Epic Air Traffic Control

The Big Idea

This week we're building our own mini-airplanes and using math to build 2 runways. Then we'll **land the planes** by moving them along the numbered runways. We'll figure out which numbers land the planes **without crashing** at the crossing!

Supplies

Bedtime Math provides:

- ★ Popsicle sticks: 2 per kid
- ★ Finger LED lights: 1 per kid
- ★ Rubber bands: 2 per kid
- ★ Glowsticks: 100 total
- ★ **To print:** Runways Layout (page 8): 1

You provide:

- ★ Post-it notes: 34, plus 1 per kid
- ★ Marker: 1

Room Set-up: You'll need a long open space for the runways, which cross in a skinny X.

Other Key Prep:

- ★ Use a marker to write the **numbers 0 to 16** on individual Post-it notes, then **again** for a 2nd set. These are for **labeling the runways**.
- ★ On a 3rd set of Post-its, individually write the letters from A to however many kids you have in your club. These will **label the "planes"** (the kids).
- ★ Depending on size and ability level of your club, you may want to make the planes ahead of time.
- ★ **Print 1 copy** of the Runways Layout (page 8) to help with runway construction.

What's the Math?

- ★ Counting evens, odds, and other number series
- ★ Bonus: factoring

Kickoff

Intro to the kids: "Who here has been to an airport? (Discuss) Has anyone noticed how planes line up in the air when they're ready to land? (Spaced out from each other, facing the wind…) Every airport has a tall tower that houses **Air Traffic Control**, and the people inside tell the pilots where and when to land. Let's try it out ourselves!"

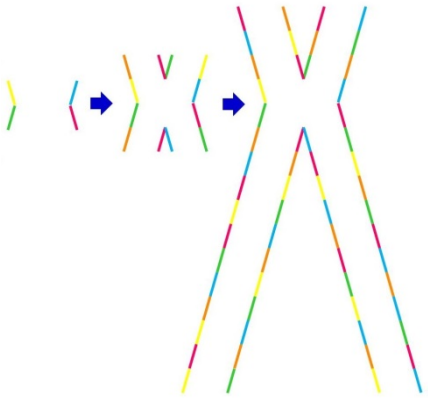
Build Your Airplanes (10-15 minutes)

1. Give each kid **2 popsicle sticks**, **2 rubber bands**, and an **LED**.
2. As you explain to the kids how to make an airplane, show them by making one yourself.
3. Have the kids hold the sticks like a lower case "t" (wing piece forward) and wrap a rubber band around in a tight X, as shown. **Some kids may need help with this – they can pair up and work together.**
4. Then the kids strap the LED onto the nose of their "plane," and secure it with the second rubber band.
5. Flick the switch on top to **turn it on!**

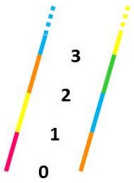
Build the Runway (10 minutes)

Intro to the kids: "We're now going to use numbers and patterns to build runways for our planes."

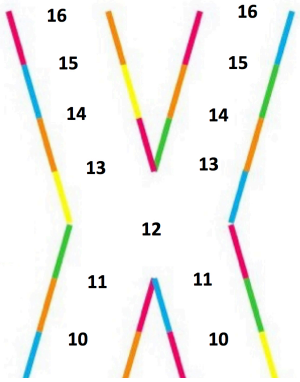
1. Crack both bundles of glowsticks to **make them glow**, then pass them out to the kids.
2. Build 2 runways that intersect in an X using this **Runways Layout** as a guide (you can see a bigger image on the last page):



   a. To begin, lay 4 glowsticks in 2 bent vertical lines, with their inner corners about **4 stick lengths apart**.
   b. Add **4 more sticks** to extend each line.
   c. Add 2 little inside Vs.
   d. Keep going: add **2 more sticks** to **each** of the 4 top points, and **10 more sticks** to **each** bottom line.
3. Now the kids number the runways by sticking Post-it notes **between the tips of the sticks**, with a "0" at the very bottom of each long leg of the X.



4. When done correctly, the crossing should look like this, with **12 at the intersection** and **16 at each finish**. →



5. If you have extra LEDs, the kids can add them to the runways on the **multiples of 4** to help see them in the dark. See if they can spot those numbers!
6. Now **turn off the room lights** – it's time to fly!

An Even Landing, or an Odd One? (15-20 minutes)

Intro to the kids: "Does anyone know what **even** and **odd** numbers are? (Discuss) Even numbers can be cut into 2 equal pieces: a 2 is two 1s put together, a 4 is two 2s. Odd numbers can't be cut in half evenly. All even numbers end in 0, 2, 4, 6, or 8, and all odd numbers end in 1, 3, 5, 7, or 9." (Take time to make sure kids understand this, especially kindergartners.)

"We're going to fly our planes in the sky and land them one by one using even and odd numbers. Like at a real airport, you have to **wait for the plane in front of you** to move forward so you don't run into it!"

"First let's try even numbers. When I say "**Fly!**" every plane on the runway moves up **2 spaces**."

1. Give each kid a **Post-it note with a letter on it to wear**. That's their landing order! **Assign** the 1st half of the alphabet range to one runway, the 2nd half to the other runway.
2. Let the kids run around flying their planes.
3. Say **"Fly!"** and **call out 2 letters**, 1 per runway. The kids wearing those letters **land their planes on the "0" mark** of their respective runways, and stay **kneeling alongside the runway** to move their planes.
4. Say **"Fly!"** again and **call out 2 more letters**. The first 2 kids move their planes to the 2, while the next 2 kids land their planes on 0.
5. **Repeat calling out "Fly!"** with 2 letters, and ***ask the kids*** to predict what will happen. Let them keep landing planes to find out!

Ask the kids:

★ "Why did you crash at the crossing?" (Discuss…they crashed because 12 is an even number!)

★ "Now let's try it with odd numbers! What will happen this time?"

Discuss...then try it!

6. Call out pairs of letters who haven't flown yet, then cycle back to the start.
7. Have kids **land on the 1 mark** this time, and continue to the 3, 5, and so on.
8. See if they predict that 2 planes won't both stop on the same number, BUT they'll pass through the 12 simultaneously.

Ask the kids: "How can we **avoid crashes**, either on the numbers or in the air?" See what the kids suggest, e.g. using even numbers for one runway and odd numbers for the other.

Fast and Slow (15-20 minutes)

Intro to the kids: "Now let's mix things up! Like real planes, we're going to fly our planes at different speeds."

Ask the kids:

- ★ "What happens if the planes on **one runway land by 2s**, and the planes on the **other runway** land **by 3s** if they all start on the 0?" Take guesses, then try it!
- ★ "What if planes land on the runway at different starting points? What if all the planes fly by 3s, but **on one runway they start on 0** and **on the 2nd runway they start on the 2**?" Take guesses, then try it!

Bonus (optional): Ask the kids: "What are all the 'speeds' that will stop the planes on the 12 if they start at 0?" Discuss…they will get **all the factors of 12**, namely 1, 2, 3, 4, 6, and 12 itself – numbers that divide neatly into 12.

A Touch of Class

To the kids: "Today we piloted our own personal airplanes, and used our math from school to make sure they didn't crash!"

- ★ "If you're counting off even numbers, will you say the number 8?" (Answer: Yes! It's divisible by 2: it can be cut into two equal halves.)
- ★ "If you count by 3's, will you say the number 10?" (Answer: No, because 10 isn't divisible by 3. 9 is a multiple of 3, and 10 is only 1 more than that.)

Kids can take home their **planes** to continue the airplane runway math at home!

Runways Layout