

Skullduggery

Grade Levels: 4-8

In a Nutshell

Blindfolded students will be introduced to an array of mammal skulls. A variety of different skull adaptations will be discussed, especially those relating to the structures and functions of different types of teeth.

Objectives

Following the activity, the students will be able to

- define the terms *herbivore*, *omnivore*, and *carnivore* and give two examples of mammals that are herbivores, omnivores, and carnivores;
- describe the purpose or functions of incisors, canines or fangs, and molars;
- distinguish between herbivores, carnivores and omnivores by the skull and tooth adaptations;
- formulate and justify their opinion regarding the classification of humans as herbivores, carnivores, or omnivores based on their skull adaptations;
- relate skull and teeth adaptations to the lives of respective animals and their abilities to adjust to changes in their environment.

Skullduggery Pre-visit Activities

The following materials are aids to help prepare your students for their visit to the Central Wisconsin Environmental Station. The vocabulary list contains terms and concepts your students will encounter in their visit. Please modify the definitions as needed. The activities listed below are merely options – it is not necessary to do them all or follow any particular order. Keep in mind that your students' learning experiences at CWES will be enhanced if they are familiar with these concepts and terms prior to the on-site activities.

Pre-visit Vocabulary

Use the following words as vocabulary or spelling words to prepare your class for their visit to CWES.

| | |
|------------------|---|
| Adaptation: | a special feature or behavior that living things have that help them survive in their environment. |
| Atlas: | place where the spine attaches to the skull |
| Braincase: | part of the skull that encloses the brain; also called the cranium |
| Carnivore: | an animal that eats meat (other animals) |
| Carrion: | dead and rotting meat |
| Dichotomous Key: | a series of questions, each of which points out a certain feature of similar living things to help distinguish between them |
| Habitat: | the place where an animal lives and all of its needs for life are met |
| Herbivore: | an animal that eats plants |
| Mammals: | a class (<i>Mammalia</i>) of warm-blooded animals with back bones that have mammary glands, hair, and two sets of teeth, as well as other Characteristics |
| Omnivore: | an animal that eats both plants and meat from other animals |
| Sagittal Crest: | the ridge down the top, center of the skull where the jaw muscles attach |
| Sinuses: | the cavity at the front of the skull connecting to the nasal cavity |
| Species: | a population of naturally reproducing organisms |

Skullduggery Pre-visit Activities

| | |
|-----------------|---|
| Spinal Column: | The backbone |
| Zygomatic Arch: | extends beyond zygomatic bone; the jaw muscle passes through the arch and attaches to the saggital crest (the larger the arch, the more developed the muscle) |
| Zygomatic Bone: | the bones found on each side of the face forming the prominence of the cheek |

Activity #1

Ask if anyone has ever used a tool to identify something. What might they have used? *ID books, pictures, dichotomous key*. Tell students that dichotomous keys are a handy tool with which to identify things. Explain to students what a dichotomous key is, and that there can be a dichotomous key for anything: birds, trees, caterpillars, etc. At each step along the key, there are two descriptions of a particular characteristic. The user chooses the description that best matches the thing they are trying to identify. Each step narrows down the choices until the thing is identified. To practice using a dichotomous key we will use a key for students in our classroom! Hand out or put on an overhead the dichotomous key for students. Tell students that you are going to key out people in the class to better understand how the key works. Go through the key with the students. Have one student stand up at a time and have the group key them out. Once a student is keyed out, write his/her name in the category under which he/she falls. If two people key out at the same step, you can invent another category to separate them.

Activity #2

Have your students pretend that they are writing a key for something. It can be anything they want – sports balls, their toys, their family, etc. It must be a key that anybody could use even if they had no knowledge of the objects beforehand. Remind them that a dichotomous key involves choices at each step, be sure that they set it up in a similar manner to the one on the preceding pages. If possible, have field guides or other dichotomous keys available for them to use as a reference.

