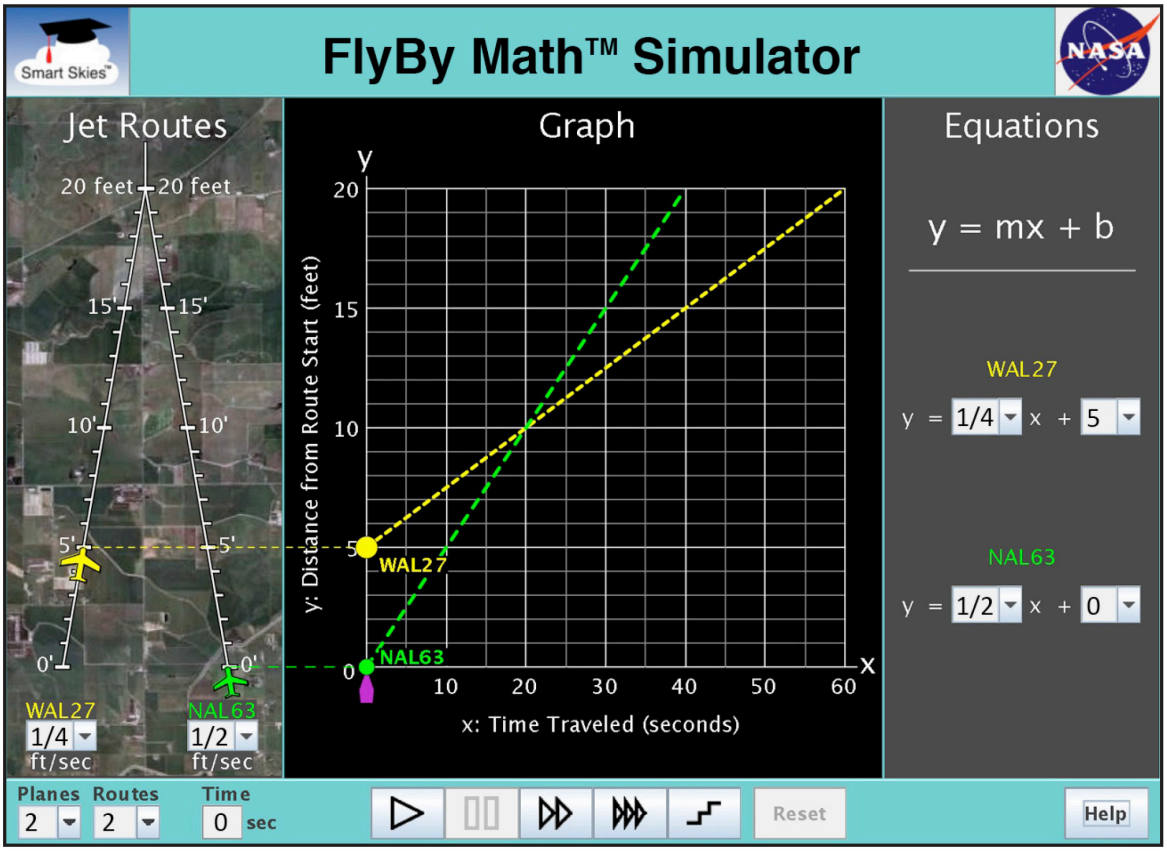
Name _____ **Answers**

Student Worksheet E

Analyzing a Distance vs. Time Graph for Two Planes

In this worksheet, you will work with **2 planes**. Sometimes you will work with **1 jet route**; other times you will work with **2 jet routes**.

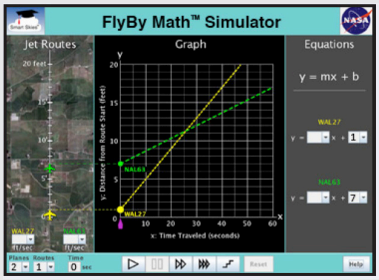
- Each jet route is 20 feet long.
- The jet routes meet at the 20-foot mark.
- The planes are flying at the same altitude.
- The planes are flying at different speeds.
- The planes have different starting positions.



You will use the simulator to learn:

- What happens in the **Jet Route Panel** when two lines cross into the **Graph Panel**. (Do the two planes collide or not?)

Problem 1: Set up the simulator



- Time slider: 0 seconds
- 2 planes, ***1 route***
- WAL27 starting position: 1 ft.
- NAL63 starting position: 7 ft.
- Make sure the NAL63 line crosses the WAL27 line somewhere near
- the center of the Graph Panel. (*You may need to grab and rotate one or both lines*.)

