

Many new mothers need advice about looking after their new baby. **Health visitors support them in this.** Understanding why things are important helps everybody learn and remember.

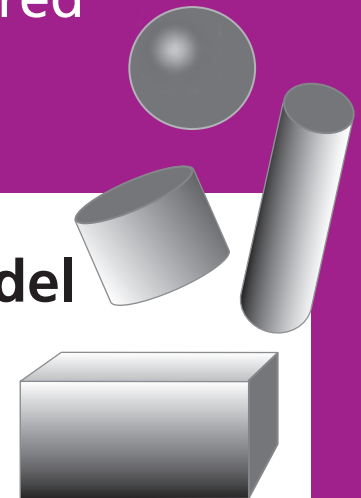
Why do babies need to be wrapped up to keep warm?

There are many reasons for this. One reason relates to the size of their bodies.

We lose heat through the surface of our body. So the larger the surface compared to our overall size, the more heat we lose.

Make a model of a baby and a model of an adult. For both, calculate the surface area and the volume.

How do your answers compare?



Childcare and early years : Keeping baby warm

Description

This topic explores the mathematics behind a well known aspect of looking after babies.

Activity 1: Making a model

Making a model is an extended activity in which the pupils working in groups make models to represent babies and adults and then compare the respective ratio of surface area to volume. The baby will have a much higher surface area to volume ratio than an adult. This is one of the reasons that babies lose heat quickly from their bodies and need to be well wrapped up in cold weather.

Begin the activity with a class discussion about why we need to keep babies wrapped up in winter and draw out body size as an issue. You may want to bring in a life-sized doll to help the discussion. Explain the task of mathematically modelling a baby, in this case by constructing a simplified physical model. Ask the pupils to produce a poster showing the group's plans for the model to be made. The physical model chosen will be adapted to the current attainment and experience of the pupils. It might be a simple overall cuboid or a more complex model involving a variety of cuboids or one including cylinders or even, for the highest attaining, spheres. Similarly, some pupils will want to make a life-size model using card, boxes and so on; for others, it is a good opportunity to work with scale measures to produce a smaller model perhaps using modelling material such as Plasticine. The process of mathematical modelling can be discussed and the benefits of simplicity contrasted with the benefits of accuracy.



Resources

A variety of materials can be used: suitable paper and equipment for making models, Plasticine (available in bulk from YPO) or play-dough, spreadsheet.

The pupils also need to make a model of an adult – for many, they may like to base this model on one of the group.

Throughout the activity there are opportunities for measurement and approximation.

Once the models are built, surface area and volume can be calculated and the ratio of surface area to volume calculated. Depending on the approach chosen, there will be the opportunity for substituting in formulae, either algebraically or in a spreadsheet. The pupils are unlikely to have worked on the volume and surface area of a sphere previously but they can search for this in textbooks or using the internet. The results can be plotted on a single graph for all the groups, showing the range of results and the overall trend of the relationship. In groups, the pupils try to explain the effect of this ratio on body heat loss.

The activity can conclude with each group making a brief presentation of their models, referring back to their planning posters, explaining their calculations and sharing the conclusions they have drawn.

The Mathematics

This mathematical modelling activity involves work on measurement, scale and surface area and volume of simple solids. Depending on the approach this may involve algebraic substitution.