Skullduggery Pre-visit Activities

Dichotomous Key For Students

1. Female...2
Male...17
2. Brown hair...3
Not brown hair...6
3. Brown eyes...4
Not brown eyes...9
4. Earlobes attached...5
Earlobes unattached...11
5. Freckles...student is _____
No freckles...student is _____
6. Brown eyes...7
Not brown eyes...12
7. Earlobes attached...8
Earlobes unattached...14
8. Freckles...student is _____
No freckles...student is _____
9. Earlobes attached...10
Earlobes unattached...15
10. Freckles...student is _____
No freckles...student is _____
11. Freckles...student is _____
No freckles...student is _____
12. Earlobes attached...13
Earlobes unattached...16
13. Freckles...student is _____
No freckles...student is _____
14. Freckles...student is _____
No freckles...student is _____
15. Freckles...student is _____
No freckles...student is _____
16. Freckles...student is _____
No freckles...student is _____
17. Brown hair...18
Not brown hair...21
18. Brown eyes...19
Not brown eyes...24
19. Earlobes attached...20
Earlobes unattached...26
20. Freckles...student is _____
No freckles...student is _____
21. Brown eyes...22
Not brown eyes...27
22. Earlobes attached...23
Earlobes unattached...29
23. Freckles...student is _____
No freckles...student is _____
24. Earlobes attached...25
Earlobes unattached...30
25. Freckles...student is _____
No freckles...student is _____
26. Freckles...student is _____
No freckles...student is _____
