PHYSICS IN MOTION
gpb.org/physics-motion

Unit 2F
Relative Velocity
Note-Taking Guide and Questions to Consider TEACHER

Main Ideas, Key Points, Questions:

After watching the video segment, write down key points, main ideas, and big questions.

Objective(s):

- *Graphically and mathematically determine the relative velocity between two objects moving in the same direction, in opposite directions, and at right angles to one another.*

Notes:

During the video segment, use words, phrases, or drawings to take notes.

Summary:

After watching the video segment, write at least three sentences explaining what you learned. You may ask yourself: "If I was going to explain this to someone else, what would I say?"

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Answer the following.

1. **In your own words, define frame of reference.**

Frame of reference takes into account how a group of objects is moving together, like how students are moving inside a school bus at the same speed relative to the outside world but are sitting still relative to each other.

2. **What does the term relative velocity mean?**

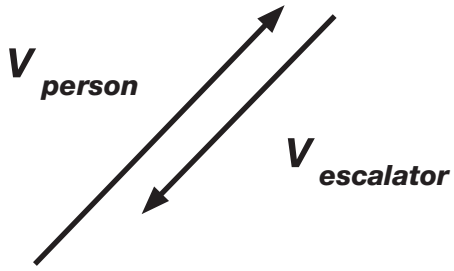
Relative velocity is the velocity of one object relative to another.

3. **Draw a vector diagram of a person walking on a moving sidewalk in the same direction of motion as the sidewalk.**

4. **A moving sidewalk at the airport moves about 1 m/s relative to the ground around it. If you walk at a speed of 2 m/s relative to the sidewalk, how fast are you moving relative to the ground?**

$$V_{result} = V_{sidewalk} + V_{person}$$
$$V_{result} = 1\,{}^{m}\!/_{s} + 2\,{}^{m}\!/_{s}$$
$$V_{result} = 3\,{}^{m}\!/_{s}$$

5. **Draw a vector diagram of a person walking up a descending escalator.**



questions continued on next page

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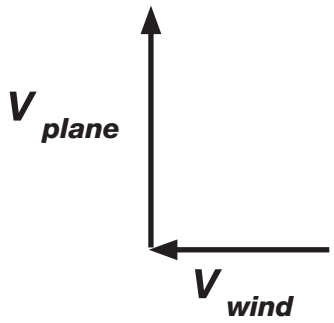
Answer the following.

6. **A descending escalator moves at nearly 1 m/s down the incline relative to the ground, and a person walks up the escalator at 2 m/s relative to the escalator. How fast does the person move relative to the ground?**

$$v_{result} = v_{person} - v_{escalator}$$
$$v_{result} = 2\,{}^{m}\!/_{s} - 1\,{}^{m}\!/_{s}$$
$$v_{result} = 1\,{}^{m}\!/_{s}$$

7. **Draw a vector diagram of a plane flying at a speed of 800 km/h north relative to the air that is moving at 100 km/h west relative to the ground.**



8. **Calculate the relative velocity of the plane to the ground from the previous question.**

$$v_{result}^2 = v_{wind}^2 + v_{plane}^2$$
$$v_{result}^2 = \left(100\,{}^{km}\!/_{h}\right)^2 + \left(800\,{}^{km}\!/_{h}\right)^2$$
$$v_{result}^2 = 650\,000\,{}^{km^2}\!/_{h^2}$$
$$v_{result} = 806.2\,{}^{km}\!/_{h}$$

9. **What mathematical operation did you use to determine the relative velocity of an object that is moving perpendicularly to a second object?**

To find the relative velocity to an outside reference point, you would use the Pythagorean theorem to add the velocities together if they are moving in perpendicular directions.