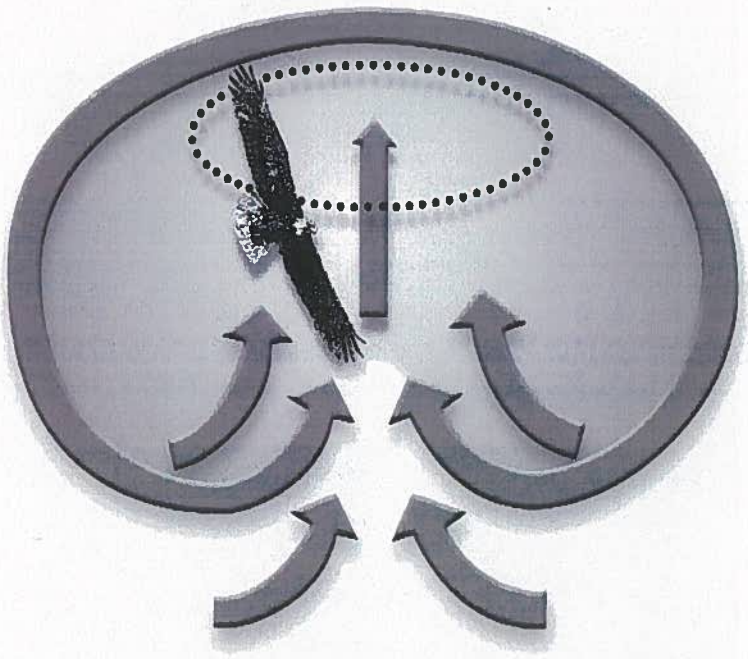
Floating on Air

SCIENCE

Hawks and eagles use currents of air to help them gain altitude and soar effortlessly as they search for prey below. They appear to be, and indeed are, floating on air with motionless wings. Natural air currents, called thermals, enable these broad-winged raptors to conserve energy during their hunting voyages.



Thermals are formed when the sun warms air near the ground. This warm air rises and pulls cool air underneath it. Hawks and eagles place themselves in the middle of the rising air. As they spread their wings and circle, the air carries them up and up. The birds can then remain at the top of the thermal effortlessly, as if they were resting on a hot air balloon.

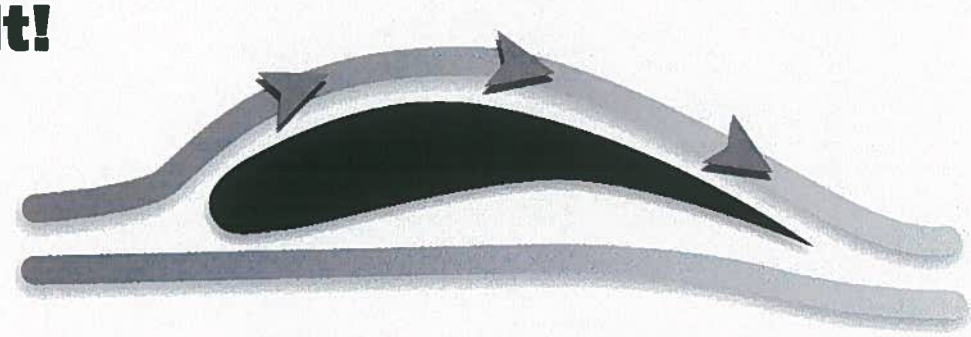
To demonstrate to students how this works, try this simple experiment: You will need a dishpan, an empty lidless plastic bottle (a 2-liter soda bottle works great), a balloon, and access to hot water.

1. Place the plastic bottle in a freezer for at least one hour.
2. Just before you are ready to show the demonstration, fill the dishpan with hot tap water and place it on a surface where the students can see it.
3. Remove the plastic bottle from the freezer and stretch the balloon over the neck of the bottle.
4. Put the bottle in the water, and watch the balloon as it expands.

This simple experiment demonstrates two concepts that are critical to flight. First, as air is warmed, the air molecules will move faster. The distance between the molecules will increase, so they will occupy a greater volume. In other words, the air expands and that's what inflates the balloon. Second, as warm air expands, its density and the pressure it exerts is less than the cold air beneath it, so it rises.

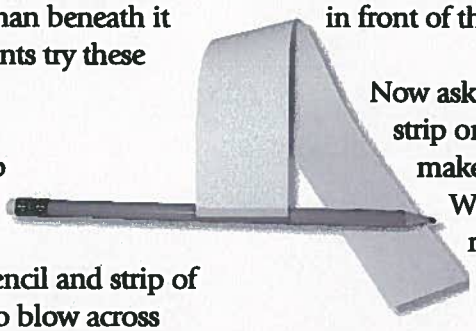
Winging It!

