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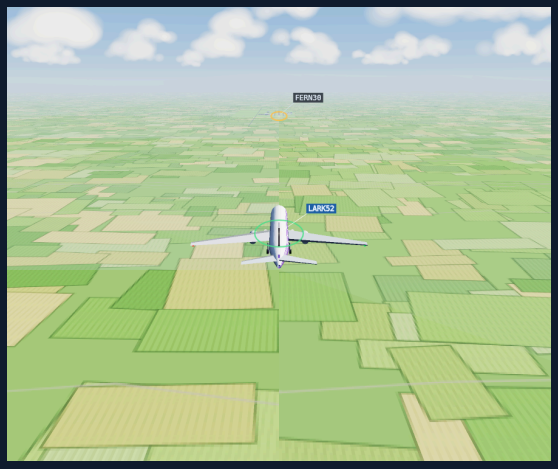
Air Traffic Control Lab: Two in a Row, Speed, Distance and Time

Grades 6-8 · 45 minutes

Math



Slides, rubric and answer key | Print and go | No student accounts | Chromebook friendly

What's included

- A one-page overview: objectives, essential question, vocabulary, standards and assessment
- A 45-minute lesson sequence: warm-up, direct instruction, guided practice, independent practice, closure
- Slides for the board: a PowerPoint file that also opens in Google Slides
- A student worksheet with a QR code and a table for six speeds
- A 3-question exit ticket, two to a page, with an answer key
- A rubric: 3 criteria, 4 levels, scored out of 12
- Differentiation for English learners, students with IEPs or 504 plans, and students who need more support or more challenge
- Cross-curricular extensions, and notes for teaching it in grades 4 and 5 and in high school
- Standards: Common Core math

Air Traffic Control Lab: Two in a Row, Speed, Distance and Time

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Level 3 of Air Traffic Control Lab is two airliners on the final approach, 5 miles apart: Fernway 30 at 160 knots in front, and Larkspur 52 at 210 behind. Airplanes on the final must stay at least 3 miles apart. Students work out the rate the gap closes, 50 knots, and predict how long until it shrinks from 5 miles to 3: 2.4 minutes, about 2 minutes 24 seconds. Then they press play. The conflict alert comes at 2:06, a little sooner than predicted, because the front airplane slows down to land inside 5 miles. Then they slow Larkspur 52 and find the slowest closing that keeps 3 miles, measuring the closest distance for six speeds.

At a glance

ESSENTIAL QUESTION

How fast does a gap close, and how do you keep it open?

OBJECTIVES

Students will be able to:

- find the rate a gap closes from two speeds
- use distance, rate and time to predict when two airplanes get too close
- compare a prediction with what happens, and explain the difference
- change one speed at a time and record the closest distance
- find a pattern in the results

VOCABULARY

Knot, Nautical mile, Closing speed, Separation, Unit rate, Conflict alert

STANDARDS

6.RP.A.3b, MP4

TIME AND MATERIALS

45 minutes, grades 6-8.

- One computer or Chromebook per student
- A projector
- The worksheet and exit ticket, one copy each per student
- The rubric, one copy per student if you grade the work
- A calculator, optional

PREP

Make copies of the worksheet and exit ticket. Before class, open mytekdev.com/try/airtrafficlab?lesson=two-in-a-row-speed-distance-and-time&ref=tpt-airtrafficlab-2 once on a student computer, which checks that your school's filter allows the app, and

ASSESSMENT

- Formative: the questions under What to look for, asked while students work, and the exit ticket (answer key included).
- Summative: the worksheet, scored with the rubric.

TECHNOLOGY AND PRIVACY

Runs in any browser, Chromebooks included, with nothing to install. Students need no account and no email: the link works signed out, and nothing they do is stored on our server unless they choose to save.

follow the short guide yourself: about ten minutes.