27. Earlobes attached...28
Earlobes unattached...31
28. Freckles...student is _____
No freckles...student is _____
29. Freckles...student is _____
No freckles...student is _____
30. Freckles...student is _____
No freckles...student is _____
31. Freckles...student is _____
No freckles...student is _____

Skullduggery Post-visit Activities

A visit to the Central Wisconsin Environmental Station can be a school-year highlight for both students and their educators. We feel the knowledge and concepts gained during a Station visit apply outside the Station as well. The following activities will allow students to expand their knowledge and help them incorporate those lessons into their everyday life. Feel free to pick from and modify the activities as best suits your group.

Activity #1

Challenge your students to complete the crossword puzzle found on page two. The answer key is located on the resources page.

Activity #2

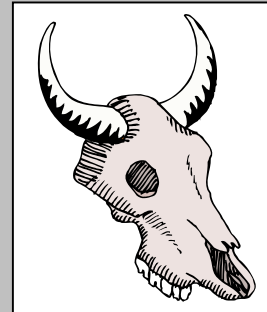
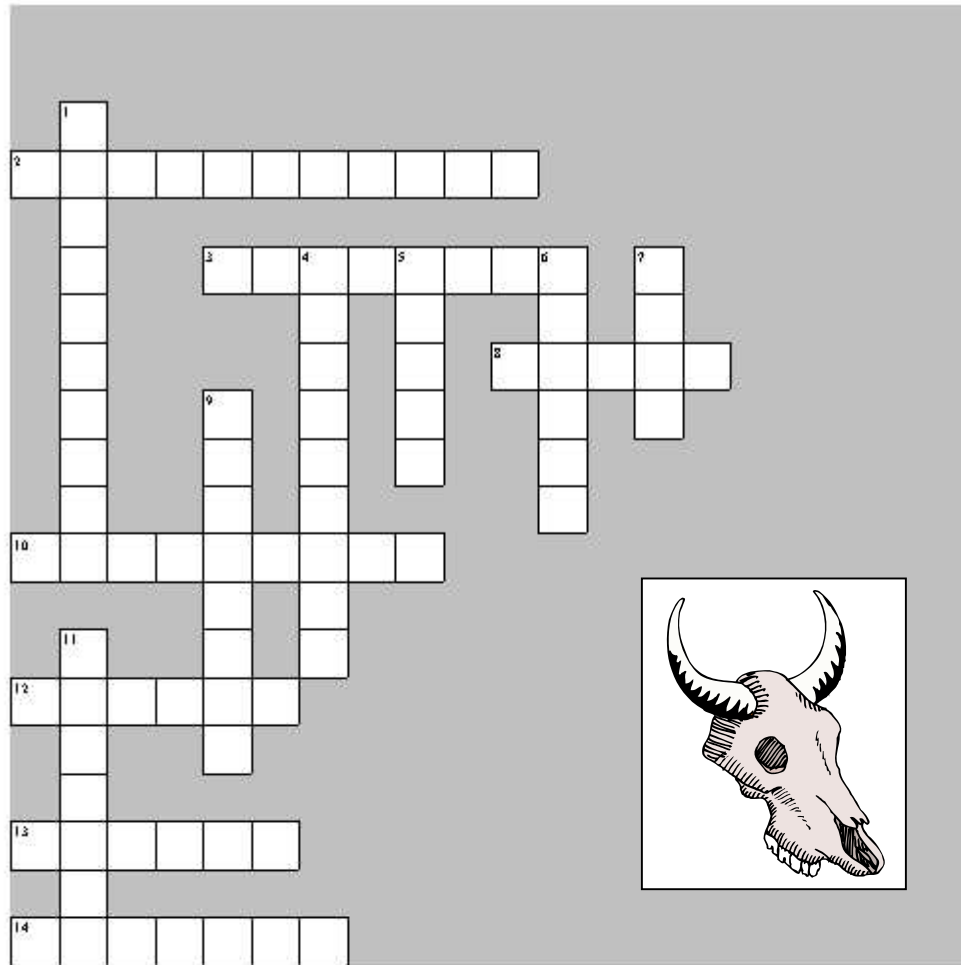
Label the teeth indicated on the two skulls on page seven as incisors, canines, or molars. The answer key is on the page. What can you figure out about these two animals just by looking at their teeth? What do you think they eat? Make a guess as to what kind of animals they come from. To further this activity, have them complete Activity #3 using this skull. The answer key is on the resources page.