SCIENCE

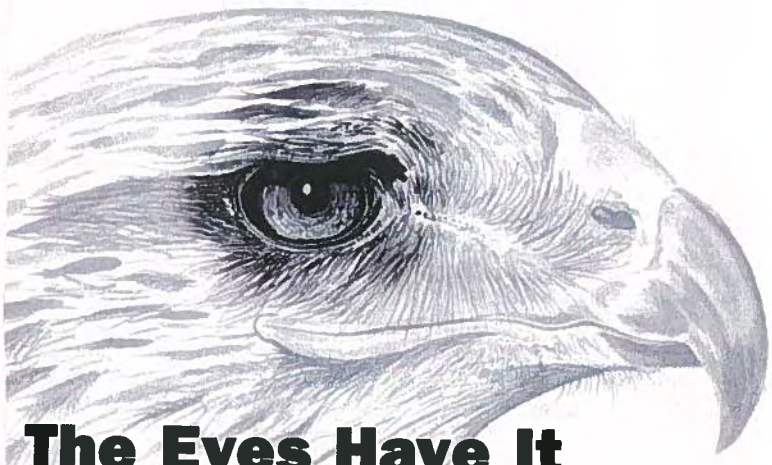


Changes in air density and pressure also enable wings to work. Because of the shape of a hawk's wings, air moves faster over the top of the wing than underneath. This results in lower air pressure on the top of the wing than beneath it and the wing naturally rises! Have your students try these two simple experiments to demonstrate this:

For this experiment, ask students to cut a strip of notebook paper $1\frac{1}{2}$ inches wide and 11 inches long. They should tape one end of the strip to a pencil as shown. Holding the pencil and strip of paper in front of their mouths, ask students to blow across the top of the paper. As they blow harder, the strip will begin to flutter and rise into the air. If students keep blowing, the airflow should cause the strip to stand nearly horizontally out in front of them.



Now ask students to place the pencil with the paper strip on top of their desk. Challenge them to make the pencil rise by blowing on top of it! While seemingly impossible, the pencils will rise slightly and move away from them!



The Eyes Have It

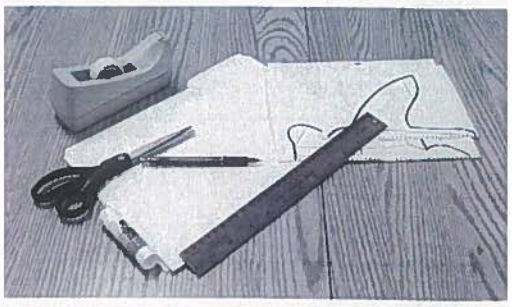
SCIENCE

Most buteo's eyes have resolving power, the ability to separate two very close objects at a distance, that is eight to ten times better than the resolving power of human eyes. Think of two people walking away from you along a very long straight street. Initially, you can see them both clearly. As they get farther and farther away, there will be a point at which you can no longer see two persons—their images will have merged. When you just see the images merging, you have reached the limit of resolution of your eyes.

Let students see for themselves just how good a hawk's vision can be. Have students place two identical small objects, such as erasers, one inch apart at the end of a hallway. Ask them to back away from the objects until they cannot see the two as separate anymore. Next, students can measure this distance and multiply it by eight. That's hawk vision!

The Hawk and The Falcon

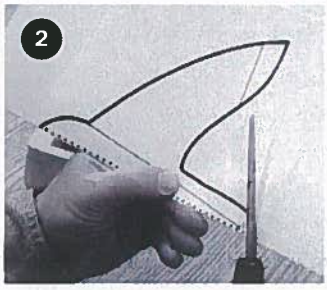
SCIENCE



Nature has fine-tuned the body designs of hawks and falcons to endow them with abilities essential to their lifestyle. These models can be used to compare and contrast the structure and flight of these two birds of prey. Students will need an old file folder, a small piece of modeling clay, tape and glue to complete each model.

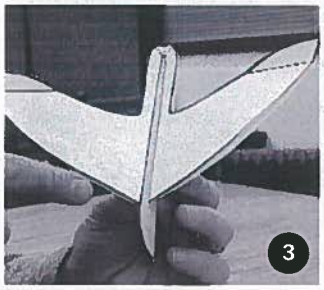
TO BEGIN:

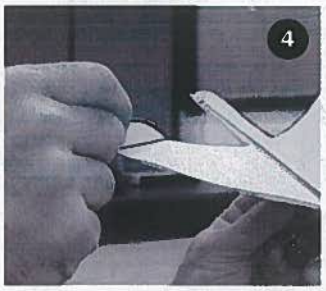
1. Tape the template to the file folder. Make sure the bottom edge of the template (thick dotted line) is at the folded edge.
2. Cut along the solid lines. Score along the fine dotted lines—put a ruler or straight edge along the line you want to score. Hold it there firmly. Use a ball point pen to draw a line against the ruler. Press hard to make a crease in the paper. Do this on both sides of the folder.

