4.29 DRAWING A FLOOR PLAN OF THINGS THAT DON'T MOVE

Application of Architectural Concepts

Age Level:

Fourth grade and up

Subjects:

Math
Science
Visual Arts
Social Studies
Language Arts

Time:

One to three 60-minute periods, depending on Teacher: the age level, extent of measurement and accuracy required. The activity, "How to Draw Straight Lines and Letter," should be done before this activity.

Materials:

- Copies of these hand-out sheets for each student:
    1. Architectural Scale Rulers
    2. Architectural Drawing Symbols
    3. How to Measure a Room
- One sheet of light colored construction paper, 12" x 18", for each student (this will accommodate a classroom about 24' x 36', which is quite average. Make adjustments if the room varies much from this size)
- A strip of 1" x 6 1/2" cardboard or mat board for each student
- Pencils
- Rulers
- A floor plan of the school, a house or other building
- Maps at different scales

Learning Objectives:

- To understand concepts of scale, measurement and three-dimensional visualization
- To gain skills in using a symbol key
- To increase visual perception of details

Design Professional:

It will be important to plan the extent of this activity carefully with the teacher, who will advise you about the level of ability of the students and aid in adapting this material to an appropriate lesson plan.

This is a good opportunity to talk about how architects draw plans, to show plans and explain the use of different scales. It will be a new concept to the students and probably to the teacher, so keep it simple.

Teacher:

This activity deals with several architectural concepts, so it is a good one for the design professional to introduce. However, students seldom have much knowledge of the marks on a ruler, other than the one-inch mark, so they will need considerable help from you. Working out a plan with the design professional where you are illustrating the architect's comments on the overhead projector will be helpful.

Rationale:

Drawing a floor plan of the classroom is a good opportunity for the architect to elaborate on what the architect's work involves, and it provides an extension of the students' mapping activities.

It is a method of looking very carefully at a very familiar environment. This usually leads to the realization that most people are not very aware of the details to be seen in the world around them.

In the process of observing certain specific things about a place, you become aware of many other things about the place. (See the activity, "Let's Get Out and See the World")

The activity also provides some valuable experience in working with rulers and scale.

4.30 DRAWING A FLOOR PLAN OF THINGS THAT DON'T MOVE

Application of Architectural Concepts

Presenting the Activity:

Three typical elements in drawing a floor plan or map are introduced:

1. Only the things that never move are shown on an architectural plan or a map.
2. There is a specific criteria for the level at which all floor plans are drawn.
3. An established symbol system is used for drawing all floor plans.

Part One—How Floor Plans are Drawn

A. Things That Don't Move

Suggested dialogue...

"We are going to draw a floor plan of our classroom (or other selected area). It will only include the things in the room that never move. Why do you think we are going to do it that way?...Right-because that is the way architects draw plans for buildings.

"A floor plan has only the things on it that don't move because those are the basic things the builder will be responsible for putting in the building. If we want to show the furniture, it will be added later, or put on another plan drawing.

"So, what will we show on our plan? Will the desks be on the plan? The tables? The chairs? What will be included—walls, doors, windows, closets, counter, bookshelves, if they are built into the wall, etc.? No, the lights, the clock or the flag will not be shown on your plan. You will see why in a minute.

"When you draw a floor plan, you do it in a certain way. All architects, planners and builders follow the same rules for drawing floor plans. Why do you suppose they do this? Yes, so that everyone connected with building the building will understand just what the plans mean. These rules are called criteria. When you know the rules, or criteria, you will be able to understand just what the plans mean. Understanding the drawings is called reading the plan. When you learn to understand the criteria, you will be able to read the plan."

Refer to the architectural plans and maps that are on the walls.

B. How a Plan is Viewed

"A floor plan is drawn the same way a map is drawn. How do you look at the ground when you look at a map? Yes, you look straight down on it. A floor plan is drawn looking straight down also.

"A good way to remember how a plan or map is drawn is to imagine you are a bird flying around the room. As you fly around, you are looking straight down on all you see below. Like a map, the floor plan is a bird's eye view. For instance, what does a bird see when it looks at the counter? Right, just the top. It won't see the doors down below, will it? So what you put on the plan is just the top.

"What will you need to know about the top ? You will need to know how long it is and how wide. You could guess at the size by comparing it to other things around it, but if you are going to draw an accurate floor plan, you will need to measure it carefully.

