# Cowabunga Grades 3-5



Splash of Math

Today we'll use the same math farmers do to figure out how the same length of fence can make 5 different-sized fields for our herd. We'll discover which shape has the largest area!

# **Supplies**

In your kit:

- ★ Masking tape
- ★ Measuring tapes: 16
- ★ Ribbon: 1 spool
- ★ Square-foot cow cards: 1 set of 100

#### You provide:

- ★ Scissors: 1 pair
- ★ Writing surface: whiteboard or large sheet of paper

#### **Key Prep**

- ★ Cut 5 pieces of ribbon each 20 feet, 2 inches in length. Make 5 separate 20-foot loops by tying the ends together.
- ★ For bonus (optional) activity on page 5: Cut (1) 12-foot piece of ribbon for every 3 kids.
  Make a loop out of each piece of ribbon by tying the ends together.

#### Room Set-up

★ A large space, like a multi-purpose room, works best. If you're in a smaller room, you'll need at least 10 x 10 feet of open space.

# What's the Math?

- \star Area
- ★ Number patterns
- ★ Perimeter
- ★ Properties of rectangles

# Kickoff

"Has anyone been on a farm or seen pictures of a farm? What animals live there?" **Discuss** until someone says "cows." "Cows are curious, and farmers work hard to keep them from wandering away from their fields. Today, you'll be the cows and the farmers!"

## Don't Let the Cows Out (15 minutes)

"What do you call the distance around a shape?" **Discuss**. It's the perimeter. "And what do you call the space a shape covers?" Discuss. It's the area. "Now it's time to be farmers. We're going to fence off rectangular fields and see how many cows fit inside!"

- 1. Hold up 1 cow card.
  - ★ "Each card is 1 foot wide by 1 foot long. For this activity, each square represents the entire space that 1 cow takes up."
- 2. Invite 4 volunteer farmers to the front and hand them a 20-foot ribbon loop as their fence.
- 3. Place 2 fully stretched measuring tapes on the floor in an L. You can secure them with masking tape, if needed.
- 4. Place the cow cards in a stack everyone can reach.
  - **?** "If our field is 1 foot wide, and we want to enclose it with our 20-foot fence, how long do you think our rectangle will be?"
- 5. The 4 farmers gently stretch the ribbon on the floor to make a long thin rectangle 1 foot wide at opposite ends, using the measuring tapes to guide them. Have each farmer tape down a corner.
- 6. Invite another volunteer to measure the length. Did the kids guess right? The field should be 9 feet long.
  - ? "Now how many cow squares will fit in here?" Discuss.
- 7. The waiting kids fill the fenced area with the cow cards in a row, making sure the squares line up edge to edge DO NOT overlap or leave space between each square.



- 8. Count how many cows fit you should get 9!
- 9. Write the dimensions of the fence (1x9) and cow count (9) on your writing surface:

Short side	Long Side	Number of Cows	Length of Fence
(Width)	(Length)	(Area)	(Perimeter)
1	9	9 (1 x 9)	20 (1+1+9+9)

#### Don't Let the Cows Out: Part II (15 minutes)

"Now let's all give it a try!"

- 1. Divide the kids into 4 groups
- 2. Give each group one 20-foot ribbon loop, 2 measuring tapes and 4 pieces of masking tape (or easy access to the roll of tape).
  - ★ "Each group has 20-foot loop of ribbon, the same length we used to make the 1 x 9 fence. We are going to make 4 more rectangle-shaped fences each a different shape using our 20-foot loops to see which shape holds the most cows!"
  - ★ "You'll each be told the width of 1 side. You have to figure out the length of the other sides."
  - ★ "The cards are exactly 1 foot wide, so you can use those along with your measuring tapes to help you make your fence the correct length."
  - $\star$  "2 kids in each group will tape the corners of the ribbon fence to the floor."
  - ★ "The remaining kid(s) will fill in the fenced area with cow cards from the pile, in neat rows and columns."
  - $\star$  "When the group finishes filling its field with cows, yell 'Cowabunga!'"
- 3. Give each group their starting field width:
  - Group 1 makes a rectangle 2 feet wide
  - o Group 2 makes a rectangle 3 feet wide
  - Group 3 makes a rectangle 4 feet wide
  - o Group 4 makes a rectangle 5 feet wide
- 4. When everyone is finished, ask:
  - **?** "Whose field is 2 feet wide? How long is it?" (Let the students explain. It should be 8 feet long.)
  - "How many cows fit in there, and why?" (Discuss. See if the kids get that 16 cows fit in the field, because 2 rows x 8 wide = 16.)



