Congratulations! You and your group have been selected to compete against other groups in a new reality TV show competition, '**Planes, Trains, or Bicycles.**' The competition coordinator (your teacher) will go over the rules and details of the game and will tell you how to fill in this worksheet as you plan your trip.

Group name:_____

Group members:_____

Plan your trip!

Goals:

1. Travel to all of the required destinations in no more than **40 days** with the lowest possible total carbon emissions per individual traveler.

Rules:

1. You must travel to all of the locations listed in the **Table of Destinations**, starting and ending in San Francisco.
2. You can use as many modes of transportation (choosing from the list in the **Transportation Table**) as you like.
3. You can divide your trip up into as many segments as you like.
4. You can take the shortest path between two points, but transportation modes must be physically possible. For example, you cannot drive a car across the ocean.
5. You must complete your trip in **40 days or less**, or your group will be disqualified from the competition.

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Table of Destinations:

Destinations:	San Francisco, U.S.A. *(must start and end here)*	Cairns, Australia	Manaus, Brazil, South America	Kano, Nigeria, Africa	Tiksi, Russia, Asia
Latitude and longitude coordinates:	37˚47'N, 122˚25'W	16˚55'S, 145˚46'E	03˚06'S, 60˚01'W	12˚00'N, 08˚31'E	71˚38'N, 128˚52'E

Helpful Hints:

➢ You can measure the distance between any two locations using the Ruler tool in Google Earth. Make sure the tool is set to measure distances in miles. Ask your teacher if you need help with this.

➢ To fly to a location in Google Earth, type its latitude and longitude coordinates into the Search bar, substituting a space in place of the degree symbol (˚).

➢ It is easier to measure the distance between two locations in Google Earth by first adding a Placemark ( ) to each of them. Ask your teacher if you are unsure how to do this.

Transportation Table:

Transportation mode	Carbon emissions (lbs CO_2) per passenger-mile	Average speed (mph)
Airplane (Boeing 747)	0.40	570 mph[*]
Train (assuming 50 riders per train car)	0.24	40 mph
Car (compact sedan, driving solo)	1.1	50 mph
Transit bus (3/4 full)	0.25	45 mph
Cruise ship	1.17	23 mph[†]
Bicycle	0	12 mph[‡]
Walking	0	3 mph

Source for carbon footprints: Sightline Institute, Jardine (2009)

[*] klm.com
[†] shipcruise.org
[‡] livestrong

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Sample calculations for your Transportation Log:

Travel time from O.R. Tambo International Airport to Kano, Nigeria by train (hrs) = Distance between O.R. Tambo and Kano (mi) ÷ average Speed of train (mph)

$$2950 \text{ mi} \div 40 \text{ mph} = 73.8 \text{ hrs}$$

Total carbon emissions to travel from O.R. Tambo International Airport to Kano, Nigeria by train = Carbon emissions for transportation mode (CETM) per passenger-mile (lbs CO_2) X Distance (mi)

$$0.24 \text{ lbs } CO_2 \text{ X } 2950 \text{ mi} = 708 \text{ lbs } CO_2$$

Destination	Distance (mi)	Mode and Speed (mph)	Time (hrs) = Distance ÷ Speed	CETM per passenger-mile (lbs CO_2)	Total carbon emissions (lbs CO_2) = CETM X Distance
O.R. Tambo International Airport	---	---	---	---	---
Kano, Nigeria	2950 mi	Train 40 mph	73.8 hrs	0.24 lbs CO_2	708 lbs CO_2

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