This print-out should have 14 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

A tailwind is a wind blowing in the direction the plane is going. A headwind is a wind blowing opposite the direction the plane is going.

Bee in the Wind

04:09, trigonometry, numeric, > 1 min, normal.

001

A bee flies to a flower 557 m due south of its hive. The bee's speed in still air is 0.71 m/s, and there is a wind blowing toward the south at 0.23 m/s.

How long will it take the bee to travel to the flower and back to the hive? Answer in units of s.

Boat in a Current

04:09, trigonometry, numeric, > 1 min, normal.

002

A boat moves through the water of a river at 10 m/s relative to the water, regardless of the boat's direction.

If the current is flowing at 8 m/s, how long does it take the boat to complete a trip consisting of a 300 m displacement downstream followed by a 300 m displacement upstream? Answer in units of s.

Headwind and Tailwind

04:09, trigonometry, numeric, > 1 min, normal.

003

An airplane normally flies at 200 km/h.

What is its air speed if it experiences a 50 km/h headwind? Answer in units of km/h.

004

What is its air speed if it experiences a 50 km/h tailwind? Answer in units of km/h.

Relative Speeds 02

04:09, trigonometry, numeric, > 1 min, normal.

005

You are sitting in a bus that is traveling along a straight, level road at 60 m/s.

How fast are you traveling relative to the road? Answer in units of m/s.

006

If you hold an apple over your head, how fast is it moving relative to the road? Answer in units of m/s.

007

How fast is the apple traveling relative to you? Answer in units of m/s.

008

If you drop the apple, what kind of motion will you see?

1. Vertical motion straight down.

2. Curved motion downward with initial vertical velocity.

3. Projectile motion with initial horizontal velocity.

4. Horizontal motion straight forward.

5. Linear motion at an angle downward.

6. Not enough information to draw a conclusion.

009

When you drop the apple, what kind of motion will a pedestrian outside the bus see?

1. Horizontal motion straight forward.

2. Curved motion downward with initial vertical velocity.

3. Vertical motion straight down.

4. Curved motion downward with initial horizontal velocity.

5. Linear motion at an angle downward.

6. Not enough information to draw a conclusion.

Stalled Escalator

04:09, trigonometry, numeric, > 1 min, normal.

010

A shopper in a department store can walk up a stationary (stalled) escalator in 20 s. The normally functioning "up" escalator can carry the standing shopper to the next floor in 30 s. Assume the same walking effort for the shopper whether the escalator is stalled or moving.

How long will it take the shopper to walk up the moving escalator? Answer in units of s.

011

How long will it take the shopper to walk **down** this upward moving escalator? Answer in units of s.

012

The shopper has gone up and down the upward moving escalator.

However, if the escalator is stalled, the shopper will make the trip up and down the escalator

1. quicker.

2. slower.

3. in the same time.

4. None of these.

Crossing a River

04:09, trigonometry, numeric, > 1 min, normal.

013

A river flows due East at 1.5 m/s. A boat crosses the river from the South shore to the North shore by maintaining a constant velocity of 10 m/s due North relative to the water. The river is 300 m wide.

What is the velocity of the boat relative to shore? Answer in units of m/s.

014

How far downstream has the boat moved by the time it reaches the North shore? Answer in units of m.