Activity #3

Using the key beginning on page eight, identify the skulls that are found on page ten. The skulls are drawn to actual size. You might need a ruler to help you. Answer keys to the skulls are on the resources page. Once the skulls have been identified, have the students use field guides or other resources to learn more about the animal. Some questions you could have them answer could be: What does their animal look like? Where does it live? What does it eat? Have them brainstorm some other foods that they could eat, based on what they know about the skull and teeth. Encourage them to think about why the animal lives where it does – is its food source available elsewhere? Does it need protection from predators? Does its size limit its habitat choice?

Skulduggery Post-visit Activities

Skulduggery Crossword Puzzle

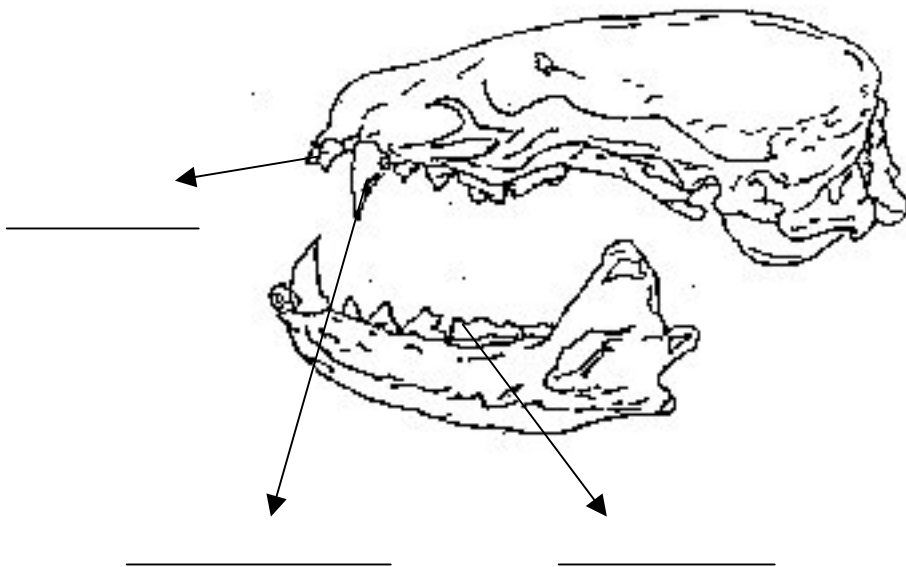
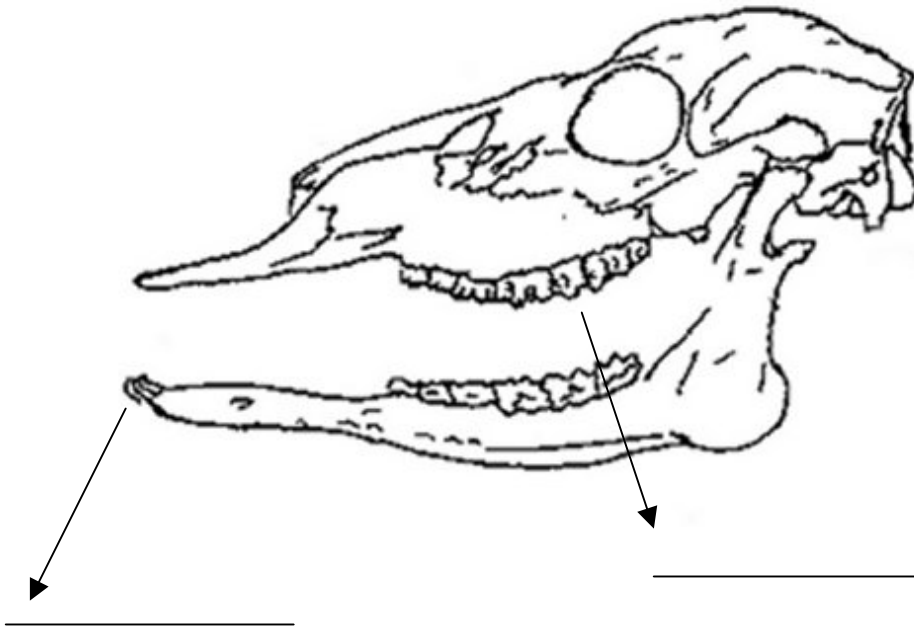


- | Across | | Down | |
|--|---|--|--|
| 2. You can use a _____ key to help you identify an unknown object. | 12. Plant-eaters use their _____ to grind up their food. | 1. It is sometimes useful to use a _____ to identify animals or learn more about them. | 6. You might be able to tell how an animal got around by looking at how its _____ cord was connected to its skull. |
| 3. When you bite into an apple, you use your _____. | 13. Meat-eaters use their _____ teeth to tear meat. | 4. A _____ eats only meat. | 7. A _____ has no upper front teeth. |
| 8. Prey animals usually have eyes on the _____ of their head. | 14. An animals skull is _____ to help it live in its environment. | 5. You can tell what an animal ate by looking at the teeth in its _____. | 9. An _____ eats both plants and meat. |
| 10. An _____ eats only plants. | | | 11. A predator's eyes are usually facing _____. |

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Skullduggery Post-visit Activities



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Skullduggery Post-visit Activities

