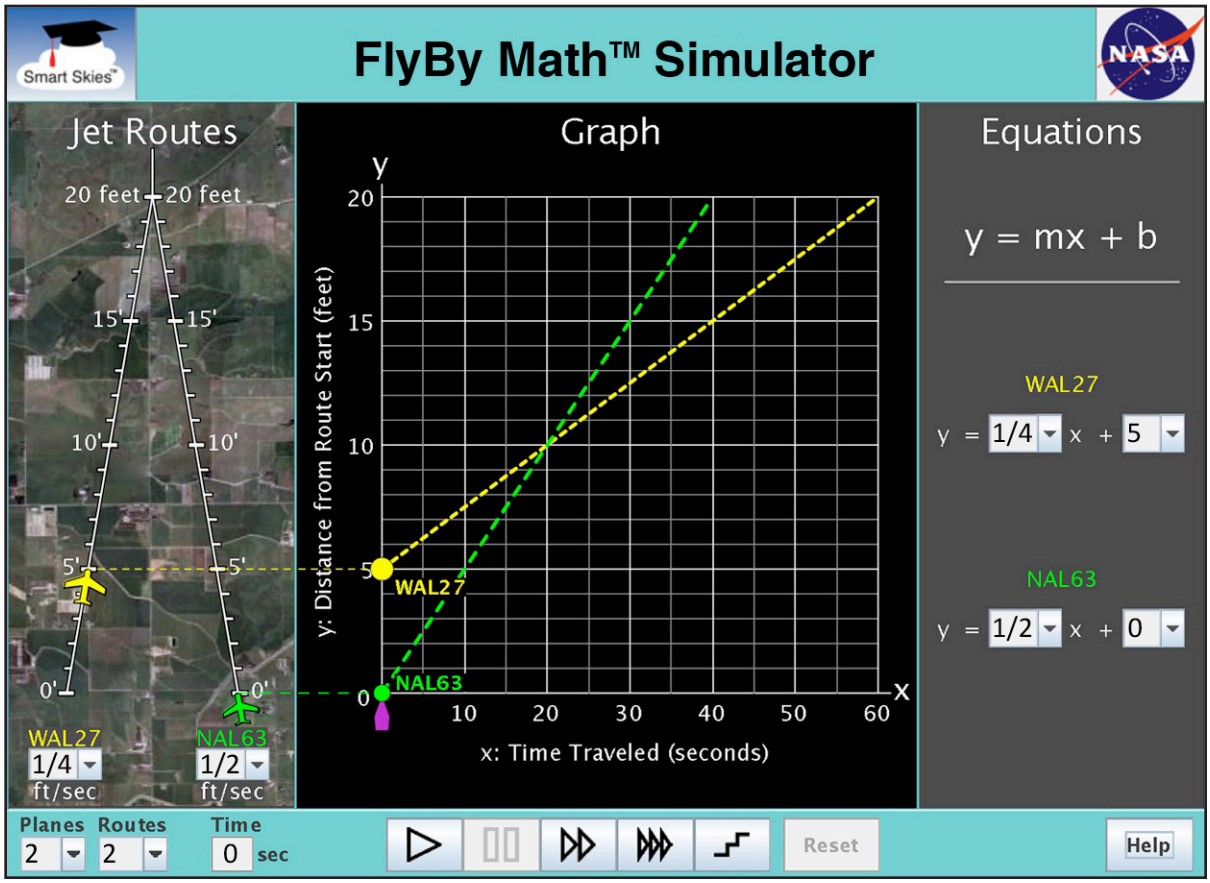
Name _____

Student Worksheet A

Introduction to the FlyBy Math Simulator

In this worksheet, you will become familiar with the three simulator panels.

