Firefighter Training
Grades K-2

The Big Idea
Today you'll find out how much math firefighters do! First, see how many pounds of gear they have to carry while moving quickly. Next, find out how much water you need to put out a fire in a given area, and finally, learn the secret color code that helps firefighters know fast a hydrant can pump water.

Supplies
In your kit:
- ★ Measuring tape: 1
- ★ Giant paper rectangles: 20

To print:
- ★ Fire Hydrant Printout, 1 copy
  See last page of these directions
  See Key Prep for no-print option

You provide:
- ★ Marker: 1
- ★ Reusable tote or backpack: 1
- ★ Stopwatch/stopwatch function on phone
- ★ Water: 1 gallon or 8 16-ounce bottles.
  See Key Prep for other options
- ★ Writing surface: whiteboard or large sheet of paper

Key Prep
- ★ If you can't acquire water, fill the tote or backpack with any heavy items, like books. Skip putting water bottles on the squares during **Learn the Drill**.
- ★ Print 1 copy of the Fire Hydrant Printout in color. If you don't have access to a color printer, write the following on your writing surface:

  Red-cap hydrants pump 500 gallons of water per minute (GPM)
  Orange-cap hydrants pump 500 to 999 GPM
  Green-cap hydrants pump 1000 to 1499 GPM
  Blue-cap hydrants pump over 1500 GPM

Room Set-up
- ★ You'll need a long hallway, empty room, or outdoor space to run a short relay race during the first part of this session. If you can't find space, skip ahead to **Learn the Drill**.

What's the Math?
- ★ Area
- ★ Counting by 1s and 10s
- ★ Estimation
- ★ Linear measurement

Kickoff

"Have you ever seen firefighters put out a fire, on TV or in real life?" **Discuss.** "They have to be really brave - and smart, too, because they need to do math quickly in their heads to figure out how much water they need. Today we're going to learn how they do it!"

Suit Up Like a Hero (20-25 minutes)

"Firefighters have to move quickly, and that takes practice. Let's heat things up with some fun exercises to get moving!"

1. Spread out and have the kids do 10 jumping jacks, 10 push-ups, and 10 sit-ups. You can lead them in the exercises or have one of the kids demonstrate for the group.
   - ? "How many moves did each of us just do in total?" **Discuss**. Point out that you did 3 sets of 10. Kids can skip count by 10 to get to 30.
2. Split the kids into 2 groups. Send one group to the opposite end of the space.
3. Have the kids run a relay race, using your stopwatch to record the time it takes run the entire relay.
   - ★ "Firefighters need to be in shape because they carry lots of heavy gear! Their clothes, helmet, and air pack together weigh 45 pounds. When you add a radio, light, and ax, it could be as much as 75 pounds of stuff! Let's see how extra weight affects running speed."
4. Repeat Step 2, except this time give the first runner the backpack/tote with 1 gallon/8 bottles of water inside. Like a real relay where runners pass a baton at each leg of the race, kids should hand the bag to the next runner after each lap.
   - ? "How much weight did we add to this backpack?" **Discuss** the liquid and weight ounces!
   - ? "The amazing thing is, when firefighters carry 75 pounds of gear, that's about 1/2 their own weight! How did carrying the extra weight affect our running speeds?" **Discuss**.

Learn the Drill (20-25 minutes)

"Luckily, firefighters don't usually need to carry water, since hydrants pump out lots of water very quickly – much faster than a kitchen faucet. The area (or size) of the fire matters a lot, because you need about 1 gallon of water for every 3 square feet of fire. Let's see how much water we'd need to extinguish a fire in this room."

1. Place a colored paper rectangle on the ground.
2. Using the measuring tape, help the kids measure to find that it's 3 feet long by 1 foot wide.
3. Show the kids that the paper is folded into thirds creating 3 square feet.
   - ? "How many gallons do we need to put out this rectangle, which is 3 square feet?" **Discuss**. See if they remember it's 1 gallon.
4. Place the gallon container/8 bottles on the rectangle. If you don't have water, use your marker to label the paper: "1 GALLON."
5. Put another paper rectangle next to the first one.

- ? "How many square feet do these squares cover together?" Discuss. Kids can count the individual squares to find the answer: 6 square feet.
- ? "How many more gallons do we need to put out this bigger fire?" **Discuss**. They will need 1 more gallon.
- ? How many gallons do do you think we would need to put out a fire the size of this room?

6. Give each kid a sheet of paper rectangles.
7. Let the kids self-organize to figure out the number of rectangles across the room (width) and down the length. Multiply those 2 numbers to find number of gallons needed to extinguish a fire in that room.

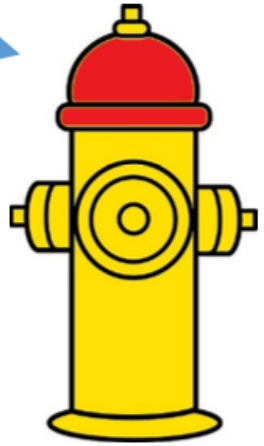
Go Fast, Go Big (5-10 minutes)

"Now that we've figured out the number of gallons we would need to put out a fire in this room, let's see how fast each of these hydrants could help us put it out!"

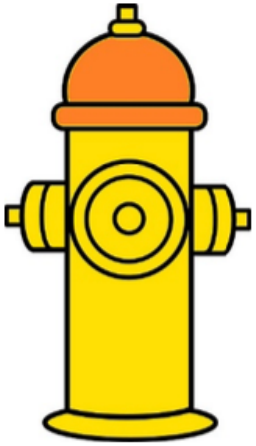
1. Show Fire Hydrant Printout or direct kids to the information on your writing surface.
   - ★ **Party Fun Fact**: "Did you know that in many places, the hydrant cap color tells you how fast that hydrant can pump water? Red cap hydrants can pump up to 500 gallons per minute (GPM) - the same as 200 kitchen faucets on full blast at the same time! Orange cap hydrants pump 500 to 999 GPM. Green pumps 1000 to 1499 GPM. Blue ones gush over 1500 GPM. They could fill 30 bathtubs in 1 minute!"

Wrap Up

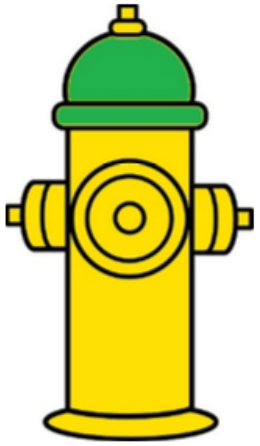
"Today we learned about firefighter math – and a lot of it looks like the math yousee in class! Firefighters need strong muscles AND strong brains to put out fires! Luckily, we have brave firefighters who respond to emergencies very quickly, to help keep us safe."



Red Cap
Less than 500 GPM



Orange Cap
500 to 999 GPM



Green Cap
1000 to 1499 GPM

Blue Cap
1500 and more GPM