



NURSES ON A MISSION

# Transporting People and Medicine

## Transporting People and Medicine from Brussels to Africa

1. Medicine from Brussels to Kinshasa, Congo can be shipped by freight plane traveling 450 mph or by 747 airliner traveling 647 mph.

- a. Write a time-distance equation for each plane. Explain what each variable in the equations represent.

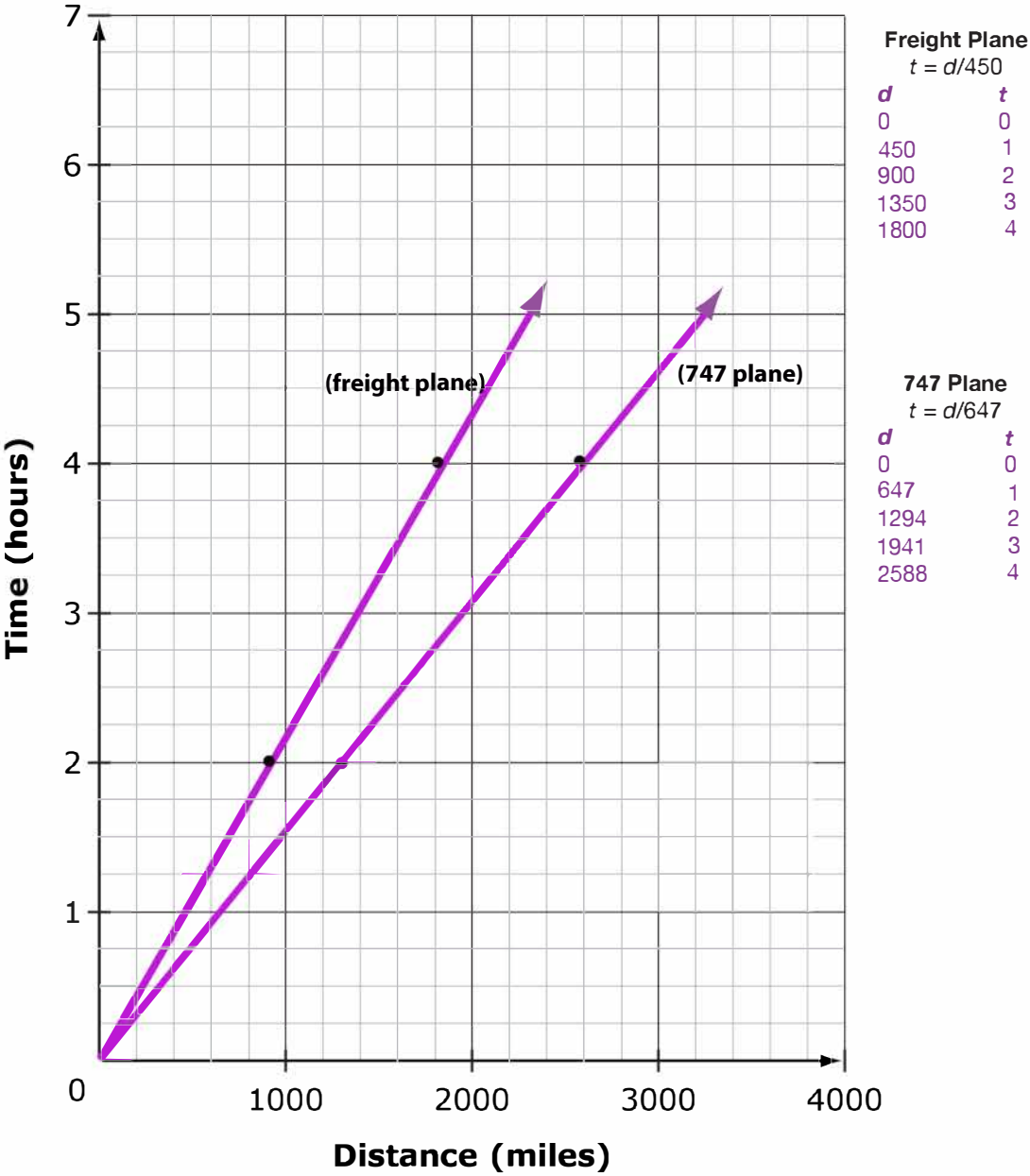
Freight plane:  $t = d/450$  and 747:  $t = d/647$ , where  $t$  = time and  $d$  = distance

- b. Write an equation to find how far the planes must fly for the flight time to be the same for both planes. How many solutions does your equation have?

$$d/450 = d/647$$

no solution (except  $d = 0$ )

c. Graph both equations on the following grid.



d. Which plane takes less time to travel 3591 miles from Brussels to Kinshasa?