Key to Mammal Skulls

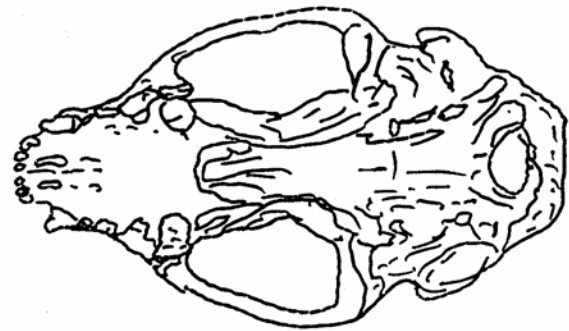
1. Does the skull have canine (fang) teeth on the upper jaw?
 - a. Yes, go to 2.
 - b. No, go to 19.
2. Are the canine (fang) teeth poorly developed (not the largest front teeth)? (Exception: Star-nose mole)
 - a. Yes, go to 3.
 - b. No, go to 4.
3. Are the teeth colored, and is the zygomatic arch absent?
 - a. Yes, Shorttail Shrew (*Blarina brevicauda*).
 - b. No, Mole (family: Talpidae).
4. Is the upper dental formula 3-1-4-2 (Incisor-Canine-Premolar-Molar)?
 - a. Yes, go to 5.
 - b. No, go to 12.
5. Does the brain case have a raised crest?
 - a. Yes, go to 6.
 - b. No, go to 10.
6. Is the skull 210 mm or longer, and is the width of canines about 12 mm at the base?
 - a. Yes, Grey Wolf (*Canis lupus*).
 - b. No, go to 7.
7. Is the upper jaw longer than 75 mm and skull 175-210 mm long?
 - a. Yes, go to 8.
 - b. No, go to 9.
8. Are the upper canine teeth long and slender (less than 11 mm wide) with relatively widely spaced upper and lower premolars?
 - a. Yes, Coyote (*Canis latrans*).
 - b. No, large Domestic dog, German Shepherd, Collie, etc. (*Canis* sp.).
9. Is the skull between 130-160 mm long and the upper jaw 50-75 mm?
 - a. Yes, Red Fox (*Vulpes vulpes*).
 - b. No, go to 10.
10. Is the skull between 115-128 mm long?
 - a. Yes, Raccoon (*Procyon lotor*).
 - b. No, go to 11.
11. Is the last molar twice as long as wide?
 - a. Yes, Brown Bear (*Ursus middendorffi*).
 - b. No, Black Bear (*Ursus americanus*).
12. Is the upper dental formula 3-1-3-1 (Incisor-Canine-Premolar-Molar)?
 - a. Yes, go to 13.
 - b. No, go to 17.
13. Is the brain case (cranium) and last molar in the shape of a triangle?
 - a. Yes, Badger (*Taxidea taxus*).
 - b. No, go to 14.
14. Is the skull less than 50 mm long?
 - a. Yes, Shorttail Weasel (*Mustela erminea*).
 - b. No, go to 15.
15. Is there a high, sloping forehead, with hind teeth that are very sharp and pointed for shearing?
 - a. Yes, Domestic cat (*Felis* sp.).
 - b. No, go to 16.
16. Is the last upper molar noticeably wider than it is long with a bony plate extending 5 mm beyond the molars?
 - a. Yes, Mink (*Mustela vison*).
 - b. No, Skunk (*Mephitis mephitis*).
17. Are there 3 or more upper incisors?

