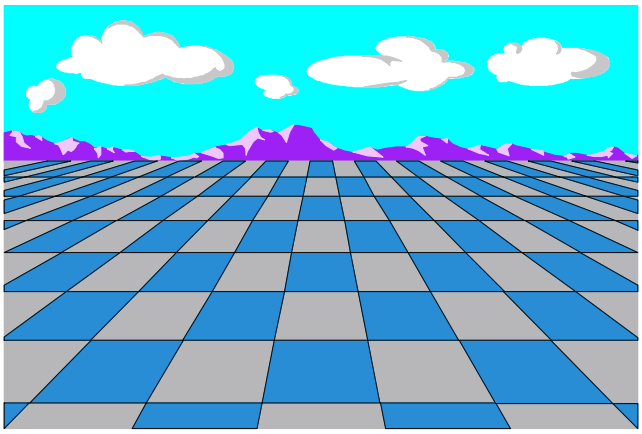
WHAT IS AREA?



CFE 3319V

OPEN CAPTIONED
ALLIED VIDEO CORPORATION
1992
Grade Levels: 5-9
17 minutes

DESCRIPTION

What is area? Lesson One defines and clarifies what *area* means and also teaches the concept of square units. Lessons Two, Three, and Four develop formulas for the area of a rectangle, parallelogram, and triangle. Working sample problems helps clarify the formulas. Each animated lesson concludes with practice problems.

INSTRUCTIONAL GOALS

- To relate visually the concept of area to two-dimensional shapes.
- To demonstrate methodically the areas of a rectangle, a parallelogram, and a triangle.
- To practice measuring area given a specific problem.
- To present working formulas to calculate areas.

BEFORE SHOWING

1. Read the CAPTION SCRIPT to determine unfamiliar vocabulary and language concepts.
2. Discuss reasons it is necessary to calculate the area of a shape.
3. Prepare to work simultaneously with the video by having paper, pencil, and ruler available.
4. Define *formulas* and give simple examples.
5. Mention that calculating area always involves multiplying.

DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause after each lesson to discuss concepts and to practice additional problems.
3. Pause to sign correct terminology after formulas are given.

AFTER SHOWING

Discussion Items and Questions

1. Discuss the importance of *estimation*. Remember the man in the video who overbought because he didn't estimate.
2. Generate reasons the following activities require using area:
    a. Wrapping gifts and decorating for holidays
    b. Making a hopscotch board or lining off a baseball field
    c. Finding a suitable table for a specified size of a jigsaw puzzle
3. Discuss why understanding multiplication is critical for computing area.
4. Contrast the terms *height* and *length.* Determine why height is associated with triangles and length with rectangles.
5. Contrast the terms *base* and *width*. Determine why base is associated with triangles and width with rectangles.
6. Consider some occupations that regularly incorporate measuring area. Examples are carpenters, tailors, painters, or graphic designers.
7. Imagine that units are not equal inside an area. Discuss why it would be difficult to calculate area.
8. Why is every triangle exactly half of a square?
9. How is perimeter related to area? How is it different? What is the formula for perimeter?
10. Explain why the formula for the area of a rectangle or a triangle will not work for that of a circle.

Applications and Activities

1. Using graph paper, create measurement problems for a rectangular area.
2. Calculate the area of classroom items in the shapes of rectangles, parallelograms, or triangles.
3. Using a paper square, compute its area.

a. Mentally compute the area of a triangle from opposite corners of the square. Check answers by cutting and calculating.
b. Cut the square to make a parallelogram as shown in the video. Compare the area of the parallelogram to the square.

4. Determine the length of the sides of a rectangle when $A=15$, a triangle when $A=8$, and a parallelogram when $A=32$.

5. Create a variety of rectangular shapes that all have an area of 40.
   a. Chart the information under the headings "Side 1," "Side 2," and "Perimeter and Area." Compare perimeter and area results.
   b. Repeat the procedure with triangles having an area of 12.

6. Using flat, plastic manipulatives, create irregular shapes using combinations of rectangles, triangles, and parallelograms.
   a. Calculate the areas of the irregular shapes. Explain in writing why it is sometimes necessary to find the area in pieces and then add.
   b. Find two irregular shapes having the same area.

7. Find the area of a shape with sides measuring to the half or quarter inch. Use a calculator, if necessary.

8. Create a design for a bedroom or school wall using rectangles, triangles, and parallelograms.
   a. Write a letter to the painter requesting specific colors and spacing of shapes.
   b. Include sketches, labeling distances and sizes of shapes exactly.

9. Estimate the area in square inches of the bottom of one's foot.
   a. On 1-inch graph paper, trace the foot and count all full squares.
   b. Count all partially full squares as half. Total and compare to the estimate. Determine why this method is not exact.