"If there are some books on the counter, are you going to put them in your drawing? What about a sink? It doesn't move, does it? So it should be in your drawing. How will it look to a bird? Yes, it will be just a rectangle or maybe an oval. You can't show how deep it is and you don't put in little things like the faucets or the drinking fountain.

"Stand up and stretch your arms out to your sides-straight out from your shoulders.

"Imagine you are flying over this room at the level of your outstretched arms. Wave your arms as though you are flying like a bird. Now look down around you. The only things you will draw on a floor plan are the things that are below the level of your wings. Notice what the things are below this level. Will the clock be on this plan?

"It is true that the hands of the clock move, but the clock doesn't move on the wall, does it? Then why won't it be on this plan? Yes, it is above the level of your arms.

"Will the lights be on the plan? No, they will be on a separate sheet that has all the electrical things on it.

"Let's think about the door. The door itself moves, but the frame for the door is built into the wall. The door frame will be on the plan because part of it is below the level of your wings. You are cutting through the walls at the level of your wings. It is sort of like slicing the room in half mentally. In making this drawing, you will be using your ability to look around you and select the things that never move, to observe where they are located and how much room they occupy."

Part Two—Drawing in Scale and Using a Ruler

Refer to the various size maps that have been put up on the wall.

A. The Meaning of Scale:

"How do you know how big or small the space is that is pictured on a map? Yes, there is always a scale on it. The scale shows how long a space on this map will equal a mile, or a certain number of feet.

"If a map is drawn at a small scale, it may cover a very large area, and the lines and words will be very small. If it is drawn in a large scale, it won't cover as big a space, and the lines and names will be easier to read, because they will be bigger.

"Has anyone made models of cars or airplanes? They are called scale models, aren't they?

"Do you remember what scale was used on a model you built? It helps you visualize what the real thing will look like. These little models are scale models of something that is real, and is much bigger. A scale drawing is the same thing. It is a drawing of a room or a whole building in a scale that makes it look just the same as it really is, only smaller. Another way to say this is to say that everything is reduced in the same proportion. The objects are all smaller than the real thing, in just the same amount. You could also make them larger in proportion-that is each part would be made larger in just the same amount."

Refer again to the architect's drawings and the maps, and explain the different scales. Have the students find the scale indication in each case.

B. Architectural Scale Rulers:

Hand out the Architectural Scale Rulers sheet to each student. Ask them to compare these rulers with their school rulers.

"What things do you observe about the Architectural Scale Rulers that are different from your school rulers?"

Responses should include:

"It isn't as long as my ruler." "It doesn't have as many marks." "The numbers are different." "The marks don't go clear to the end of the ruler."

Show the students an architect's scale.

"Architects use a shorter ruler because it is easier to move it around on a drawing. They separate the markings for different scales and number each mark consecutively, so they don't have to count each of the marks. The numbers don't start right at the end of the ruler, as they do on your school ruler. Look at your ruler and see if you can see why that is. Are some of the corners broken off? A broken end will not let you measure accurately. Starting in from the edge gives the ruler a little protection for the first marks.

"You can see that the space between the marks varies with each of the different scales. Look at the one-inch scale compared to the half-inch scale, and compared to the quarter-inch scale.

"It is better if the sheets of drawings aren't too big to handle by the workmen on the construction job, so architects select the scale that will best show the information they want to give, but will not make a drawing too large.

"A scale of one inch means that one inch equals one foot. Other scales might be, one half inch equals one foot, or one quarter inch equals one foot.

"Most floor plans are drawn at a scale of one quarter inch equals one foot. This scale makes a drawing that doesn't require a sheet that is too large, but it is a big enough scale to allow rooms

to show details and dimensions quite clearly.

"If you need to do a drawing that shows a great deal of detail, it would be a good idea to use a scale of one half inch equals a foot. If you are going to do a furniture arrangement on this plan later on, this scale is a good one to use.

"Look at the quarter-inch and half-inch marks on your school ruler. They are kind of hard to see, aren't they? This is because they are not numbered Your architect's scale will make it easier, won't it?

"Why do you think the architect's scale is shorter than your school ruler? Yes, it is easier to handle when you are laying out measurements for a drawing."

Hand out the cardboard strips. Ask the students to cut out their 1/4" and 1/2" scale rulers and paste one on each side of the card-board strip.

"Now you have learned how to look at a room when you draw a floor plan, and the position from which you look. You also have an architect's scale, so you will be able to draw everything the right size, but, would you believe, there is still more information you will need?