Skullduggery Post-visit Activities

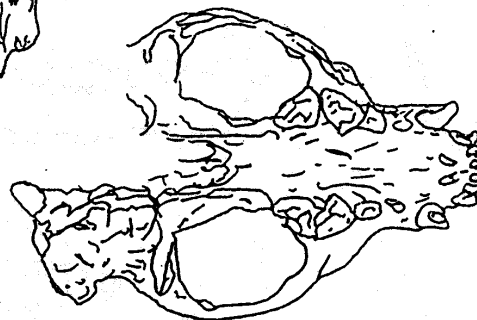
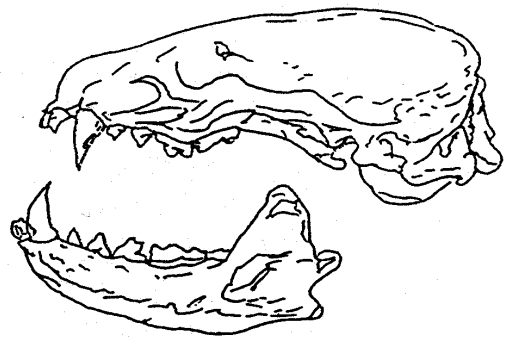
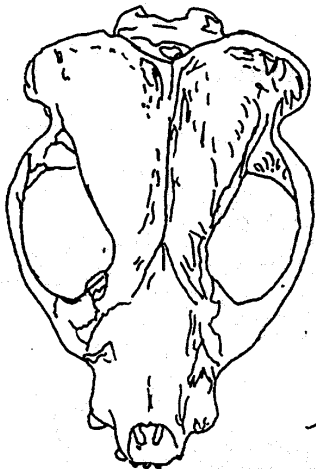
- a. Yes, go to 18.
 - b. No, Bat (Family *Vespertilionidae*) (actual number varies by species).
18. Are there **more than** 3 upper incisors?
- a. Yes, Opossum (*Didelphis marsupilis*).
 - b. No, River Otter (*Lutra canadensis*).
19. Does the skull have front gnawers for plant eating?
- a. Yes, go to 20.
 - b. No, go to 29.
20. Are there two pairs of upper incisors (4 total), and does the skull seem very fragile?
- a. Yes, Cottontail Rabbit (*Sylvilagus floridanus*).
 - b. No, go to 21.
21. Are the upper incisors orange-colored?
- a. Yes, go to 22.
 - b. No, go to 25.
22. Does the skull have 4 upper molars on each side?
- a. Yes, go to 23.
 - b. No, go to 24.
23. Is the skull longer than 120 mm?
- a. Yes, Beaver (*Castor canadensis*).
 - b. No, Porcupine (*Erethizon dorsatum*).
24. Is the skull between 90-110 mm?
- a. Yes, Woodchuck (*Marmota monax*).
 - b. No, Muskrat (*Ondatra zibethicus*).
25. Is the skull longer than 55 mm?
- a. Yes, Grey Squirrel (*Sciurus carolinensis*).
 - b. No, go to 26.
26. Is the skull smaller than 30 mm long?
- a. Yes, Deer Mouse (*Peromyscus maniculatus*).
 - b. No, go to 27.
27. Does the skull have 4 functional upper molars?
- a. Yes, Striped Chipmunk (*Tamias striatus*).
 - b. No, go to 28.
28. Is the skull relatively narrow with a weak and narrow brain case?
- a. Yes, Striped Ground Squirrel (*Citellus tridecemlineatus*).
 - b. No, Red Squirrel (*Tamiasciurus hudsonicus*).
29. Is the last molar twice as long as it is wide?
- a. Yes, Domestic horse.
 - b. No, go to 30.
30. Is the skull between 260-350 mm long and have jagged molars for grinding plants?
- a. Yes, White-tailed deer (*Odocoileus virginianus*).
 - b. No, Hippogiraffopine (But try again to be sure!!)

Skullduggery Post-visit Activities

Skull A



Skull B

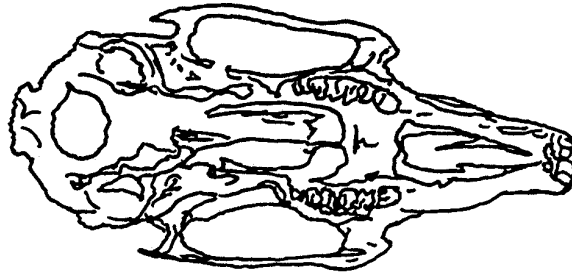
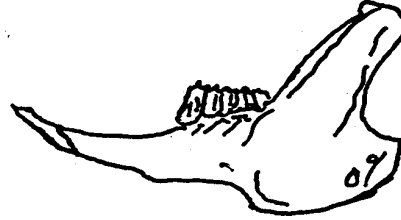
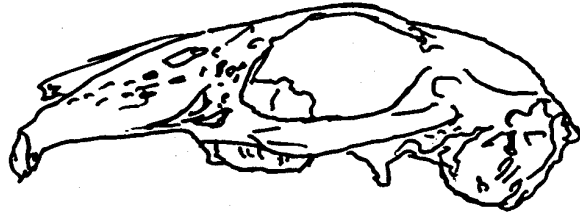