10. Design a bulletin board display clearly explaining the concept of *area*. Include formulas for each shape learned.

   a. Create a scene depicting the use of area, such as a dog in a fenced yard or the frame of a house.
   b. Display the best worksheets from related lessons.

WEBSITE

Explore the Internet to discover sites related to this topic. Check the CFV website for related information (http://www.cfv.org).

CAPTION SCRIPT

Following are the captions as they appear on the video. Teachers are encouraged to read the script prior to viewing the video for pertinent vocabulary, to discover language patterns within the captions, or to determine content for introduction or review. Enlarged copies may be given to students as a language exercise.

Welcome to
your Assistant Professor's

lesson on area.

This lesson helps you

to understand what area is

and how to use it in your life.

You can make this
Assistant Professor

repeat itself--
it won't mind.

Area is a way
of measuring a surface.

Here are some examples
of surfaces

that you may need to measure.

Here is a table top,

the floor of a room,

or the wall of a house.

Let's meet a local handy man
named Norm.

Norm thinks he doesn't need

to know about area
to do his job.

Norm has been hired
to paint the wall

and lay some carpet
in the room we just saw.

He is going
to the paint store now.

I'd like to buy
some paint please.

How much area
you tryin' to cover?

It's a pretty
big wall--

just give me
a lot of paint.

You got it!

We'll deliver it
this afternoon.

How much
do I owe you ?

A lot.

While Norm wonders
why the man asked him

how much area
he needed to paint,

and what he will do

with all that extra paint,

let's see how we find
the area of a rectangle.

Let's start
by looking closely
at the table top.

The surface
of the top is a rectangle.

A rectangle
has only two dimensions.

We won't know how long
or how wide it is

until we actually measure it.

For now, we will
call the length L

and the width W,

so our lessons
will be easier to explain.

Imagine that we can lift

the surface
from the table, and rotate it.

Notice you cannot see
the surface from its edge.

That is because the surface

has no third dimension;

in other words,
it has no thickness.

So a surface
can only be measured

in two dimensions.

Remember, we are using
length *and* width

to describe
those two dimensions.

We will be using
abbreviations L *for length,*

and W *for width.*

Now that we know

that a flat or plane surface

has only two dimensions,

let's measure the table top.

We can measure
the two dimensions

with a measuring tape.

The length
of the table is three feet.

The width
of the table is two feet.

Now we could say

the area of the table top

is three feet long
by two feet wide

or said another way:

Three feet by two feet,

or two feet by three feet.

Although it seems easy

to describe
the area of a table top

by saying it is two feet wide

by three feet long,

this method
doesn't work very well

when describing larger
or more complex surfaces.

So surfaces are usually
square units of measure;

such as square centimeters,
square inches, square miles,

square feet, and so on.

Let's describe the surface area
of the table top

in units of square feet.

Measure
the table top with a ruler.

This time,
we will mark off the edges

in one foot units.

There are three
one foot units along the length,

There are two one foot
units along the width.

We will divide the surface

into these one foot units
along its length and width.

The surface is now
divided into parts

that are all units
of one foot in length

and one foot in width,

or said another way,
units of square feet.

So the table top has an area

of 1,

2,

3,

4,

5,

6 square feet.

Let's review

what we have
learned about area.

Area is a means of describing

or measuring a surface.

The area of a surface
is usually measured

in square units.

Let's look at the rectangle

formed by the table top again.

As you can see,
the rectangle is divided

into three rows
of two square feet.

So the total number
of square feet,

or the Area,
is the length (three feet)

multiplied by the width
(two feet),

or the area is six square feet;

using the abbreviations
A *for area,*

L *for length,*
and W *for width.*

Of course,
not all rectangles

measure two feet
by three feet.

So in place of three feet,

we can use L

and in place of two feet,

we can use W.

We have created a formula

for the area of any rectangle:

A = L multiplied by W.

Let's see what
Norm's up to now.

He's going to the carpet store.

I hope he at least
measured the room.

I need some
carpet--

But
not too much!!--

It's a little room.

You'll only
be needing a small
carpet, right?

That's right.

Oh no !!!
What's that formula again?

With this formula,
we can determine the area

of any rectangle or square.

Let's try some examples.

Take Norm's floor,

it's a rectangle
that is 9 feet wide

and 8 feet long.

The width is: 9.

The length is : 8.

Let's use our formula
for area: A= L x W.

We know
the width is nine feet.

We can substitute 9 feet

for the W *in our formula.*

Our formula now reads:
A = L times 9 feet.

The length is 8 feet.

We can substitute 8 feet

for the L in our formula,

so that the formula now reads:

A = 8 ft. x 9 ft.

The area is 9 feet
multiplied by 8 feet,

or, 72 square feet.

Now use a pencil and paper

to try these two
example problems on your own.

What is the area of a rectangle

with a length of 6 cm
and width of 4 cm ?

The answer is 24 square cm.