"You will need to know the rules-What did we call them? Yes, criteria, that architects and builders use for showing the things in a room on a floor plan. They all use the same criteria so they will all be able to read the plans correctly. You read the symbols indicated in the criteria just the way you read the words in a book. A well-drawn plan will be easy for everyone who knows the criteria to read."

C. Architectural Drawing Symbols:

Hand out the Architectural Drawing Symbols sheet and take the students through the sheet using the plans on the wall to illustrate the symbols.

"When you look at a map, what do you usually find that helps you understand the map? (A key) The drawings on your hand-out sheet represent a key to the symbols that are used on architectural drawings.

"When you draw the wall of the room, you do not draw just one line. A wall has two sides, with some space between them. Most walls in a school will be about six inches thick. You will need to use your scale to measure the distance between the lines. Sometimes there is a post in the wall, so you will show a projection out from the wall. If there is a post out in the room, it will be shown as a square or a rectangle.

"Doors are a space in the wall that you can walk through, so a door is drawn as an open space in the wall. Different kinds of doors are shown in different ways, as you will see on your sheet. Some swing, some fold, and some slide past each other.

"Windows are shown in a similar way to the doors, but they are not an open space. They are inside the wall. Vertical lines inside the wall show how wide the window is, and a horizontal line is the symbol for a window. It represents the edge of the glass that the bird would see looking down on a window that is cut through the wall at the level of its wings.

"You see, you can give a lot of information about doors and windows on a floor plan that others will under-stand if they know about the criteria. Remember, doors are shown as open, because the bird could fly through them, but windows are shown as closed, so the bird would get smashed if it tried to fly through.

"Chalkboards and bulletin boards are separate pieces that are attached to the wall. They only stick out from the wall an inch or two, so there will be a line just a little way out from the wall with a line at each end to show how long it is. A bookcase is shown in much the same way, except it will usually be out from the wall about 12 inches.

"If there is a counter, remember to draw just the top. It usually will be out from the wall about two feet. If there is a sink in the counter, it will usually look like a rectangle, or occasionally it may be an oval.

"Look around. Are there other things in this room that don't move? Small items such as light switches, plugs, fire extinguishers, etc., are best left out on this plan.

"What else are we going to need to know before we can start drawing? Yes, we need to know how big the room is, so we can be sure that the piece of paper we are going to use to draw on will be large enough."

If the time is short, have the students take the measurements from the plan of the school. If they are to have an experience in taking measurements and recording them, continue to the next part of this activity.

Part Three—How to Measure a Room

A. Taking Measurements and Recording Them:

Hand out the How to Measure a Room sheet.

Ask the students what they observe about the way the plan is drawn. What measurements will they need for the drawing of this room?

A steel tape measure will give much more accurate results on the overall measurements. A yard-stick works well for smaller measurements.

The class can discuss the best methods for taking the measurements. One way is for the students to divide into groups to measure different parts of the room, and then share their measurements.

It could also be done as a classroom activity, with two students working together to measure a certain part, and two others doing another part.

The measurements can be recorded (not drawn to scale) on a large sketch sheet on the wall. All the students would work from this sheet to make their own scale drawings. This speeds the process and allows for checking for accuracy before the drawings are started.

Hand out the 12" x 18" light colored paper.

"This sheet of paper is 12" wide, and 18" long. The scale we will use for this floor plan drawing will be one-half inch equals one foot. We will use that scale because it is big enough to put the details in quite easily. It is also a good size to use if we want to work with furniture arrangements later on.

"Look at your architect's rulers and find the one that has the half-inch scale on it. That is the one you will be using.

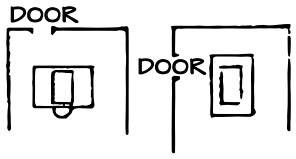
"Let's see if you can work out a problem using this scale. If the sheet of paper is 12" x 18", how big a room can we draw on it? If one side is 12" long, how many feet will that be if 1/2" = 1'? Good—it will be 24'. Now, how about the side that is 16"? Yes, that will equal 36 feet."

Compare these dimensions with the dimensions of the classroom.

Many classrooms are very close to these dimensions. If the room is smaller, then there is no problem. If it is longer or wider, strips will need to be taped to the basic sheet, or use a larger sheet of paper.