Lesson sequence

MINUTES	STAGE	WHAT YOU DO	WHAT STUDENTS DO
0 to 5	**Warm-up** Hook	Show the title, essential question and Today I can slides (about 1 minute). Then the warm-up: the walker and the jogger.	Answer the warm-up on the worksheet.
5 to 15	**Direct instruction (I do)** Model it	Project Level 3, but do not press play yet. The tower view is on the left: the airport from the control tower, the airliners with their landing lights on and a tag with each call sign. The radar is on the right: the runway at the top, the dashed final approach line, and a green dot for each airplane with its data block (call sign, altitude in hundreds of feet, speed in tens of knots). Under the radar the radio log keeps every word said, marked "you" or "program". Click an airplane on the radar to give it an instruction. Point at the two data blocks: 15 and 20 are the speeds over the ground in tens of knots, about 150 and 200, which is 160 and 210 through the air less the 8 knot headwind. The difference is 50 either way. Show the numbers slide. Work the prediction together: the gap closes at 50 knots, 50 nautical miles an hour; 2 miles at 50 nautical miles an hour is 2 divided by 50, 0.04 hours, 2.4 minutes, 2 minutes 24 seconds. **It's working when:** Some students divide 5 by 50. Ask: does the gap need to close to zero, or to 3? Only 2 miles of it can close.	Work the prediction on the worksheet.
15 to 22	**Guided practice (We do)** Predict, then watch	Students open the link or scan the QR code. A short guide runs Level 3 into its conflict alert, then has them slow Larkspur 52 to 180. Students write the time of the alert next to their prediction. **Watch for:** Students who click too late. The speed takes a little time to change; click Larkspur 52 right after pressing play.	Follow the guide. Write the time of the alert, and the closest distance at 180.
22 to 37	**Independent practice (You do)** Six speeds	Students try 200, 190, 180, 170, 160 and 150 for Larkspur 52, one each run, clear both to land, and record whether they kept 3 miles and the closest distance from the card. Time runs at 4 times by default. Speed up and Slower, under the tower view, change it; the round play button starts the shift again from the beginning, with the program as it is now. Walk the room with the What to look for questions. **If they ask:** "About how much more room does each 10 knots slower give?" The pattern **Watch for:** Students who try 140. A jet takes 150 to 250 knots here, and the app says so: a real limit.	Fill in the table with six speeds, and answer the questions.
37 to 45	**Closure** Why was it early? And exit ticket	Show the closure slide. Take ideas, then explain compression: the front airplane slows down to land. Hand out the exit ticket.	Discuss, then answer the exit ticket.

Before you teach: a ten-minute walkthrough

Open mytekdev.com/try/airtrafficlab?lesson=two-in-a-row-speed-distance-and-time&ref=tpt-airtrafficlab-2. A short guide opens over Level 3, Two in a row. The tower view is on the left: the airport from the control tower, the airliners with their landing lights on and a tag with each call sign. The radar is on the right: the runway at the top, the dashed final approach line, and a green dot for each airplane with its data block (call sign, altitude in hundreds of feet, speed in tens of knots). Under the radar the radio log keeps every word said, marked "you" or "program". Click an airplane on the radar to give it an instruction.

1. **The traffic.** Fernway 30 is 8 miles out at 160 knots; Larkspur 52 is 13 miles out at 210. Both call in at the start. There is a light headwind, 8 knots, the same for both, so it does not change the closing speed.
2. **The speed.** Click Larkspur 52 on the radar; the box has a Speed list in 5 knot steps and a Set speed button. The pilot reads it back and slows at about 1 to 2 knots a second. A jet takes 150 to 250 knots here.
3. **Inside 5 miles.** Each airplane slows to its own landing speed, 140 knots for these two, and takes no speed instructions. That is why the gap shrinks faster near the end.
4. **Speed.** Time runs at 4 times by default. Speed up and Slower, under the tower view, change it; the round play button starts the shift again from the beginning, with the program as it is now.
5. **The card's estimate.** Once Larkspur 52 is closing, the card works out "inside 3 miles in" from the gap and the closing speed at that moment, so just after the start it reads 2:23 and counts down. It is the same 2.4 minutes.
6. **Numbers to expect.** Nothing done: the conflict alert at 2:06, 2.99 miles. Larkspur 52 slowed at the start to 200: alert at 2:25. 190: alert at 2:57. 180: both land, closest 3.33 miles. 170: 3.71. 165: 3.90. 160: 4.10. 150: 4.49.