Jet Route Panel	Graph Panel	Equation Panel
• The planes fly at the same altitude. • Each jet route is 20 feet long. • The jet routes meet at the 20-foot mark.	• For each plane, its distance vs. time graph is shown. • That graph is a straight line.	• An equation is given for each line on the graph. • Each equation is written in slope-intercept form: $y = mx + b$



You will learn:

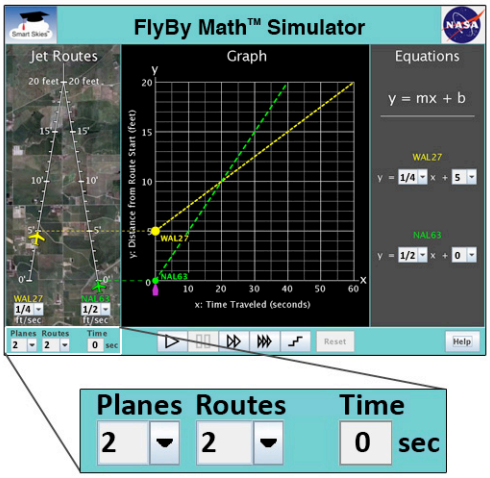
- How to set a plane's speed and starting position.
- How to run and reset a simulation.

Tip:

If the clock time (below the Jet Route Panel) is not 0 seconds, then you will need to click Reset to change:

- The number of planes
- A plane's speed
- A plane's starting position on its jet route

Problem 1: Set up the simulator using the Jet Route Panel



(a) Select the number of planes and jet routes

Select: 2 planes, 1 route

Which planes do you see? WAL27 NAL63

With 2 planes, can you select 2 routes? Yes No

Select: 1 plane, 1 route

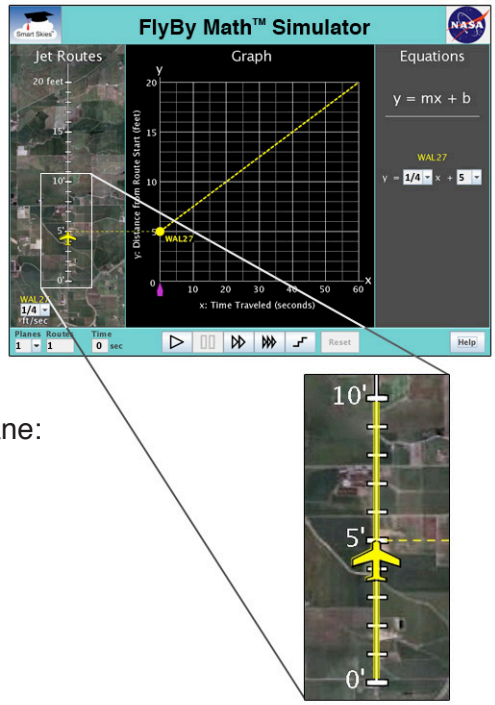
Which plane do you see? WAL27 NAL63

With 1 plane, can you select 2 routes? Yes No

(b) Select a plane's starting position

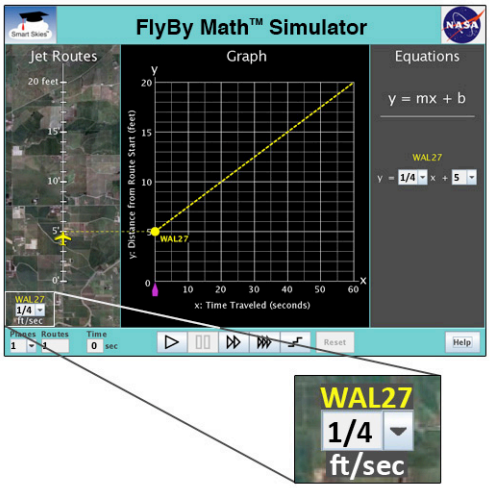
Select: 1 plane, 1 route (Click Reset if necessary.)

Drag the WAL27 plane forward and backward, from 0 ft to 10 ft, along the jet route.



Check all the items that change when you drag the WAL27 plane:

- ❑ The position of the WAL27 dot on the y-axis of the graph.
- ❑ The slope (steepness) of the WAL27 line on the graph.
- ❑ The value of m in the WAL27 equation.
- ❑ The value of b in the WAL27 equation.



(c) Select a plane's starting speed

Select: 1 plane, 1 route (Click Reset if necessary.)