"When you start your drawing, be sure that your pencil is sharp. Draw everything in very lightly at first. That will allow you to erase and make changes and corrections.

"It will be a great help to you in getting things in the right place if you keep your paper on your desk in the same position as the walls of the room relate to your desk.



"Use your architect's scale for all of your measurements, but you may use your school ruler for drawing the straight lines. When you have finished and your drawing has been checked, go over the lines with your pencil or pen to make them easily readable.

"Start with the largest parts first. That would mean getting the outside wall of the room on the plan first. Then start with the doors and the windows. Add the counters and the bookcases and put in the chalkboards and bulletin boards last.

DRAWING A FLOOR PLAN OF THINGS THAT DON'T MOVE

Application of Architectural Concepts

> *"Now you are ready to put in the numbers and the letters. Use your rulers to draw the dimension lines. Look at your sheet and try to do it just as it is shown on the sheet. You must be very careful to get the dimension lines in just the right place, or your plan will not be accurate. Notice that all the lines are straight and line up across the sheet. This makes a drawing easy to read."*

Refer to the activity, "How to Draw Straight Lines and Letter," for instructions on how to add the dimensions and notes and do architectural lettering.

Be sure the students add a north arrow, a scale and their name on the drawing. The north arrow on the drawing will help students understand the orientation of the sun's path and wind patterns that will affect their overall school and classroom.

> *"Architects always sign their drawings; put the scale and a north arrow on it so others will be able to read the plan correctly. This way, if people have questions about the plan, they will know who to ask."*

Closure:

Initiate a discussion on how this activity has helped the students become more aware of the objects in the room, with their sizes and shapes, their locations in the room, and their three-dimensional relationships.

Comment that, while architects want their drawings to look well done, the criteria for a good architectural drawing is not how pretty it is, but how accurately it is drawn and how clearly the information on the drawing is shown.

Use this plan as a basis for the activity, "Drawing a Floor Plan of Things That Move."

Suggestions from teachers:

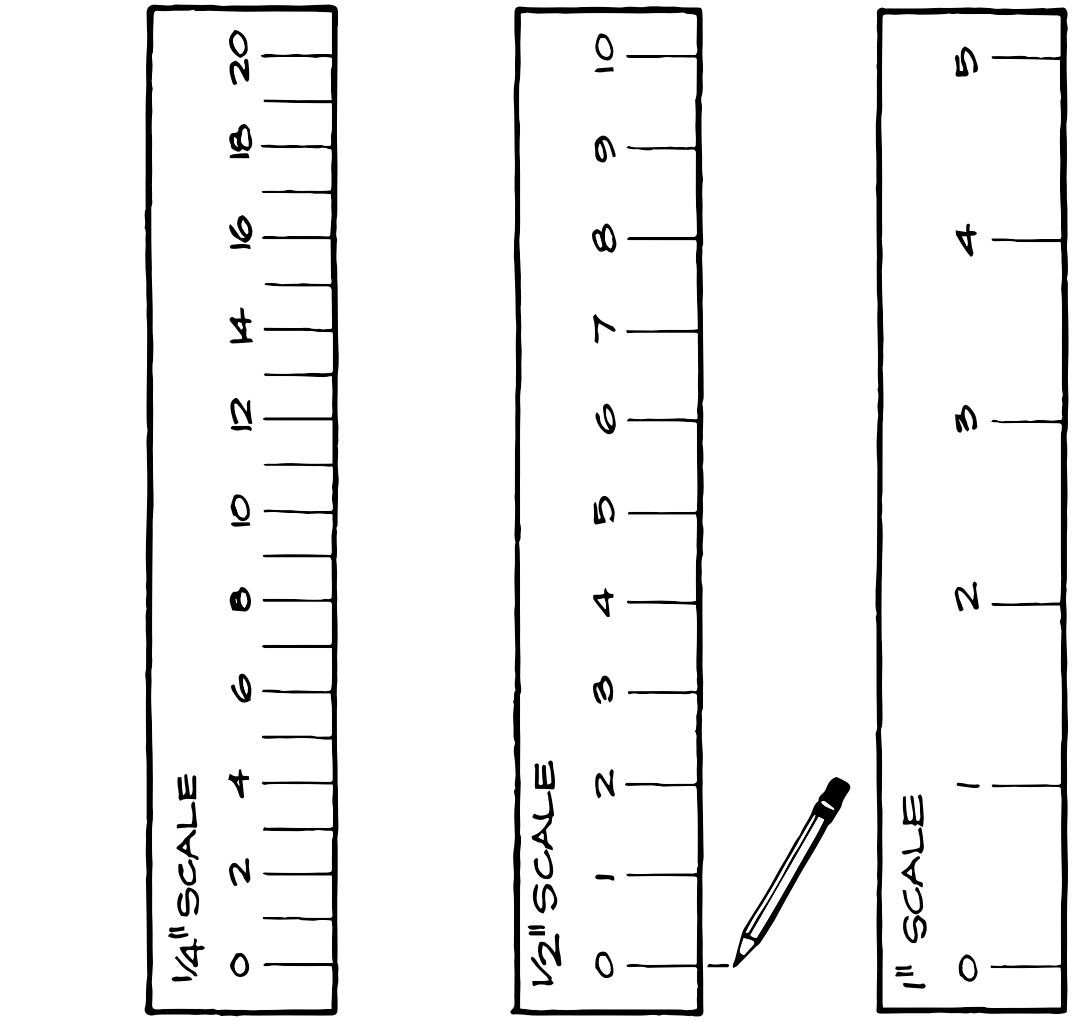
One group of teachers decided to make a master over-lay on apiece of plastic so each student could use it to evaluate his or her own drawing. This eliminated peer pressure and criticism of their work. The students were told all the positive points about their floor plan as they (individually, with the teacher) checked their plans with the over-lay. This eliminated the possibility for hard feelings caused by displaying "best" floor plans and reinforced the learning involved.

