

TABLE OF CONTENTS

Lessons

Insect Anatomy	2
Anatomy: Eyes and Spiracles.....	12
Insect Metamorphosis.....	22
Beetles	32
Bees and Wasps	42
Moths and Butterflies	52
Four Common Flies	62
Book Review	70
Glossary	78
Answers	80

Important Information!

Science Mind Bender® books teach young students important scientific terms and problem-solving skills using interesting animals. Most of these scientific terms are taught at a much older age, so these lessons and activities are designed for use with a parent or teacher—they are not designed for independent student work. This is also a book that most students will enjoy, but find challenging. For these reasons, many students will benefit from working through the book more than once.

Students working through these activities will often become curious about the interesting animals in the pictures. This is a great opportunity to introduce some research skills, so students learn how easy it is to find answers to their questions.

Before beginning the first lesson, it is important to work students through the practice problem, so they learn the importance of marking false answers in the Mind Bender® activities. Students who do not mark the false answers will find the Mind Benders® much more challenging.

HOW TO USE A CHART

Each Mind Bender® puzzle gives you a chart and a set of clues. Read the clues very carefully and mark each space yes "X" or no "-" in the chart. Many students make the mistake of just marking "yes" answers in the chart. This makes the puzzles harder to solve since "no" answers sometimes lead you to the "yes" answer.

Example:

A girl, a boy, and their dad have their own pets. Use the clues and chart to find each one's pet.

1. The boy's pet and the dad's pet have legs.
2. The dad's pet likes to sit on his shoulder.

How to Solve:

1. Read clue 1. Look at each of the pets shown at the top of the chart. The bird and the horse have legs, but the snake does not, so the bird and the horse belong to the boy and the dad. If the bird and horse belong to the boy and the dad, the snake must belong to the girl.
2. Mark your answers on the chart. Draw X for yes in the box under the snake in the girl's row. Draw - for no in the other two boxes under the snake and in the other two boxes in the girl's row. Look at your chart; it shows the snake belongs to the girl, not to the boy or the dad.
3. Read clue 2. Could a bird sit on the dad's shoulder? Could a horse sit on the dad's shoulder? This clue tells us that the dad's pet is the bird.
4. Mark your answers on the chart. Draw X for yes in the box under the bird in the dad's row. Draw - for no in the other empty box under the bird and in the other empty box in the dad's row. This means that the bird belongs to the dad, not to the boy.
5. Look at the chart. If the snake belongs to the girl and the bird belongs to the dad, then the horse must belong to the boy. Draw X for yes in the last empty box.

		- ₁
- ₁	- ₁	X ₁
		- ₁

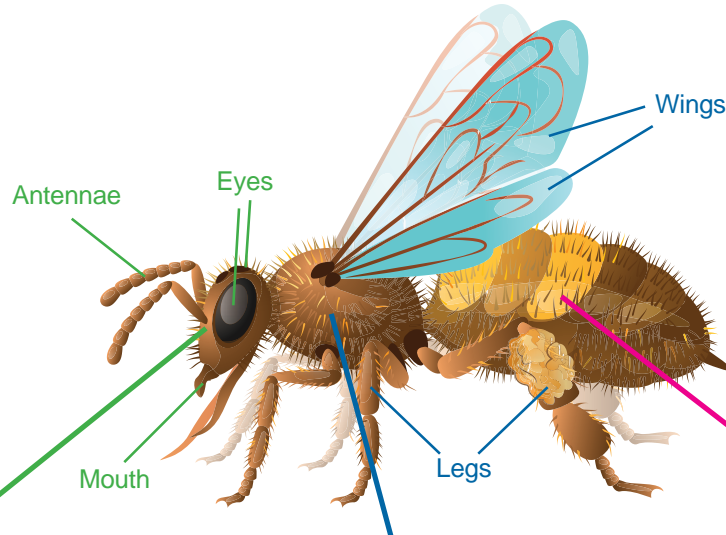
- ₂		- ₁
- ₁	- ₁	X ₁
X ₂	- ₂	- ₁

- ₂	X ₂	- ₁
- ₁	- ₁	X ₁
X ₂	- ₂	- ₁

Insect Anatomy

All insects are **cold blooded invertebrates** with **exoskeletons**. They have:

- 6 legs
- 3 body segments
- 2 antennae
- 0-5 eyes¹



Head

- Eyes
- **Antennae** are used to smell, touch, feel, or hear.
- Mouthparts are used for eating, defending, and attacking.