Use the WAL27 speed menu to change the plane's speed.

Check all the items that change when you change the WAL27 speed:

- ❑ The position of the WAL27 dot on the y-axis of the graph.
- ❑ The slope (steepness) of the WAL27 line on the graph.
- ❑ The value of m in the WAL27 equation.
- ❑ The value of b in the WAL27 equation.

Problem 2: Run the simulation

Set up the simulator:

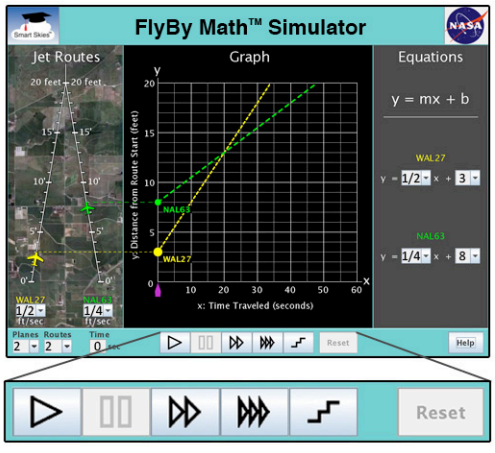
- If the clock time is not 0 seconds, click Reset.
- Choose 2 planes and 2 routes.
- WAL27 starting position: 3 ft from the start of its jet route
- NAL63 starting position: 8 ft from the start of its jet route
- WAL27 starting speed: ½ ft/sec
- NAL63 starting speed: ¼ ft/sec

(a) Run the simulation

Click Play. ▷

Check all the statements that describe what happens when you click Play:

- ❑ Each plane moves on its jet route.
- ❑ The clock runs.
- ❑ Each dot moves on the graph.
- ❑ The time slider moves along the x-axis.
- ❑ In each equation, the value of m changes.
- ❑ In each equation, the value of b changes.



Problem 2 continued...

(b) Explore the Control Panel

In the Control Panel, mouse over each button to learn its action.

Circle the Control Panel button you would use to **pause** the simulation.

Circle the Control Panel button you would use to make the simulation **run as fast as possible**.

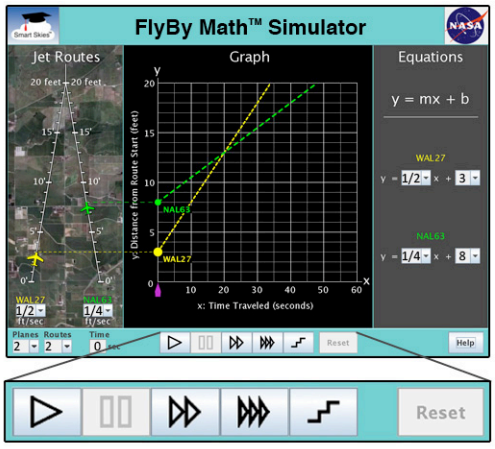
(c) Use the Step button

If the clock time is not 0 seconds, click Reset.

Click Step. *Click it again and again.*

Check all the statements that describe what happens when you click Step.

- ❑ In the Jet Route Panel, each plane moves ahead on its route.
- ❑ The clock advances to the next second.
- ❑ In the Graph Panel, each dot moves up and to the right along its line.
- ❑ In the Graph Panel, the time slider advances to the next whole second.
- ❑ In the Equation Panel, for each equation, the value of m changes.
- ❑ In the Equation Panel, for each equation, the value of b changes.

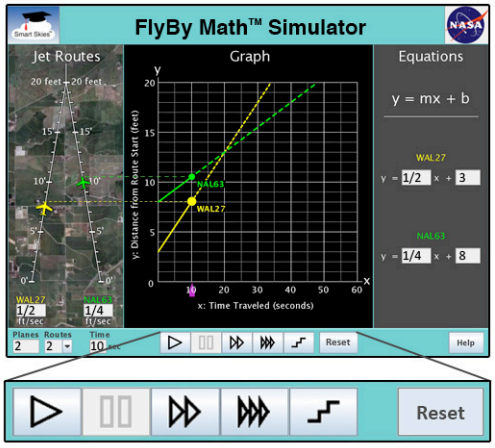


Problem 3: Reset the simulation

(a) Reset the simulation using the Reset button

> **Set up the simulator:**
>
> Make sure the clock time is **not** 0 seconds.
>
> (If the clock time is 0 seconds, click Play to run the simulation for at least 10 seconds. Then click Pause.)