Another teacher worked out a game that gave the students additional practice in working with the marks on the ruler. See the following pages for the game, "Cheat."

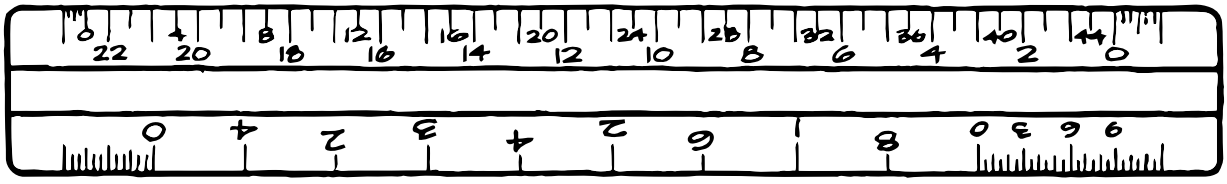
DRAWING A FLOOR PLAN OF THINGS THAT DON'T MOVE

Application of Architectural Concepts

Architectural Scale Rulers



NOTE: PENCIL SHOULD BE SHARP.
MAKE MARKS ON SAME SIDE AS RULER MARKS.
MAKE MARKS IN SAME DIRECTION AS RULER MARKS.



ARCHITECT'S SCALE

DRAWING A FLOOR PLAN OF THINGS THAT DON'T MOVE

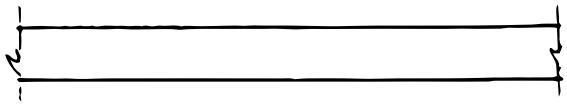
Application of Architectural Concepts

Architectural Drawing Symbols

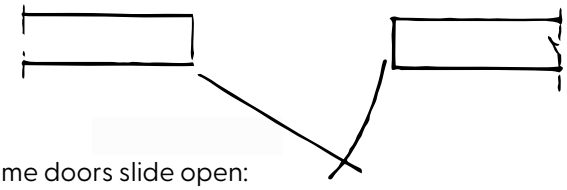
- A floor plan that is used to build a building shows only the things that don't move and are below the level of your outstretched arms.
- A floor plan is a bird's eye view as the bird looks straight down at the space below.

- This is a Floor Plan symbol Key
- It is drawn at a scale of one-half inch equals one foot:

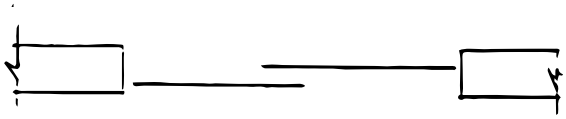
Walls are about six inches thick:



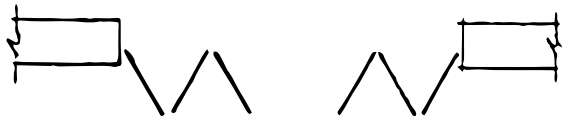
Some doors swing open:



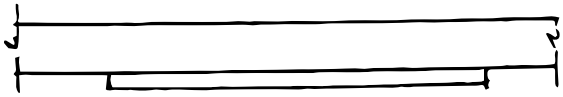
Some doors slide open:



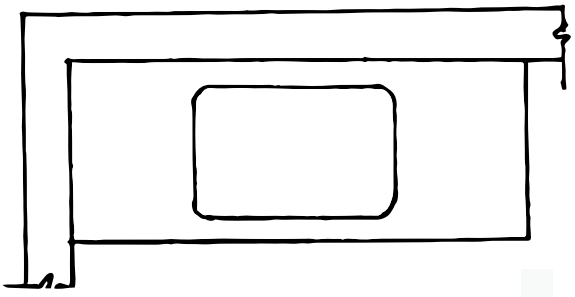
Some doors are folding:



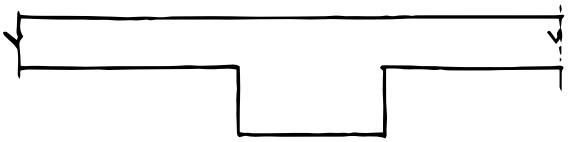
Chalk and bulletin boards are shown as a line just a little outside the wall:



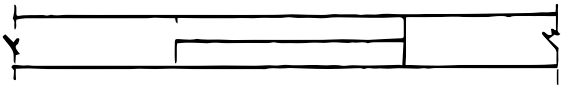
Only the tops of the counters and sinks are shown:



Some walls have a post in them:

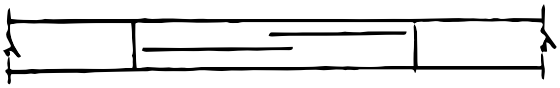


Some windows don't open:



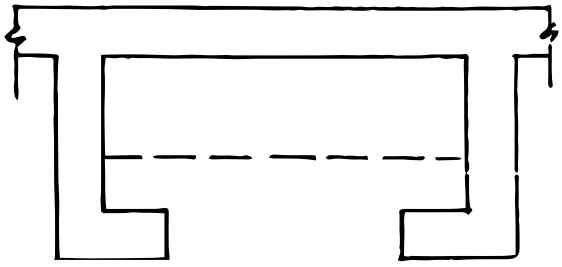
Some windows are in rows and one or two may swing open:

Some windows slide open:



Some windows stick out. They are called bay windows:

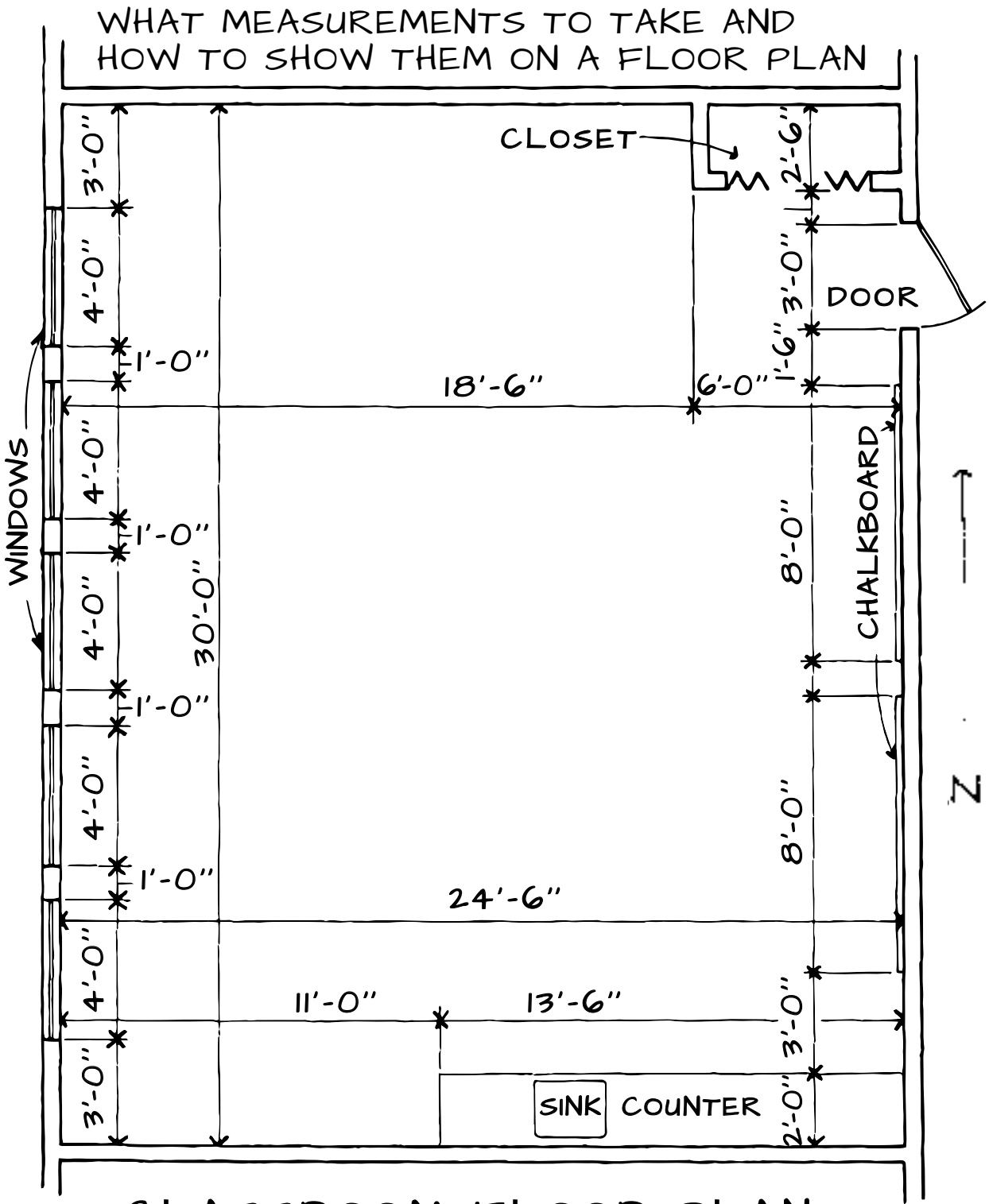
Closets look like this—the shelf is above your arms, so it is dotted:



DRAWING A FLOOR PLAN OF THINGS THAT DON'T MOVE

Application of Architectural Concepts

How to Measure a Room



PLAY THE GAME "CHEAT"

Drawing a Floor Plan of Things That Don't Move

How to play the game, "Cheat."

Materials:

- Dice (one pair for a group of four to six students) taped with marks for 0, 1/16, 1/8, 1/4, 1/2 and 1 inch
- A different colored marker for each student or team (see pattern)
- Two, 12" rulers with good, clear markings
- A transparency of the drawing of the rulers

Learning Objective:

- A game to develop understanding of the marks on a ruler and the use of fractions. The skills acquired in the game will be very useful in many of the measurement and scale drawing activities.

Rationale:

Although rulers should be a commonly used tool, few students understand what the marks actually represent. Knowing the measurements and being able to visualize the relative distances they represent is an essential skill for math or mapping lessons.

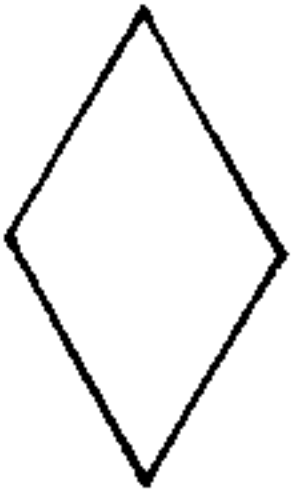
Procedure:

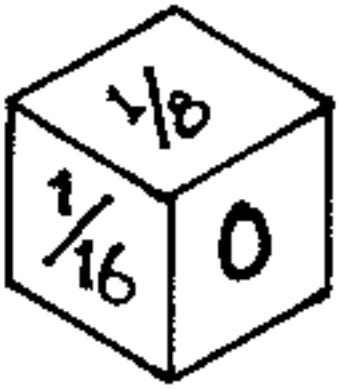
Put a transparency of the drawing of the rulers on the overhead. Demonstrate on the drawing as you go through the game instructions.

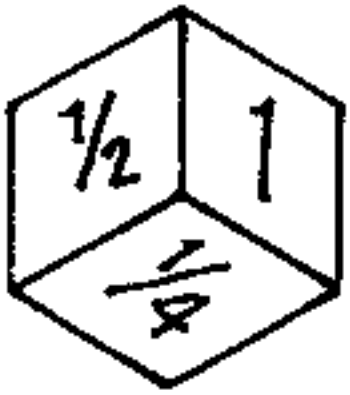
1. Divide the students into two teams.
2. A student from the first team rolls the dice, adds the two fractions and places the marker in the correct position.
3. A student from the second team repeats the process.
4. Encourage the team members to try to catch the opponents making a mistake in placing the marker.