Thorax

This middle segment of the insect is where all 6 legs and the wings (if any) are attached.

Abdomen

This last segment is where the internal organs are protected. An insect's **spiracles**, or breathing holes, are located along the sides of the abdomen and thorax.

Look at the ant and the hornet. Point to the 6 legs, 3 body segments, 2 antennae, and eyes. Remember, these parts are found on all insects. If a creature doesn't have all these parts, it is not an insect. Notice that the ant does not have wings. Not all insects have wings.



ant



hornet

¹Only a few of the world's insects have no eyes. Most insects have 2-5 eyes.

Activity 1: Insect Anatomy

1. The three body segments that all insects have are: _____, _____, and _____.
2. All insects have _____ antennae and _____ legs.
3. Circle the **insect** in each row. Then explain why the other 2 animals are *not* insects.



scorpion



lacewing



slug



cicada



centipede



tick



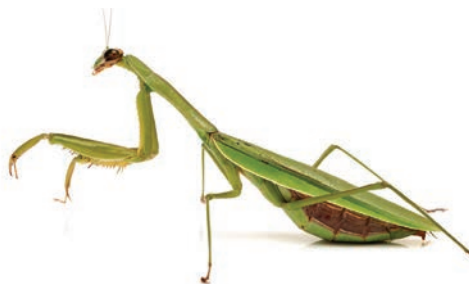
spider



crane fly



millipede



praying mantis






snail



woodlouse

Activity 2: Insect Anatomy

Directions: Fill in the chart using **X** for yes and **–** for no as you solve the puzzle.

	2	5	8
 bee			
 tarantula			
 beetle			

A bee, a tarantula, and a beetle all have a different number of eyes. Find how many eyes each animal has.

1. The animal that is *not* an insect has the most eyes.
2. The insect with the long, dark, wing covers has the fewest eyes.

Activity 3: Insect Anatomy

Directions: Listen to the clues and match them to the insect they describe.



June beetle



Baltimore
checkerspot butterfly



honeybee



soldier fly



bedbug



fire ant

1. As an adult I only live 5-8 days and do not have a mouth. I have a long, slender abdomen. Other animals often mistake me for a dark colored wasp and are too scared to eat me.
2. I have a small, tear-shaped abdomen. When attacking another animal, I bite with my mouthparts and sting using the tiny stinger at the end of my abdomen. My reddish-pink color warns other animals that I am dangerous.
3. I fly in a fast, unpredictable pattern. My white spiracles for breathing can be seen along my abdomen. My straw-like mouth is curled when I am not drinking nectar.

Activity 4: Insect Anatomy

Directions: Listen to the clues and match them to the insect they describe.



leaf cutter ant



honeybee



fly



lime butterfly



wasp



Hercules beetle

1. yellow-orange mouthparts for cutting • 2 large eyes
2. large eyes • 2 wings • tube-shaped mouth • greenish-blue exoskeleton
3. claw-like mouthparts for slicing • long antennae • 2 small eyes
4. long, clubbed antennae • 2 small, black eyes • long, thin, straw-like mouth

Activity 5: Insect Anatomy

Directions: Fill in the chart using **X** for yes and **—** for no as you solve the puzzle.



ladybug



dragonfly



wasp

	fast ¹	faster ²	fastest ³
ladybug			
dragonfly			
wasp			

A ladybug, a dragonfly, and a wasp have different types of wings. Find approximately how fast each insect beats its wings.

1. The insect with a striped abdomen beats its wings slower than the insect with 4 transparent wings.
2. The insect with a pair of spotted, protective, outer wings beats its wings more times per second than the insect with the long, slender abdomen.

¹fast: 30 beats per second

²faster: 90 beats per second

³fastest: 250 beats per second

Activity 6: Insect Anatomy

Directions: Listen to the clues and match them to the insect they describe.