5. Write the dimensions of each fence and its cow count on the whiteboard. Continue with the other farmer groups until you have generated this table:

Short side (Width)	Long Side (Length)	Number of Cows (Area)	Length of Fence (Perimeter)
1	9	9 (1 x 9)	20 (1+1+9+9)
2	8	16 (2 x 8)	20 (2+2+8+8)
3	7	21 (3 x 7)	20 (3+3+7+7)
4	6	24 (4 × 6)	20 (4+4+6+6)
5	5	25 (5 x 5)	20 (5+5+5+5)

- **?** "What did we just discover?" **Discuss**. Let the students catch that the same length of fence held different numbers of cows!
- **?** "What's true of every length and width?" **Discuss**. Let the kids figure out that they always add up to 10!
- ? "Why?" **Discuss**. Let the kids explain that, because opposite sides of rectangles have equal lengths, the sum of a short side and a long side must equal half of the perimeter.
- "What happens to the area of the field as we lengthen the short side of the fence? (Discuss what happens to the cow count: it goes up until you make a 5x5 square.)
   Party Fun Fact: "A square is the shape with the largest area for any length fence!"

#### Extra Challenge (optional)

"Now that you see how farmers fence in their cows, let's try these puzzles. Can you figure out how to use:

- 1. 18 feet of fence to enclose 20 square feet of area? (Answer: 5x4 fence.)
- 28 feet of fence to enclose 48 square feet? (Answer: 6x8 fence.) How about 49 square feet?" (Answer: 7x7 fence.)
- 3. "What's the greatest area you can enclose with 36 feet of fence?" (Answer: 81 square feet, since it will make a 9x9 square.)
- 4. "What's the greatest area you can enclose with a 44-foot fence?" (Answer: 121 square feet, since it will make an 11x11 square.)

## Wrap Up

"Who knew there was so much math involved in farming? This math looks a lot like the math you use in school when you study area and perimeter. It's the same math you'd use build a fort or measure your room!"

You can give each kid a measuring tape if you've completed Let's Get Loud and Firefighter Training (you'll need 1 measuring tape for each activity) or have fewer than 16 kids!

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## Bonus, if you have time: Fence-Hopping (IO-I5 minutes)

"Now it's time to be the cows. But you're not just any cows. You're tricky, fence-jumping cows who want to escape – if you follow the right patterns!"

- 1. Invite 2 volunteers to come to the front.
- 2. They stand 5 feet apart facing each other, with their feet at shoulder width.
- 3. Give them a 12-foot loop of ribbon to wrap around their ankles. This is the fence.
- 4. Invite 2-3 more volunteers to jump in and demo these moves:
  - o Jumping and landing with both feet inside the loop or outside
  - Landing with one foot in the loop, one foot out
  - Landing with one or both feet on top of the fence
  - Turning while jumping to face the other way
  - Or they can make up their own moves!
- 5. Together the club picks 3 moves as the start of a set routine. Write them in order on a blackboard.
- 6. Divide the kids into groups of 3. Give each group one 12-foot ribbon loop. 2 kids put the ribbon around their legs. They add 1-2 moves of their own to the routine written on the board. The 3<sup>rd</sup> in the trio tries out the routine.
- 7. Kids take turns jumping through the routine to learn it.
- 8. Then throw in the numbers! Kids count by 2s while jumping. They yell "2!" on the first jump, "4!" on the next, etc.
- 9. Try other multiples, too, like 10s, 3s, or 4s!

#### Extra Challenge (optional)

- **?** "What multiples would get you to the number 20?" (Answer: counting by 1s, 2s, 4s, 5s, 10s, and of course 20s!)
- "What multiples would get you to 100?" (Answer: 1s, 2s, 4s, 5s, 10s, 20s, 25s, 50s, and 100s)