When the students understand the game, have them play it as groups of three or four. Explain the game is called, "Cheat," because they can, at any time, move their marker further than the total of their dice if the opponent doesn't catch them. If they are accused of cheating (making an error), and are guilty, they must return to the place where they started the turn. If they are accused when they are not guilty, then the accuser (opponent) will have to move back 1/2 inch!

Encourage the students to play the game in free time as much as possible.

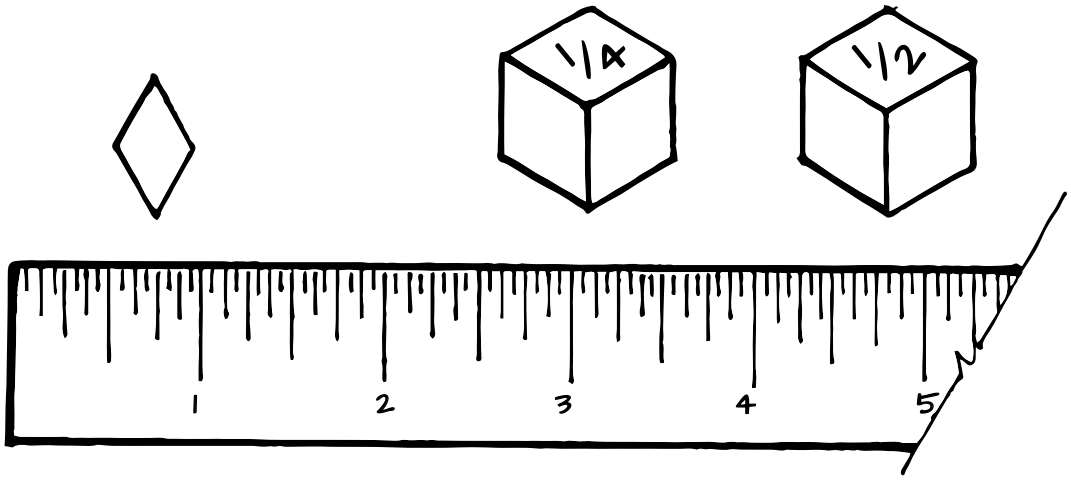


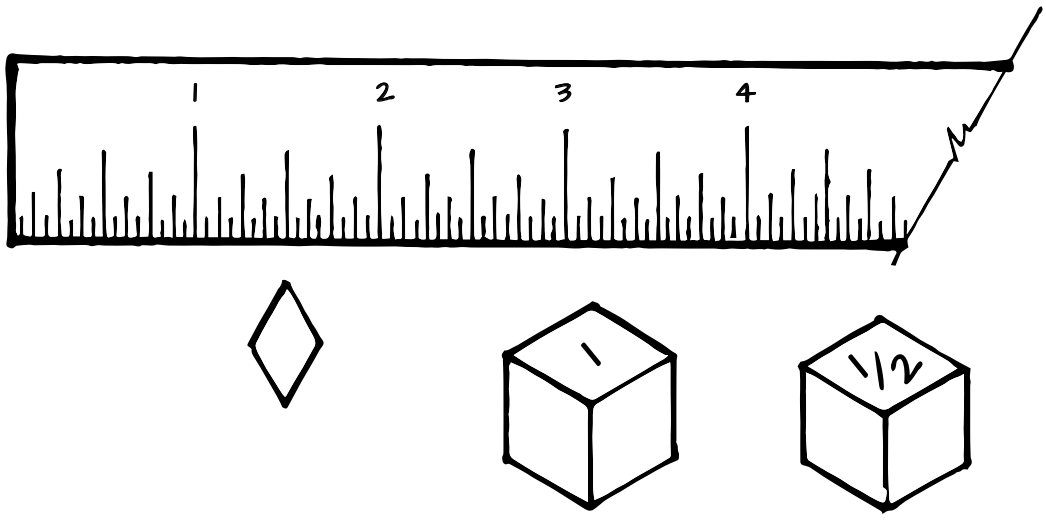




PLAY THE GAME "CHEAT"

Drawing a Floor Plan of Things That Don't Move





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