

Chapter 1 Linear Motion

Example Problems

1.8 Relative Motion

E1. A monkey is riding on a bus that is moving at 8.5 m/s relative to the street. While the bus is in motion the monkey walk towards the front of the bus at a speed of 1.3 m/s relative to the bus. Calculate the speed of the monkey relative to the street.

Draw a picture

Show your work

a) _____ ← units

E2. A monkey is riding on a bus that is moving at 8.5 m/s relative to the street. While the bus is in motion the monkey walk towards the back of the bus at a speed of 1.3 m/s relative to the bus. Calculate the speed of the monkey relative to the street.

Draw a picture

Show your work

a) _____ ← units

E3. A monkey swims at 2.4 m/s relative to the water. If the current flows at 1.2 m/s. Calculate how long will it take the monkey to swim 100 m both up and down stream.

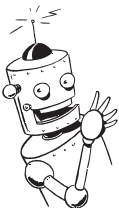
Draw a picture

Show your work

a) _____ ← units

b) _____ ← units

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E4. Car **A** and car **B** are traveling in opposite directions towards each other. Car **A** is traveling at 27 m/s and car **B** traveling at 51 m/s in the opposite direction. Calculate how fast car **A** appear to be moving to an observer in car **B** and how fast does car **B** appear to be moving to an observer in car **A**.

Draw a picture

Show your work

a) _____ ← units b) _____ ← units

E5. From the last problem, if at time = 0 seconds the two cars are 1800 meters apart, calculate how long it take before the two cars pass each other.

Draw a picture

Show your work

a) _____ ← units

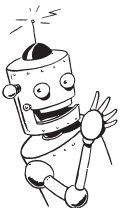
E6. A boat is traveling north. The people on the boat measure the water to be moving past the boat at a velocity of 5 m/s towards the south. A stationary observer on the shore measures the velocity of the boat to be moving 2 m/s north. What is the actual velocity of the water as seen from the shore in meters per second?

Draw a picture

Show your work

a) _____ ← units

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Student Problems

1.8 Relative Motion

1. A monkey is flying to New York for her big Broadway debut. If the plane heads out of Los Angeles with a velocity of 220 m/s, and encounters a tail wind blowing from behind the plane at 45 m/s. Calculate the velocity of the plane relative to the ground.

Draw a picture

Show your work

a) _____ ← units

2. A train is travels at a speed of 45.0 m/s relative to the tracks. A monkey shoots a Nerf dart at a gorilla sitting behind him (towards the back of the bus). The dart leaves the gun traveling 23 m/s relative to the train. Calculate the velocity of the dart relative to the tracks.

Draw a picture

Show your work

a) _____ ← units

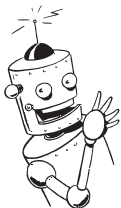
3. A monkey is flying an airplane at a speed of 375 m/s relative to the ground. The monkey fires a missile. The missile flies forward at a speed of 782 m/s relative to the plane. Calculate the speed of the missile relative to the ground.

Draw a picture

Show your work

a) _____ ← units

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4. A rocket in outer space is moving at a speed of 1.25 km/s relative to a stationary observer. The captain fires the engine and hot gases are expelled out of the rear of the rocket at a speed of 2.75 km/s relative to the rocket. Calculate the speed of the gases relative to an observer.

Draw a picture

Show your work

a) _____ ← units

5. Two motorboats approach each other along a straight-line course. Boat **A** is headed north at 15 km/h. Boat **B** is headed south at 24 km/h. What is the velocity of boat **A** as seen by the skipper on boat **B** in km/h?

Draw a picture

Show your work

a) _____ ← units

6. From the pervious problem, if at time $t = 0$ the two boats are 3 km apart, calculate how long before the two boats meet in hours and then minuets.

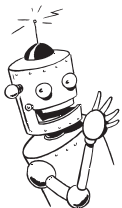
Draw a picture

Show your work

a) _____ ← units

b) _____ ← units

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7. Two friends see each other when they are 200 m apart and start running toward each other. One runs at 8 m/s, the other at 12 m/s. Calculate how long before they meet.

Draw a picture

Show your work

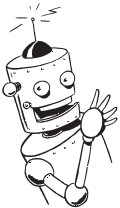
a) _____ ← units b) _____ ← units

8. From the previous problem, calculate how far each friend runs before they meet.

Draw a picture

Show your work

a) _____ ← units b) _____ ← units



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