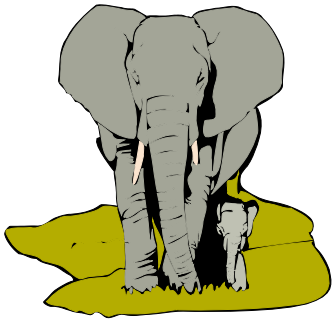


Why Elephants Have Big Ears and Badgers Don't

We often wonder why elephants are bald and have such huge ears.

We notice that most animals from hot countries are often ..... and animals from cold places are usually ..... We wonder if temperature has anything to do with the size that animals can be.

We know that warm blooded animals make their heat from ..... The food is ..... and taken by the bloodstream around the body. Heat is actually made in the .....

Perhaps we can look at how size affects the amount of ..... an animal can make and how easily it loses it.

We should do a mathematical investigation. To make the calculations easier, we will think of all animals as being roughly..... We can then work out the volume of a sphere, and what would happen each time we double the radius of the sphere.

spherical, thin, heat, fat, cells, food, digested

The formula for the volume of a sphere is: $V = \frac{4}{3}\pi r^3$ where r is the radius of the sphere and π is the constant pi. (Pi = 3.14)

So, if our sphere has a radius of 2cm. Then we would do this sum: (2 x 2 x 2) x (3.14 x 4/3) = Volume (We have turned it around to make it easier.) (You may use a calculator)

2 x 2 x 2 = ... x 3.14 -:- 3 x 4 = ... cm^3 (Round it off to 2 decimal places.)

Now try the same sum with a radius of 4cm. 4 x 4 x 4 x 3.14 -:- 3 x 4 = ... (Round it to 2 decimal places.)

So how many *times* is the second answer bigger than the first one?

Now double the radius again to 8cm. Do the sum. How many *times* bigger is this answer than the second one? .....

So: Every time we double the radius, the volume jumps by ..... times.

This means that as an animal grows bigger, it has many more cells in its body to make heat. So large animals create more heat than small ones.

We now need to look at how animals lose heat. We know that, when we run about, we go red as the blood comes to the skin surface to get rid of heat. So the size of the skin surface might be important. Check it out.

The formula for the surface area of a sphere with a radius of 2cm is:

$4\pi r^2$ (Remember: pi = 3.14)

The surface area of the sphere is: (4 x 3.14) x (2 x 2) = ... (Round it off).

Now double the radius to 4cm. Do the sum again. The surface area of a sphere with a radius of 4cm = ...

Try a radius of 8cm. What do you get? ..... How many *times* bigger is this than the last answer? .....

Try a few more and see what happens. .....

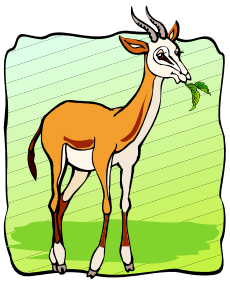
So, as animals double in size, they make ..... times as much heat, but can only lose ..... times as much through their surface area. The bigger you are, the hotter you get!

Elephants live in hot climates, so they have a real problem! The only way they can lose enough heat is to have a ..... skin (clue) and those huge ears, which they use as radiators. They flap in the breeze and lose heat. (Indian elephants are smaller and live in shady jungles, so they can afford to have smaller ears.)

Polar bears, on the other hand, have thick fur to trap heat. (Research – what colour is a polar bear hair?) Their skin is black to absorb heat, and their bodies are huge, with loads of cells, to generate lots of heat.

So animals are adapted to survive in the environment they live in. Their size, colour and shape all matter. Each time we look at an animal, from now on, we will ask ourselves 'Why is it like it is?'

So, what about our badger? How would you describe its adaption to climate? (Large body, short legs, thick fur.)



African antelope

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