> The prediction, 2.4 minutes, is honest arithmetic with the numbers given, and the app is right too. The difference is compression, which is the closing discussion. Do not let students think their math was wrong.

Background for the teacher

Airplanes on the same final approach must stay at least 3 nautical miles apart, or 1,000 feet apart in height. A knot is one nautical mile an hour, so the arithmetic of the final approach is distance, rate and time with no conversions: 2 miles at a closing speed of 50 knots is 2/50 of an hour.

Controllers set up the spacing before 5 miles, because inside it each airplane flies its own landing speed and takes no speed instructions. A fast airplane behind a slow one keeps closing even then; controllers call it compression, and leave extra room up front.

When the spacing is lost, a real radar system raises a conflict alert. In the app nothing crashes: both airplanes stop where they are, and the card shows what happened. Air traffic controllers in the United States are hired by the FAA, which says it hired a record 2,235 trainees in its 2026 fiscal year. Applicants must apply before turning 31, and the median pay was $148,080 a year in 2025 (Bureau of Labor Statistics).

What to look for

Ask these while students work. A student who has understood the lesson can answer them without help:

- How fast is the gap closing, and how did you work it out?
- Why does only 2 miles of the gap count?
- Why did the alert come before your prediction?
- About how much more room does each 10 knots slower give?
- Why not slow Larkspur 52 to 140?

> The third question is the one that matters. A student who says "the front one slowed down to land, so the gap closed faster" has compared a model with data. A student who says "my math was wrong" needs to see that it was right for the numbers given.

Cross-curricular extensions

- Math: convert 210 knots to miles an hour and to kilometers an hour.
- Science: why do airplanes land into the wind? Look at how a headwind changes the speed over the ground.
- Careers: look up how controllers space airplanes at a busy airport, and what "miles in trail" means.
- Geography: find the busiest airport near you, and how many airplanes it lands an hour.

Vocabulary

Knot	A speed of one nautical mile an hour. Airplanes and ships use knots.
Nautical mile	The mile used in the air and at sea, about 1.15 ordinary miles.
Closing speed	How fast a gap shrinks: the speed behind minus the speed in front.
Separation	The distance airplanes must keep apart: here 3 miles on the final approach.
Unit rate	How much for one: here, how many miles the gap closes in one hour, or one minute.
Conflict alert	The warning when two airplanes are closer than they may be. In the app both stop where they are.

Differentiation

ENGLISH LEARNERS

- Keep the vocabulary slide up, and point at the radar, the airplane or the radio log as you say each word: the picture carries the meaning.
- Give a sentence frame on a card: The gap closes at ____ knots, so ____ miles takes ____ minutes.

STUDENTS WITH IEPS OR 504 PLANS

- Pair students, one at the keyboard and one recording numbers.
- Give the six speeds on a card: 200, 190, 180, 170, 160, 150.
- Allow a calculator for the prediction. Where the IEP allows a modified assignment, score the first two

- Act it out: two students walk in a line, the one behind a little faster, and the class says when they are too close.

rubric rows only.

STUDENTS WHO NEED MORE SUPPORT

- Work the warm-up and the prediction together on the board.
- Fill in the 180 row of the table together.
- The card after every run gives the closest distance.

STUDENTS READY FOR MORE

- Predict the closest distance for 175 before running it, from your table.
- Open Level 4, the heavy jet's wake: the room needed depends on the airplane in front. Find out how much.
- Write the rule in Blocks: "when an arrival checks in" with "slow this airplane to 160 knots". Does it slow both? Does it matter?

Adapting for other grades

Younger students: In grades 4 and 5, skip the prediction and run the six speeds as an experiment; score the last two rubric rows, total 8, and 6 meets the objectives.

Older students: In high school, graph the closest distance against the speed and fit a line: about 0.04 miles for each knot. Then model the front airplane's slowdown inside 5 miles and see if the prediction comes closer to 2:06.

Student worksheet

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/airtrafficlab?lesson=two-in-a-row-speed-distance-and-time

Essential question: How fast does a gap close, and how do you keep it open?

Warm-up: A friend 1 mile behind you jogs at 5 miles an hour while you walk at 3. How long until they catch up?

_____

1. **Vocabulary.** Knot, nautical mile, closing speed, separation, unit rate, conflict alert: write each in your own words.