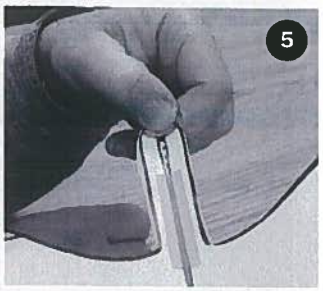


TO COMPLETE THE FALCON:

3. Bend the wings and tail out to the side. Glue the body together from the front of the wing to nearly the tip of the tail. Stop where the shaded area begins.
4. Bend the tips of the wings up along the score line.
5. Use the tip of your finger to make a small upward tilt to the tail on the shaded area.

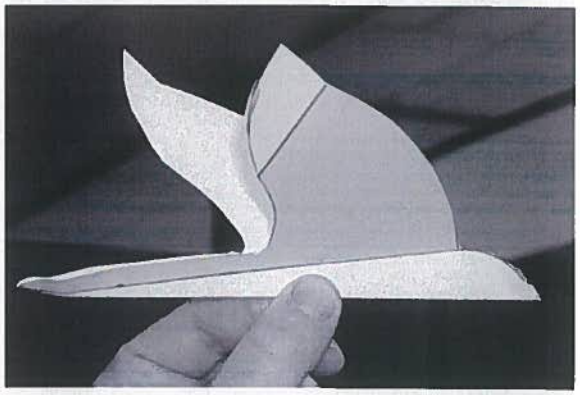






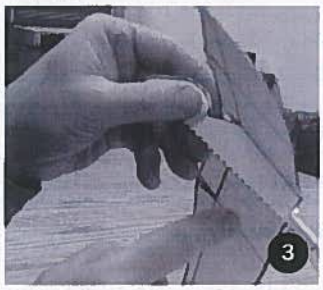
6. Check to see that the wings are even and point up slightly. Put a small amount of modeling clay inside the head. Test fly the falcon to see if you need more or less. When you are satisfied with its flight, tape over the head.
7. Referencing a bird identification guide; you can use markers, colored pencils, or crayons to decorate your falcon.

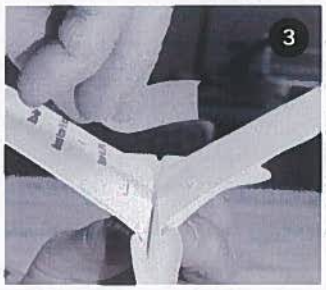
Falcon silhouette

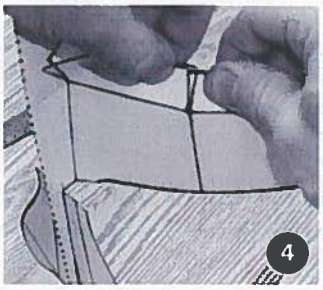


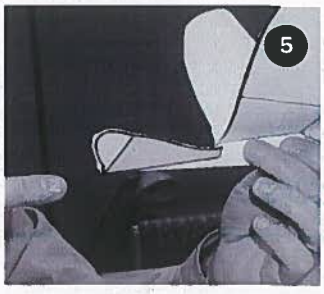
TO COMPLETE THE HAWK:

3. Bend the wings and tail out to the side. Then glue **Tab A** outside the body. This will make a small "V" shaped dip where the wings begin. Behind this dip, place a piece of tape over the slit where the wings join.
4. Find the two overlap lines on either side of the slit on the middle of each wing. Put some glue on the top of the tab nearest to the body and slide the other over until the tabs overlap. Hold them together until the glue dries. This gives the wings their upward bent shape.
5. Bend the sides and the tips of the tail up.









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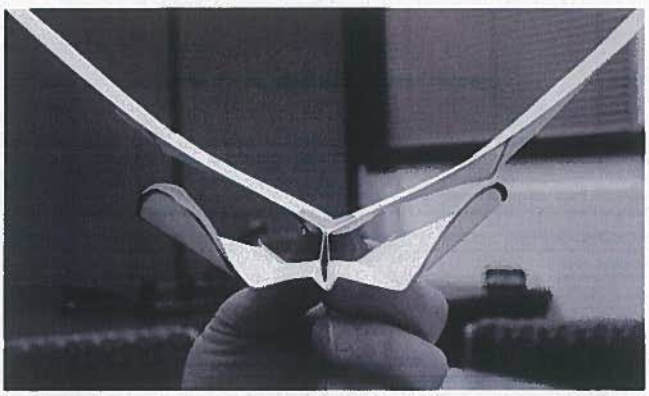


Nests Are Neat

Subjects: Math and Science

Objective:

Math: Students will use and understand numbers.