747

2. The cost of shipping by freight plane is \$100 plus \$2.00 per pound. The cost of shipping by 747 airliner is \$125 plus \$1.90 per pound. How many pounds of freight must be shipped for the costs to be the same for either plane? Solve algebraically.

$$\text{Freight} = 100 + 2p$$

$$747 \text{ airliner} = 125 + 1.90p$$

$$100 + 2p = 125 + 1.90p$$

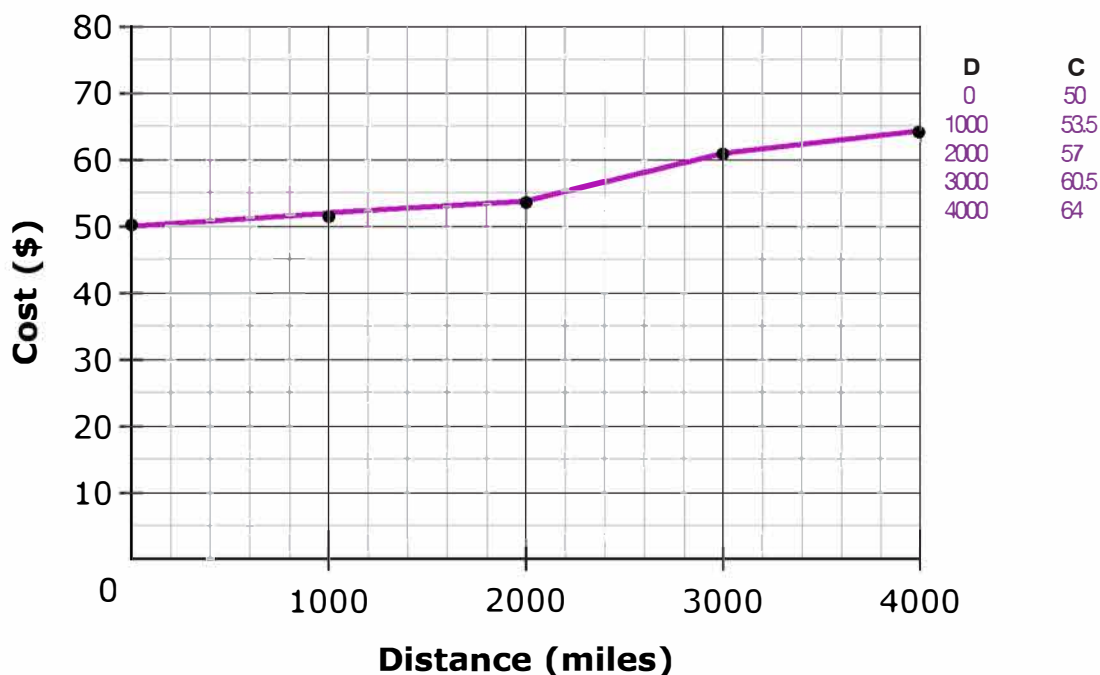
$$p = 250 \text{ pounds}$$

3. For nurses traveling from Brussels to Kinshasa, the airlines offer a special humanitarian rate. Nurses may travel on a 747 airliner for \$0.35 per 100 miles plus a \$50 boarding fee.

- a. Write a cost-distance equation for the humanitarian rate on a 747 airliner.  
Explain what each variable in the equations represent.

$$C = 0.35 \frac{x}{100} + 50 \quad c = \text{cost} \quad x = \text{distance traveled in miles}$$

- b. Graph the relationship between cost and distance for a 747 airliner.