What is the area of a rectangle

with a length of 12 cm.
and a width of 5 cm.?

The answer is 60 square cm.

If your answers are correct

we will go on
to the next section.

If not, reverse the tape

to view this section again.

Now that we have
learned how to calculate

the area of rectangles,

let's look
at another important shape:

the parallelogram.

A parallelogram
is a four sided figure

whose opposite sides

are always equal in length

and the same distance apart,

but whose corners
may not be square,

or 90-degree corners.

The width,
which in a parallelogram

is called the base,

is measured as the distance
between its two sides.

The height is the distance

between the top and the base.

The base
always remains the same

and the height
always remains the same.

Now we know how to measure
the base and height

of a parrallelogram.

The formula for the area
of a parallelogram

is basically the same
as for a rectangle.

The area of a rectangle
is calculated

by multiplying
its length by its width.

The area of a parallelogram
is calculated

by multiplying
its base by its height:

A = B x H

Let's see why this is so.

Here is an example
of a parallelogram.

Remember, the base is B,
and the height is H.

Let's construct a line

from point A to point B,
to form a triangle

from the end
of this parallelogram.

Now let's separate

the triangle
from the parrallelogram,

and move it around

to fit onto the other side.

By separating this triangle

and moving it to the other side,

we have changed
the parallelogram
into a rectangle.

This rearrangement

will always result
in a rectangle.

When we separated the triangle

from the rest
of the parrallelogram,

and placed it
on the other end,

we did not make the parts
smaller or larger.

When we
put them back together
as a rectangle,

the area of that rectangle

is the same as the area

of the original parrallelogram.

The formula for the
area of a rectangle is:

A = L x W.

Let's substitute
height for width

and base for length.

Now our formula reads:

Area is equal
to base multiplied by height.

We have created a formula

for the area
of a parallelogram.

the area of a parralellogram

is its height
multiplied by its base,

or A = B x H.

Now let's use our formula

to find the area

of some sample parallelograms.

What is the area
of a parallelogram

with a base of 10 cm.

and a height of 4 cm?

The answer is: 40 sq. cm.

What is the area
of a parallelogram

with a base of 8 cm.
and a height of 3 cm. ?

The answer is: 24 sq. cm.

Let's see
how we can use this way

of finding the area
of a parallelogram

to measure and calculate

the area of a triangle.

Here is a sample triangle

It can be any triangle
of any size.

First, let's create a triangle

identical to this one.

We have two triangles

that are exactly the same size.

Because they are identical,

we know they have the same
area.

We don't know what the area is,

but we do know that

it is the same
in both triangles,

because they are identical.

We can fit
these two triangles together

in many ways
to form several shapes.

However, we can always
form a parallelogram

by rotating one
of the triangles, like this.

We made a parralleogram

by putting together
two identical triangles.

Because these two triangles
have the same area,

the area of the parallelogram

is twice that of the triangle,

and the area of the triangle

is one half the area
of the parallelogram.

Let's measure
the height of the parallelogram.

The height of the parallelogram

is the same as the height
of the triangle.

And if we measure
the base of the parallelogram,

we find that it is the same

as the base of the triangle.

The area of the triangle

is 1/2 of the area
of the parallelogram.

Remember that the area
of the parrallelogram

is A = B x H.

And remembering that
the area of any triangle

is 1/2 of the area

of a parralellogram
made from that triangle

and another one identical to it,

we may say that
the area of a triangle

is equal to 1/2 of its base

multiplied by its height.

Or, the area of a triangle

is 1/2 B x H.

Let's use this formula

to find the area
of a sample triangle.

The height
of this triangle is 5 cm.

Its base measures 8 cm.

Remember that our formula

for the area of a triangle is:

A = 1/2 x B x H

Using our formula,

we substitute 8 cm.
for the base,

and 5cm. for the height.

Now our formula reads:

Area = 1/2 of 8 cm. times 5 cm.

or 1/2 of 40 square cm.,

or the area of the triangle
is 20 square cm.

Now use the formula we've made

to find the area
of these sample triangles.

What is the area
of a triangle

with a base of 4 ft.

and a height of 6 ft. ?

The answer is: A = 12 sq. ft.

What is the area of a triangle

with a base of 9 cm.

and a height of 6 cm. ?

The answer is : A = 27 sq. cm.

Now let's review
the formulas we have learned.

The formula
for the area of a rectangle

is A = L x W

The formula
for the area of a parallelogram

is A = B x H

the formula
for the area of a triangle

is A = 1/2 (B X H)

Try some problems on your own.

You can find many items
around your home

that you can measure
and find the area of

using these formulas.

There are many example
problems

in your math book.

Practice at problem solving
is the key

to a solid understanding
of math.

And if you don't understand
the first time,

you can make this
assistant professor

repeat itself
as many times as you like.

Good luck!

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