Science: 1. Students will investigate the diversity of animals.

2. Students simulate animal behavior.

Materials:

- Materials for nest making (students collect)
- Nests are Neat Worksheet
- Tape measure

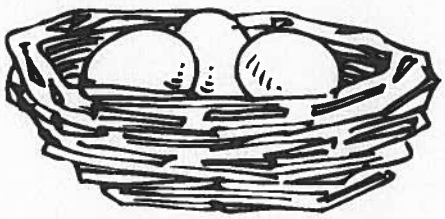
Procedure:

1. Discuss what your students know about nests. Where are nests sometimes located? What materials do birds use to make nests? How are nests built?
2. Share pictures of nests. Remind the students that nests vary as much as the birds that make them. Some birds nest high in trees; some nest on the ground. Some birds plaster their nests to the sides of buildings or on rocky cliffs. Not all birds use the same things to build their nests either. Sticks, mud, grasses, spider webs, twine, twigs, leaves, foil and scraps of cloth are a few things birds might use building their nests.
3. Tell students they are going to build a bird nest. First, they will need to collect their materials. (Remind students not to pick flowers or pull up living plants.) To simulate a bird's beak, they may use only their thumb and index finger to pick up materials. They should use their fist to form a cup shape in the nest. Ask them to think about how a bird might form the nest into the cup shape. Many species will sit in the center of the nest and turn in circular motions, pushing and shaping the material.
4. Students should share their nests with one another when finished.
5. For the second part of this activity, students will be talking about nest sizes and figuring the area. Talk again about the shape of nests, most are round. The sizes vary from an eagle's nest (9 feet in diameter) to a hummingbird's nest (3 inches in diameter).
6. Measure a nine foot line on the floor. Have the students stand in a circle around this line. Tell them this is the size of an eagle's nest. When finished, tell them they are going to learn how to figure the area of a circle. Before they sit down, you might want to explain that area is the amount of room inside the circle.
7. Pass out the Nests are Neat Worksheet. Practice the formula with your students. When they are comfortable with the formula, have them figure the area for the following birds' nests.

   Answers:

Great Blue Heron	$A = 5.9$ feet^2
Eagle	$A = 63.6$ feet^2
Hummingbird	$A = 7.1$ inches^2
Red-tailed hawk	$A = 5.3$ feet^2

8. Don't stop with the worksheet! Have the students do some research to find out nest sizes of other bird species.



Nests are Neat!

Figuring the area of circles is as easy as pi.

There are many things in our world that are circular in shape. Look around you, do you see any? Go to one of the objects and measure the distance around the circle. This is called the **circumference**. Next, measure the distance from one side of the circle to the other. This is called the **diameter**. Divide the circumference by the diameter. If you did your calculations carefully, you should have come up with a number very close to 3.14. This number is called **pi**.

For about twenty five hundred years, mathematicians have known this little "magic" trick. They have also used pi, which symbol looks like this π, to figure the area of a circle. **Area** is the amount of space inside the circle. It is measured in square units. Think of it like this, if you cut out a whole bunch of little squares, how many little squares could fit inside the circle?

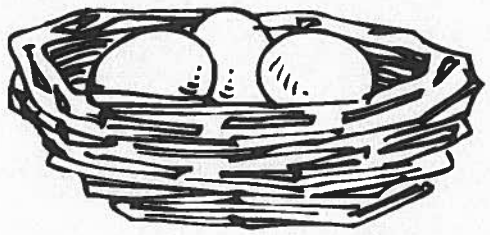
The formula to find the area of a circle looks like this: **Area = 3.14 X r^2**

Figure the area of the following nests. Here's how:

1. You're given the diameter (d), which is the length across the center of the nest. To use the formula you first need to get the radius (r), which is half the diameter.
2. Divide the diameter (d) by 2. This equals the radius (r).
3. Once you have the radius. Multiply it by itself. You've figured radius squared!
4. Lastly, multiply that number by π (3.14). Remember to write that little 2 above the unit of measure on your answer!

Great Blue Heron	d = 2.75 feet
Eagle	d = 9 feet
Hummingbird	d = 3 inches
Red-tailed hawk	d = 2.6 feet

Area of a great blue heron's nest = _____
Area of an eagle's nest = _____
Area of a hummingbird's nest = _____
Area of a red-tailed hawk's nest _____



Congratulations!
You're a circle master!!!