Click Reset. Reset

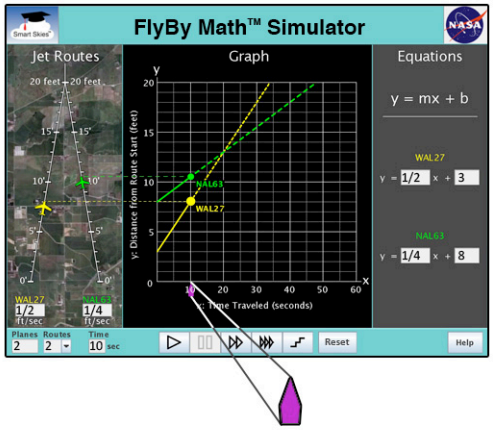


Check all the actions that happen when you click Reset.

- ❑ The time slider returns to 0 seconds on the x-axis.
- ❑ The clock reads 0 seconds.
- ❑ Each dot on the graph returns to the y-axis.
- ❑ Each plane returns to its starting position on its jet route.
- ❑ In each equation, the value of m changes.
- ❑ In each equation, the value of b changes.

(b) Reset the simulation using the time slider

> **Set up the simulator:**
>
> Make sure the clock time is **not** 0 seconds.
>
> (If the clock time is 0 seconds, click Play to run the simulation for at least 10 seconds. Then click Pause.)



Drag the time slider (▲) along the x-axis to 0 seconds.

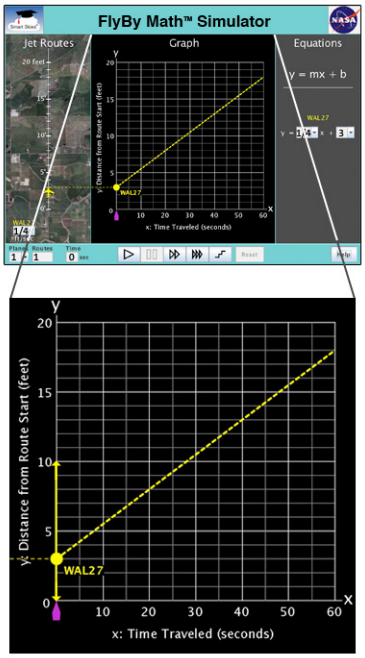
What does the clock show when the time slider is at 0 seconds on the x-axis?

_____ seconds

Problem 4: Explore the Graph Panel by dragging a dot along the y-axis

Set up the simulator:

- Time slider: 0 seconds
- Select: 1 plane, 1 route
- WAL27 starting position: 3 ft
- WAL27 starting speed: ¼ ft/sec



*In the **Graph Panel**, drag the WAL27 dot up and down the y-axis. As you drag the dot, look at the **Jet Route Panel** and the **Equation Panel**.*

Check the items that change when you drag the WAL27 dot:

- ❑ The position of the WAL27 plane on its jet route.
- ❑ The WAL27 plane speed.
- ❑ The value of m in the WAL27 equation.
- ❑ The value of b in the WAL27 equation.