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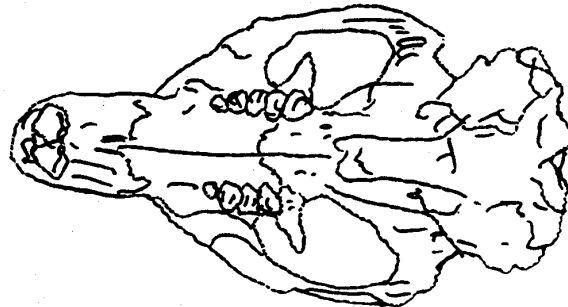
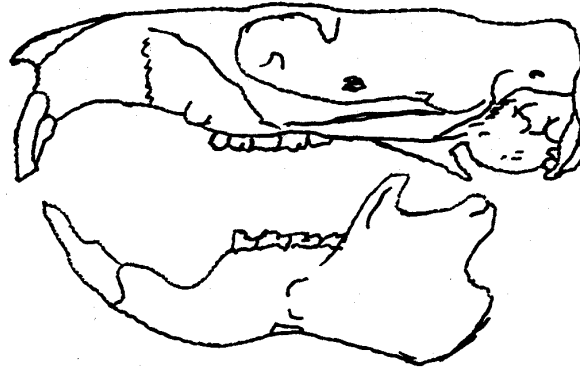
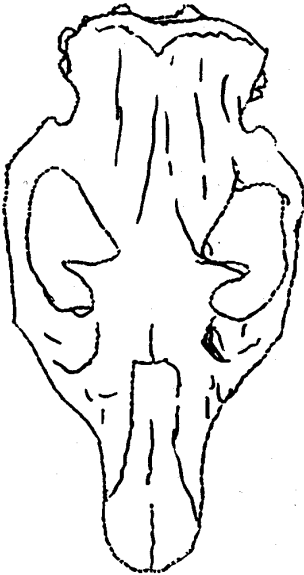
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Skullduggery Resources

Skull C



Skull D



Skullduggery Resources

Teacher Resources

Caras, Roger A. 1967. *North American Mammals*. New York: Meredith Press.

Jackson, Hartley H.T. 1961. *Mammals of Wisconsin*. Madison, WI: University of Wisconsin Press.

Any field guide to mammals is also a good resource.

Youth Literature

Johnson, Jinny. 1994. *Skeletons: An Inside Look at Animals*. Pleasantville, New York: Reader's Digest Kids. 46 pp.

Kahney, Regina. 1992. *The Glow in the Dark Book of Animal Skeletons*. New York: Random House.

Crossword Puzzle Answer Key

Across

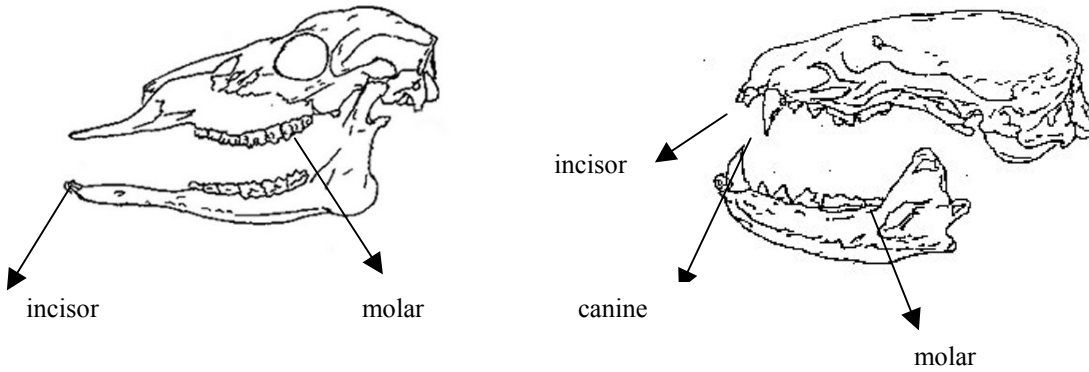
2. dichotomous
3. incisors
8. side
9. herbivore

Down

1. field guide (1 word)
4. carnivore
5. skull
6. spinal
7. deer
9. omnivore
11. forward

Skullduggery Resources

Post-visit Activity #2 Answer Key



Post-visit Activity #3 Answer Key

- Skull A – Striped Skunk
- Skull B – Badger
- Skull C – Cottontail Rabbit
- Skull D - Woodchuck