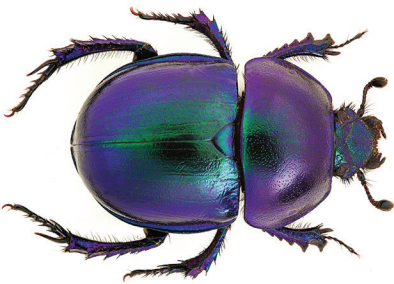
cicada



moth



cockchafer beetle



dung beetle



asparagus beetle

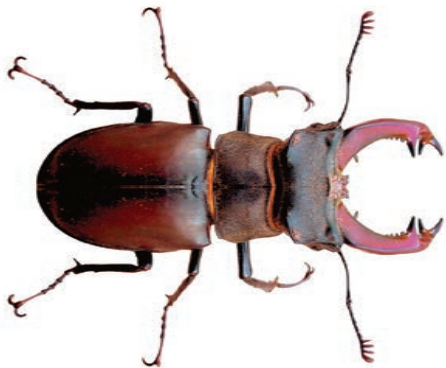


earwig

1. My legs have small claws on the ends to help me grip surfaces. You can count the "leaves" on my antler-like antennae.
2. My hard, spotted, outer wings protect my soft, hidden, flying wings. My long, beaded antennae are attached to my green-black head.
3. My short, bristle-like antennae are hard to see. Attached to my thorax are legs and clear wings. My abdomen is large and thick, but shorter than my wings.

Activity 7: Insect Anatomy

Directions: Listen to the clues and match them to the insect they describe.



stag beetle



honeybee



flea



grasshopper



painted Jezebel
butterfly



mole cricket

1. can jump 15-20 inches • no wings • tiny antennae • striped abdomen
2. powerful forelegs for digging • large abdomen with 2 "tails"
3. thin legs • can taste with feet • colorful wings
4. can taste with antennae • oval-shaped abdomen • long hairs on legs to collect pollen

Interesting Animals in This Lesson



bedbug

This tiny **parasite** is smaller than a grain of rice and likes to live in warm, cozy places where it can hide during the day and drink the blood of warm blooded animals in the dark. Its bite is itchy. After eating, it has the energy to grow and mate. It can go without food for about 2 months.



flea

This harmful parasite lives by drinking the blood of mammals and birds. Their bites itch and can also spread disease. A flea can jump 15 inches (100 times its body length) to land on its **host**. A flea can lay about 25 eggs a day. After it lays eggs, the **larva** eats adult flea poop (also called **dung** or **scat**) which is hardened, digested blood.



June beetle

In the late spring this extra-large beetle emerges from underground to eat flowers, fruit, and leaves—so gardeners don't like to see them! The female lays eggs 2-5 inches beneath the soil in her **burrow**. After hatching, the larvae eat roots and can damage plants. Birds and small mammals eat these **grubs**.



earwig

The earwig gets its name because of its ear-shaped wings. They don't have wing muscles, so they use their **pincers** to carefully fold and tuck away their wings. Their pincers are also used for defense, wrestling other males, and attracting mates. The pincers can pinch, but usually not strong enough to break human skin. Earwig mouth parts are designed to chew plants.



stag beetle

Stag beetles get their name because their mouthparts look like deer antlers. Like deer, male beetles use these to fight with other males. They won't hurt you though. They eat decaying plants and help to create nutrient-rich soil. When they are young they live in and eat rotting wood and other decaying material.



grasshopper

Its long, powerful, hind legs make it able to jump 20 inches, about 20 times its body length (imagine you could jump across 2 or 3 buses in 1 leap!). It bites and chews leaves. Its "ear drum" on its abdomen is used to "hear" other grasshoppers. Each group of grasshoppers uses a different song rhythm to attract mates.

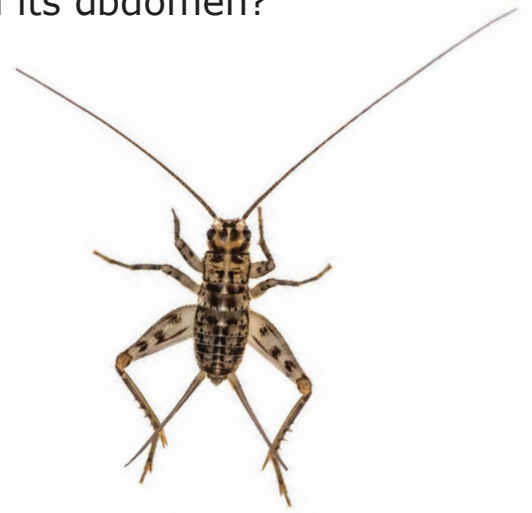
Review: Insect Anatomy

Directions: Answer each question by pointing.

1. Point to each insect's thorax.
2. Point to each insect's abdomen.
3. All insects have two antennae, but which two insects have very short antennae?
4. All these insects have wings, but point to the insect that has a brightly colored exoskeleton protecting its wings.
5. Which insect has a head that is wider than its abdomen?



forest caterpillar hunter



cricket



dragonfly



housefly