2. **My prediction.** Closing speed: ____ knots. Miles that can close before 3: ____. Time: ____ hours = ____ minutes.

3. **What happened.** The conflict alert came at ____ .

4. **My table.** Speed for Larkspur 52 / kept 3 miles? / closest distance. 200: ____. 190: ____. 180: ____. 170: ____. 160: ____. 150: ____.

1. Why did the alert come sooner than your prediction?

2. What speed would you give Larkspur 52, and why?

Exit ticket

Name: _____

1. One airplane flies 180 knots and the one behind it 200. The gap closes at: (A) 380 knots (B) 20 knots (C) 200 knots

2. At a closing speed of 30 knots, how long does it take to close 1 mile? (A) 30 minutes (B) 2 minutes (C) 1 minute

3. A friend predicts the gap will close in 2.4 minutes, and the alert comes at 2:06. Use what you learned today to explain why.

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Answer key: exit ticket

QUESTION	ANSWER	WHY
1	B	The gap closes at the difference between the speeds.
2	B	30 knots is 30 miles in 60 minutes, so 1 mile in 2 minutes.
3	Open answer	The front airplane slows down to land inside 5 miles, so the gap closes faster at the end: compression.

Worksheet: what students should find

BLANK	WHAT THE APP SHOWS
My prediction	50 knots; 2 miles; 0.04 hours = 2.4 minutes (2 minutes 24 seconds).
What happened	2:06.
My table	200: no, alert at 2:25. 190: no, alert at 2:57. 180: yes, 3.33. 170: yes, 3.71. 160: yes, 4.10. 150: yes, 4.49.
Question 1	Fernway 30 slows from 160 to 140 inside 5 miles, so the gap closes faster at the end.
Question 2	Open: 180 or slower keeps 3 miles; 160 leaves more room for safety.

> Every run of Level 3 is the same two airplanes at the same places, so a speed gives the same numbers on any computer. A student whose numbers differ clicked later, or changed something else too.

Rubric

Score each row from 1 to 4.

Name: _____

CRITERIA	4 EXCEEDS	3 MEETS	2 APPROACHING	1 BEGINNING
Predicting	Finds the closing speed and predicts 2.4 minutes, and says why only 2 of the 5 miles count.	Predicts 2.4 minutes with some help.	Finds the closing speed but not the time.	No prediction.
Testing one speed at a time	Tests six speeds, changing only Larkspur 52, and records each closest distance.	Tests five speeds and records each.	Tests one or two.	Does not test.
Explaining the difference	Explains the early alert with the front airplane slowing inside 5 miles, and states the pattern in the table with numbers.	States that slower behind keeps more room.	Says some speeds work and some do not.	No explanation.

Total: ____ / 12. A score of 9 or more meets the objectives.

Standards

The lesson is built for 6.RP.A.3b: students solve a constant speed problem, the time for a gap to close at a given rate, and check it against the simulation. Comparing the prediction with what happened, and explaining the difference, is mathematical practice 4, modeling.

FRAMEWORK	CODE	GRADES	STANDARD	HOW THE LESSON MEETS IT
Common Core Math	**6.RP.A.3b**	6	Solve unit rate problems including those involving unit pricing and constant speed.	Students find the closing speed as a rate and use it to work out the time for the gap to close from 5 miles to 3.
Common Core Math	**MP4**	6-8	Model with mathematics.	Students model the two airliners with constant speeds, compare the model with the simulation, and explain where the model leaves something out.

Checked November 2026 against: Common Core State Standards for Mathematics: Grade 6, Ratios and Proportional Relationships, Common Core State Standards for Mathematics: Standards for Mathematical Practice.

Optional: save student work in a free class

The whole lesson runs at the link on the worksheet, with no accounts and no sign-up.

To keep students' work, and see it all in one place, make a free class. It takes about ten minutes, once, and covers every lesson in this series: mytekdev.com/tools/class-setup

Students in a class open mytekdev.com/tools/air-traffic-control-lab/lessons/two-in-a-row-speed-distance-and-time/start instead of the worksheet link. Each one gets their own copy of the starter, and the same link reopens it next time.

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