In the Graph Panel, drag the time slider (▲) until the NAL63 dot is on top of the WAL27 dot where the lines cross. Then answer these questions.

(a) In the **Jet Route Panel**, do the planes collide? (Yes) No

(b) DO NOT RESET the problem. In the **Jet Route Panel**, choose TWO (2) jet routes.

In the Jet Route Panel, do the planes collide? Yes (No)

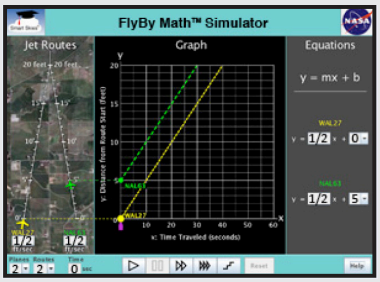
(c) Fill in the blank to complete each sentence.

With one jet route, the lines crossed on the graph and the planes *did* collide.
(did / did not)

With two jet routes, the lines crossed on the graph and the planes *did not* collide.
(did / did not)

Problem 2: Set up the simulator

- Time slider: 0 seconds
- 2 planes, ***1 route***
- WAL27 start: 0 ft., ½ ft/sec
- NAL63 start: 5 ft. ½ ft/sec



In the **Graph Panel**, drag the time slider to 20 seconds so the WAL27 dot and the NAL63 dot are at the point where the lines cross. Then answer these questions.

(a) In the **Graph Panel**, the lines cross when time x = 20 seconds.

In the **Jet Route Panel**:

Do the planes collide? (Yes) No

How far is WAL27 from the start of the jet route? *10* ft

How far is NAL63 from the start of the jet route? *10* ft

Are these distances the same? (Yes) No

(b) In the **Graph Panel**, at the point where the lines cross, what is the **y-coordinate** for each plane?

WAL27: (x , y) = (20 seconds, *10* ft)

NAL63: (x , y) = (20 seconds, *10* ft)

(c) DO NOT RESET the problem. In the **Jet Route Pane**, choose TWO (2) jet routes.
In the **Graph Panel**, the lines cross when time x = 20 seconds.
In the **Jet Route Panel**:

Do the planes collide? Yes (No)

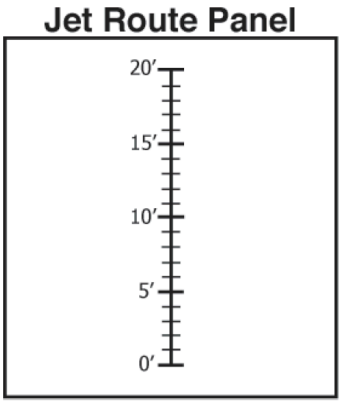
How far is WAL27 from the start of the jet route? *10* ft

How far is NAL63 from the start of the jet route? *10* ft

Are these distances the same? (Yes) No

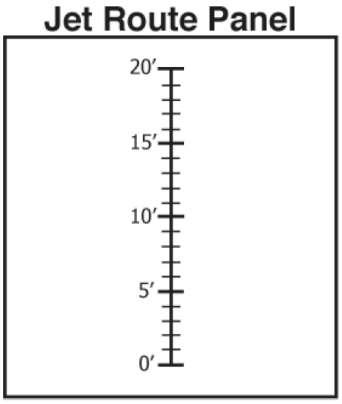
Problem 3:

Two Jet Route Panels are shown.



(a) Check **all** the places where two planes could collide on **one** jet route:

- ☑ At 0 feet, where the route begins.
- ☑ At 20 feet, where the route ends.
- ☑ Anywhere else along the route.



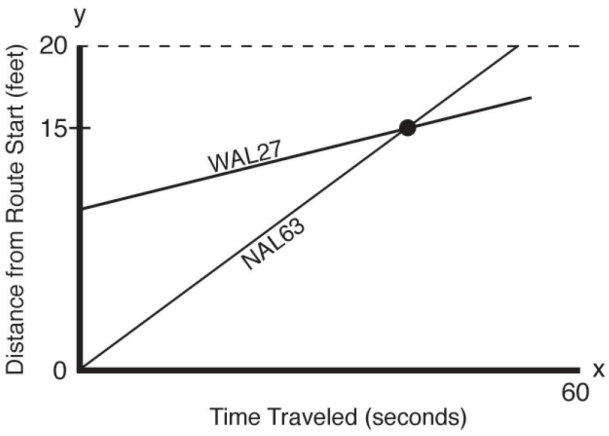
(b) Check **all** the places where two planes could collide on these **two** jet routes.

