumber people did not do a good job at planning, how might it affect you?
4. After seeing how blades and planing technology has changed, what do you predict for the future? Would bigger trees be easier or harder to make a cutting plan for? Why?