- c. On the basis of the graph, what is the cost to travel 3591 miles from Brussels to Kinshasa on a 747 airliner?

about \$63 (responses will vary)

4. The special rate for nurses traveling on a freight plane is \$.04 per mile plus a \$10 boarding fee. Write an equation to find the cost for a nurse to travel 3591 miles from Brussels to Kinshasa on a freight plane. What is the difference in cost to fly by freight plane versus a 747 airliner?

$$\text{Freight} = .04 (3591) + 10 = \$153.64$$

$$747 = \text{About } \$63.00 \text{ (use solution 3c)}$$

$$\text{Difference} = \text{about } \$90.64$$

5. The streets in the city are parallel north/south and east/west. The airport delivers to four warehouses and two storage units in the city.

- Storage A for ice is at the airport (the origin).
- Warehouse B for backpacks is 3 miles east and 2 miles north of the airport.
- Warehouse C for bandages is 12 miles east of the airport.
- Warehouse D for frozen medications is 12 miles east and  $y$  miles north of the airport.
- Warehouse E for warm medications is 3 miles east of the airport.
- Storage Z for coolers is 5 miles south of Storage A.

Points

A (0,0)

B (3,2)

C (12,0)

D (12,8)

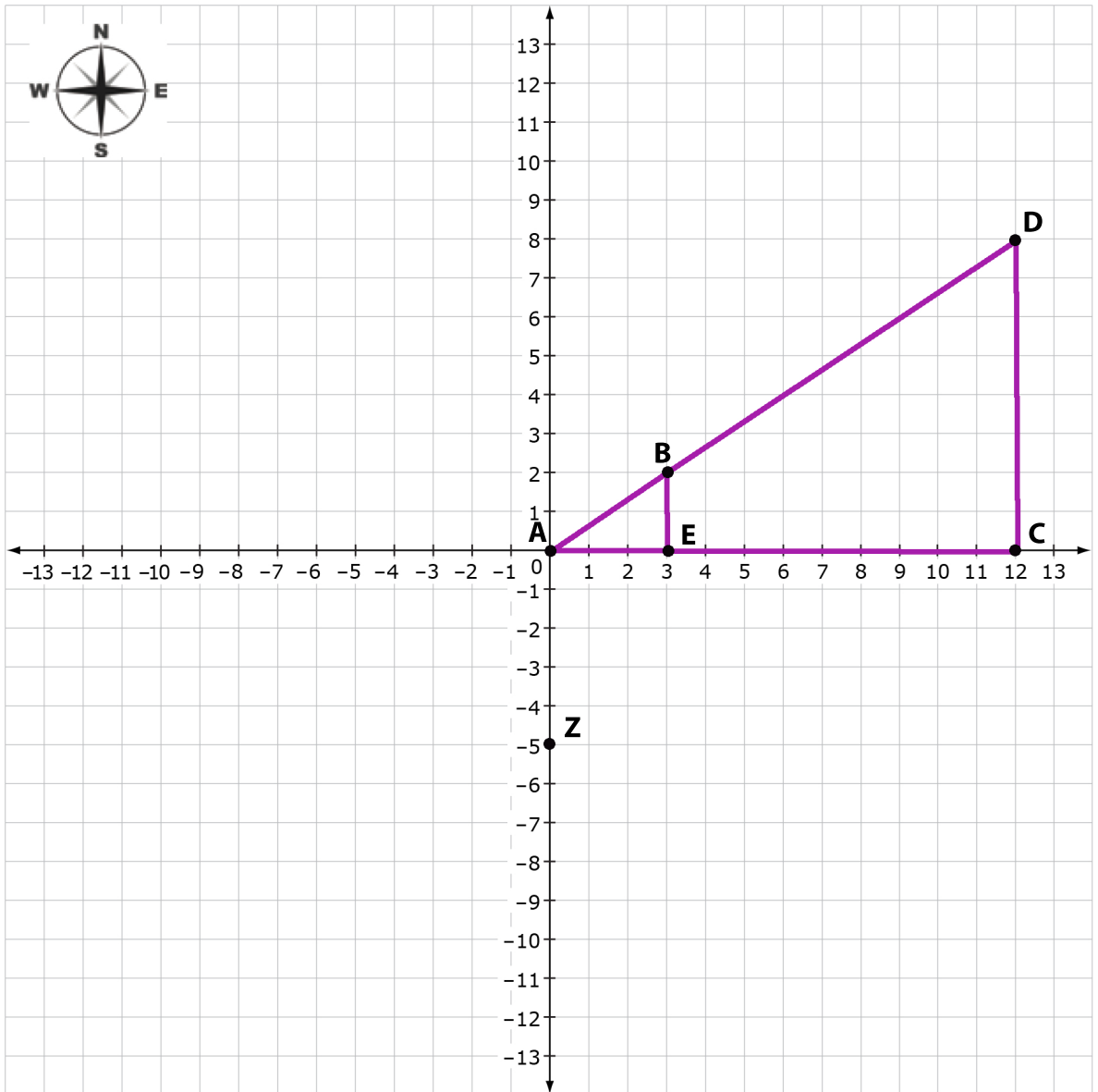
E (3,0)