- ❑ At 0 feet, where the route begins.
- ☑ At 20 feet, where the routes meet.
- ❑ Anywhere else along the route.

Summarizing What Happens on the Jet Route(s) When Two Lines Cross on the Graph

Problem 4:

A graph for two planes is shown.



(a) WAL27 and NAL63 are flying on the **same** 20-foot jet route.

The lines cross on the graph at y = 15 feet.

Do the planes collide on the jet route?

(Yes) No

(b) WAL27 and NAL63 are flying on **different** jet routes that meet at 20 feet.

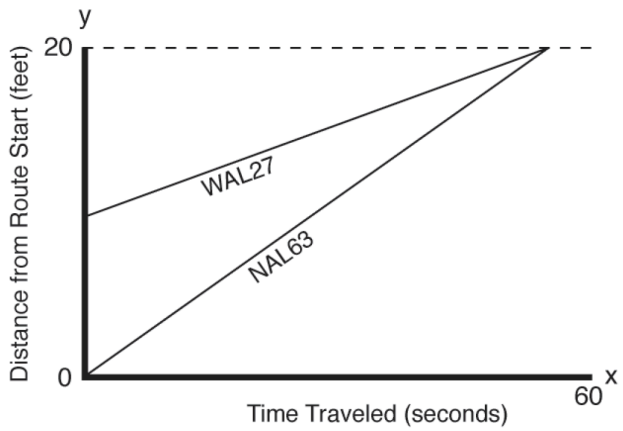
The lines cross on the graph at y = 15 feet.

Do the planes collide on the jet routes?

Yes (No)

Problem 5:

A graph for two planes is shown.



(a) WAL27 and NAL63 are flying on different jet routes that meet at 20 feet.

The lines meet on the graph at y = 20 feet.

Do the planes collide on the jet routes?

(Yes) No

How do you know?

The lines meet at a point where y = 20, so each plane is at the 20-foot mark on its jet route at the same time. Since the two routes meet at that 20-foot mark, the planes collide.

Problem 6: SUMMARIZE

(a) Check the sentences for which you are ***sure*** that two planes ***do collide***.

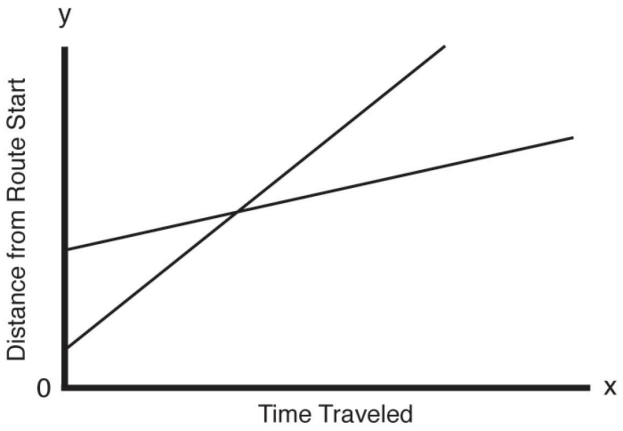
- ❑ In the Graph Panel, the two lines cross or meet.
- ❑ In the Graph Panel, the two lines are parallel. (The lines have the same slope.)
- ☑ In the Graph Panel, the two lines cross or meet; in the Jet Route Panel, the planes are on the *same* route.
- ❑ In the Graph Panel, the two lines cross or meet; in the Jet Route Panel, the planes are on *different* routes that meet at an intersection

(b) Check the sentences for which you are ***sure*** that two planes ***do NOT collide***.

- ❑ In the Graph Panel, the two lines cross or meet.
- ☑ In the Graph Panel, the two lines are parallel. (The lines have the same slope.)
- ❑ In the Graph Panel, the two lines cross or meet; in the Jet Route Panel, the planes are on the *same* route.
- ❑ In the Graph Panel, the two lines cross or meet; in the Jet Route Panel, the planes are on *different* routes that meet at an intersection

Problem 7:

GO BEYOND: Check **all** the different situations that **could** be represented by this graph.



- ☑ Two planes flying on the same jet route.
- ☑ Two planes flying on different jet routes that meet.
- ☑ Two planes flying on different jet routes that do not meet.
- ☑ Two cars driving on different roads.
- ☑ Two trains on the same track traveling toward each other.
- ☑ Two trains on different tracks traveling away from each other.