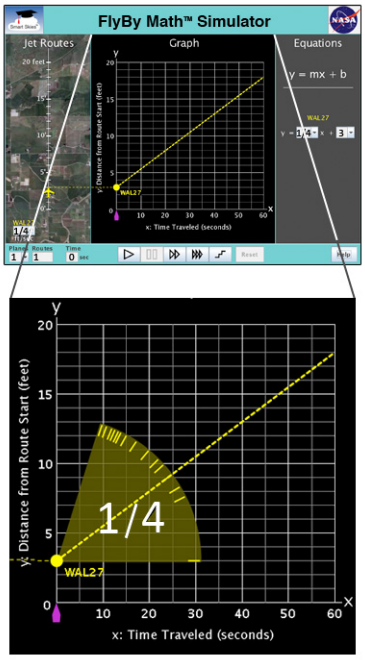
Problem 5: Explore the Graph Panel by rotating a line

Set up the simulator:

- Time slider: 0 seconds
- Select: 1 plane, 1route
- WAL27 starting position: 3 ft
- WAL27 starting speed: ¼ ft/sec

(a) *In the **Graph Panel**, click and hold the mouse on the WAL27 line so the slope of the line appears.*

What is the slope of the WAL27 line? _____ ft/sec



(b) *In the **Graph Panel**, drag and rotate the WAL27 line. As you rotate the line, also look at the **Jet Route Panel** and the **Equation Panel**.*

Check the items that change when you rotate the WAL27 line:

- ❑ The slope of the WAL27 line.
- ❑ The position of the WAL27 plane on its jet route.
- ❑ The WAL27 plane speed.
- ❑ The value of m in the WAL27 equation.
- ❑ The value of b in the WAL27 equation.

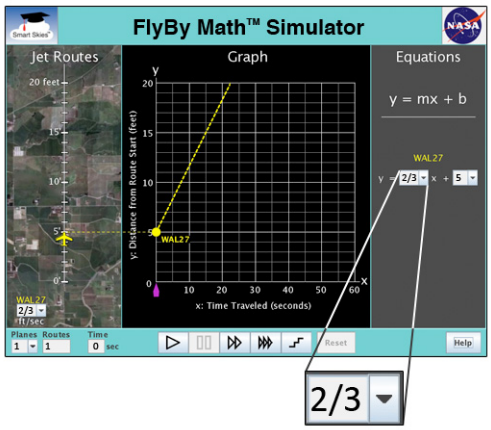
Problem 6: Explore the Equation Panel by changing the value of m

Set up the simulator:

- Time slider: 0 seconds
- Select: 1 plane, 1route
- WAL27 starting position: 5 ft
- WAL27 starting speed: ⅔ ft/sec

*In the **Equation Panel**, use a menu to choose some different values for **m**.*

*Each time you choose a new value for m, look at the **Jet Route Panel** and the **Graph Panel**.*



Check the items that change when you change the value of m:

- ❑ The position of the WAL27 plane on its jet route.
- ❑ The WAL27 plane speed.
- ❑ The position of the WAL27 dot on the y-axis of the graph.
- ❑ The slope (steepness) of the WAL27 line.

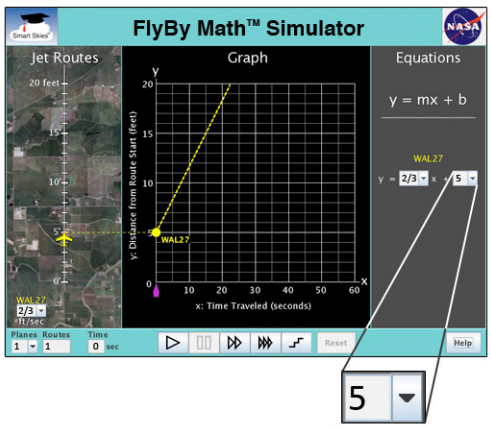
Problem 7: Explore the Equation Panel by changing the value of b

Set up the simulator:

- Time slider: 0 seconds
- Select: 1 plane, 1route
- WAL27 starting position: 5 ft
- WAL27 starting speed: ⅔ ft/sec

*In the **Equation Panel**, use a menu to choose some different values for **b**.*

*Each time you choose a new value for b, look at the **Jet Route Panel** and the **Graph Panel**.*



Check the items that change when you change the value of b:

- ❑ The position of the WAL27 plane on its jet route.
- ❑ The WAL27 plane speed.
- ❑ The position of the WAL27 dot on the y-axis of the graph.
- ❑ The slope (steepness) of the WAL27 line.