Z (-5,0)



Triangle ABE is similar to triangle ADC.

a. Plot the location of each warehouse and storage unit.



b. How far is it from Warehouse C to Warehouse D?

Since the triangles are similar, the slope of AB must equal the slope of AD.

$$\frac{2}{3} = \frac{DC}{12}$$

$$DC = \frac{24}{3} = 8 \text{ miles}$$

- c. Due to crime and congestion on the streets, the airport hires a helicopter to fly in a straight line from Storage A to Warehouse D. Write an equation to describe the line followed by the helicopter.

$$y = 2/3x$$

- d. The helicopter flies from Storage Z to Warehouse D. Write an equation to describe the line followed by the helicopter.

$$y = 13/12x - 5$$

6. You discover that a delivery from Brussels is short 254 doses of measles vaccine. You must order measles vaccine from two distributors inside the country.
- The first order is for 3 boxes. Each box contains 3 bags of vaccine. Each bag contains  $x$  plus 4 doses of vaccine. The company adds an extra 3 doses to the order.
  - The second order is for 1 box, which contains 3 bags of vaccine. Each bag contains  $x$  plus 2 doses. The company adds an extra 5 doses. What is value of  $x$ ?

$$3 \text{ boxes} = 3( 3(x + 4) ) + 3$$

$$1 \text{ box} = 3(x + 2) + 5$$

$$254 = 9(x + 4) + 3 \text{ plus } 3(x + 2) + 5$$

$$254 = 9x + 36 + 3 + 3x + 6 + 5$$

$$254 = 12x + 50$$

$$204 = 12x$$

$$17 = x$$

The Department of Health will supply trucks, vans, scooters, boats, and pack carriers for transporting people and supplies. You must transport one nurse, two assistants, and 1000 pounds of supplies to each village. The roads are bad, so vehicles must travel slowly. The table shows information about the vehicles, what they can carry, and where they can travel.

Travel Way	Vehicle	Capacity	Speed
Highway	Truck	3 people and 2000 pounds of supplies	20 mph
	Van	9 people and 1000 pounds of supplies	20 mph
Woods road	Van	9 people and 1000 pounds of supplies	10 mph
Jungle path	Scooter	1 person and 350 pounds of supplies	6 mph
River	Boat	5 people and 500 pounds of supplies	8 mph
Footpath	Pack carrier (packer)	0 people and 100 pounds of supplies	3 mph

*Note: Pack carriers (packers) are people who carry supplies to remote villages.*

Write and solve equations for each of the following questions.

7. How many scooters are needed to move 1000 pounds of supplies from Village J to Village M?

$1000 = 350s$

$2 \frac{6}{7} = s$

3 scooters

8. Three boats each have returning soldiers already on board. How many returning soldiers are on the boats if only 9 packers were allowed to board the boats from Village L to Village R?

