

ADVANTAGE Test Prep

Grade

7

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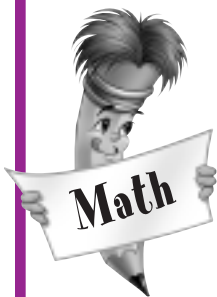
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CREDITS

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The Science of Flight

If you're like most people, you've probably been puzzled by an odd fact. You know an airplane weighs many tons. Yet, you've looked up in the sky countless times to see one of these amazing (and amazingly heavy) objects flying through the air, seemingly defying gravity. How an airplane—or bird—can stay aloft is a fascinating subject. In fact, the only thing holding the airplane up is air!

The key to flight is a scientific principle called *lift*. It was first described by a Swiss scientist named Daniel Bernoulli in 1738. Lift allows an object to fly, thanks to differences in air pressure. Compare a bird's wing to an airplane's wing and you'll see they share some important characteristics. Both are thicker at the front than at the back. Both are flat on the bottom and curved on the top. Scientists call this unusual shape an *airfoil*.

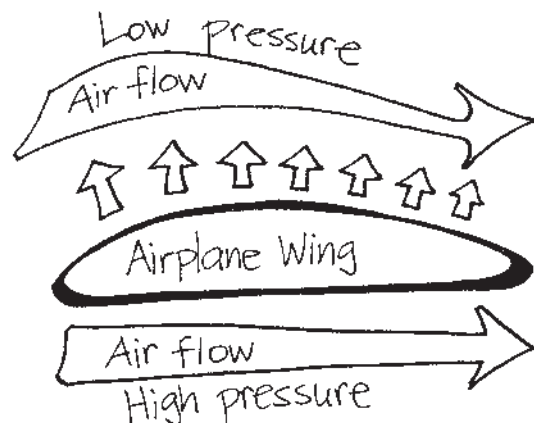
As Bernoulli discovered, the airfoil shape creates different air pressures above and below the wing. As the bird or airplane moves forward (an activity known as *thrust*) wind rushes over and under the wing. The air rushing over the curved top part has a lower pressure than the air passing underneath the flat bottom of the wing. This pressure difference occurs because faster-moving air has a lower pressure than slower-moving air. The air has to move faster to get over the curved top of the wing than it does to slip by the flat underside.

This difference in air pressure, now known as the Bernoulli effect, actually creates a vacuum. The vacuum pulls the wing upward, along with the rest of the airplane or bird. As long as a wing is moving forward fast enough, the air it meets moves by the wings fast enough to keep the object aloft. Think about what happens when an airplane comes in for a landing. It slows down, resulting in a loss of forward motion, or thrust. Less thrust equals less lift, and the plane drops to the ground.

If you're skeptical that moving air can be powerful enough to lift a heavy object, there's a little experiment you can do. Cut a thin strip of onionskin or tracing paper. Hold the strip of paper just under your lips with both hands. Then blow over the top of the paper. Direct your breath downward over the paper like you're blowing into a pop bottle. You may be surprised at what happens next. As you blow harder, the air coming from your mouth moves faster. However, it doesn't push the paper downward. The slip of paper rises.

You've just experienced the phenomenon that Bernoulli analyzed over 250 years ago. Lift and thrust, the forces that lift your strip of paper, are the same forces that keep jets zooming and birds soaring.

How Air Pressure Creates Lift



VOCABULARY



KNOW THE SKILL: WORDS IN CONTEXT

Some test questions ask you to figure out the meaning of a word. Often you can guess the meaning of the word by thinking about the word's context. Context is the meanings of the other words around the unknown word.

DURING THE TEST

To learn what a word means from the context of the sentence, look for the verb or subject in the sentences around it. These words will give you clues about the unknown word.

TEST EXAMPLE

- 1 Which word means the same thing as *skeptical*?
If you're skeptical that moving air can be powerful enough to lift a heavy object, there's a little experiment you can do.
- (A) certain (C) unhappy
(B) doubtful (D) uninterested

THINK ABOUT THE ANSWER

The correct answer is option B, *doubtful*. Option A is incorrect because if you were certain about the effect of moving air, you wouldn't have to do the experiment. Option C, *unhappy*, doesn't make sense in the sentence. Neither does option D, *uninterested*.

NOW YOU TRY IT

- 2 Choose the word or words that mean the same thing as *aloft*.
- As long as a wing is moving forward fast enough, the air it meets moves by the wings fast enough to keep the object aloft.
- (F) moving
(G) hanging
(H) at the front
(J) in the sky

Check your answer on page 109.



That One's Out

When answering vocabulary questions like these, plug each choice into the sentence and ask yourself if it makes sense. Some will not, and you can eliminate these right away.

VOCABULARY



KNOW THE SKILL: **ROOTS, PREFIXES, AND SUFFIXES**

Tests will ask you to analyze word bases and the beginnings and endings of words to determine word meaning. A **root** is the main part, or base of a word. A **prefix** is placed at the beginning of a root, while a **suffix** goes at the end of a root. Some common prefixes are *un-*, *non-*, *ex-*, *pre-*, and *bi-*. Some common suffixes are *-able*, *-ish*, *-ly*, *-ness*, and *-ance*.

DURING THE TEST

Look for a part of an unknown word, the prefix, root, or suffix, that resembles one you already know. For example, *tortuous* contains that same root as *torture*. The adjective suffix *-ous* is added. This helps you guess that the word *tortuous* means, “very hard, almost like being tortured.”

TEST EXAMPLE

- 1 Which word or words best replace *seemingly*?

An airplane can fly through the air, seemingly defying gravity.

- (A) as if
- (B) without
- (C) proudly
- (D) in addition to

THINK ABOUT THE ANSWER

The answer is option A. The root *seem* in *seemingly* can mean, “something that looks one way but is really another way.” The airplane *seems* to be defying gravity, but as you learn later, it is really held up by the difference in air pressure above and below its wings.

NOW YOU TRY IT

- 2 Which answer best defines *beneficiaries*?

Modern business travelers are certainly the beneficiaries of Bernoulli’s discoveries.

- (F) people who study Bernoulli
- (G) people who ignore Bernoulli
- (H) people who mistrust Bernoulli
- (J) people who are positively impacted by Bernoulli

Check your answer on page 109.



Beginnings and Endings

Use your knowledge of prefixes and suffixes to eliminate nonsense choices in questions that focus on word meanings.