$3 \text{ boats} = \text{soldiers} + 9 \text{ packers}$

$3(5) = s + 9$

$15 = s + 9$

$6 = s$

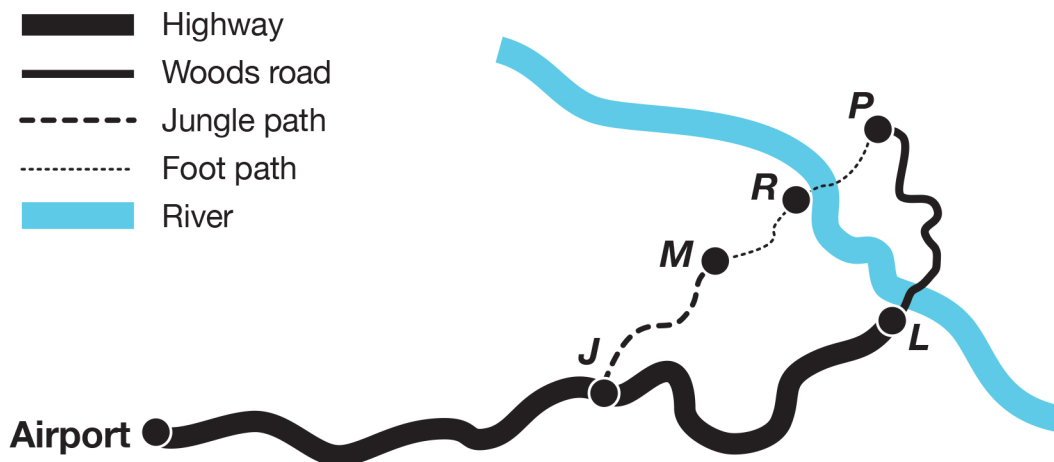
# Transporting People and Materials from the Airport to Villages

You must find staff and supplies for five clinics in remote villages.

- Villages M and P are located on high mountain plateaus.
- Village R is in a river valley between the mountains.
- Villages L and J are in the jungle lowlands.

Distances between the villages are listed below.

- Village J is 160 miles from the airport by highway.
- Village J is 160 miles from Village L by highway.
- Village L is 80 miles from Village P by a woods road.
- Village R is 64 miles upriver from Village L.
- Village M is 48 miles from Village J by jungle path.
- Village M is 24 miles from Village R by footpath.
- Village R is 24 miles from Village P by footpath.



9. There are 5 trucks filled to capacity. Each truck is carrying an 800-pound box and a box of unknown weight. What is the total weight of all the unknown boxes? Write an equation and solve.

$$5(2000) = 5(x + 800)$$

$$10000 = 5x + 4000$$

$$6000 = 5x$$

$$1200 = x, \text{ total} = 5(1200) \text{ or } 6000 \text{ pounds}$$

10. The average weight of people is  $n$  pounds. Write equations to represent the total weight carried by a truck and by a van. At what weight ( $n$ ) will the total weight carried by a truck equal the total weight carried by a van? Round your answer to the nearest tenth.

$$T = 3n + 2000$$

$$V = 9n + 1000$$

$$3n + 2000 = 9n + 1000$$

$$1000 = 6n$$

$$166.7 = n$$

**11.** Devise a plan to transport the following from the airport to each village in the least amount of time.

- One nurse
- Two assistants
- 1000 pounds supplies that include vaccine and ice packs

Packers are available at all villages. Scooters are at Village J. Boats are at Village L. Vans are at Village L. Every person travels 8 hours per day.

Village	Travel Time
J	8 hours
L	16 hours
R	24 hours
P	24 hours
M	16 hours

Two trucks and one van leave airport.

In Village J:

- 2 assistants, 1 nurse, and 1000 pounds of supplies remain in Village J; and
- 3 scooters carry 2 assistants, 1 nurse, and 1000 pounds of supplies to Village M.

One truck (3 people and 2000 pounds of supplies) and 1 van (6 people and 1000 pounds of supplies) leave for Village L. (Number of people in each vehicle may vary.)

In Village L:

- 2 assistants, 1 nurse, and 1000 pounds of supplies remain in Village L;
- 2 boats (3 people and 1000 pounds of supplies) go to Village R; and 1 van goes to Village P

# The Effect of the Conflict on Populations

- 12.** Many villagers were displaced and died from disease and malnutrition during the conflict. The population of Village P today is 1800, which includes 10 soldiers who have not left the community. What was the population of Village P before the conflict if 55% of the villagers died during the conflict?

$$1800 = 10 + p - 0.55p$$

$$1790 = 0.45p$$

$$3978 = p$$

- 13.** Village M is caring for 5 wounded warriors. The current population is 2100, including the wounded warriors. What was the population of Village M before the conflict if 55% of the villagers died during the conflict?

$$2100 = 5 + p - 0.55p$$

$$2095 = 0.45p$$

$$4656 = p$$