Shaping the land activity

Mining is the process of extracting valuable resources from the earth in order for them to be used for the many things we use every day. To mine the valuable resources a considerable amount of waste rock (or overburden) must be removed. This is handled separately to the valuable resource. The overburden is either placed into spoil piles or waste rock dumps and revegetated or used as back fill in a pit after mining.

In this activity you assume the role of an environmental scientist in planning the reshaping of a steep waste rock dump or spoil pile into a gradual slope using a scale model. You then take on the role of a bulldozer driver in carrying out these plans!

Equipment

Wet sand, playdough, wet clay or other similar malleable substance.

Large knife and other implements to shape the surface.

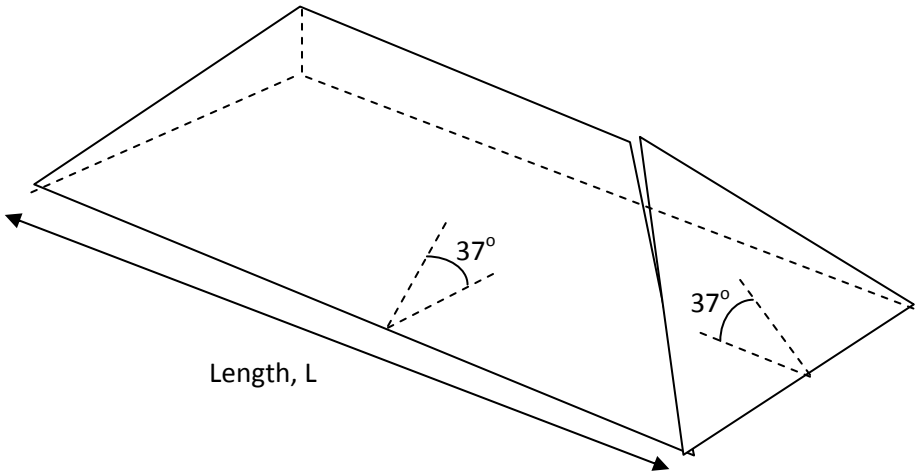
Ruler, protractor and other measuring instruments as required.

Method

1. Draglines are large machines with huge buckets that pile the overburden into high spoil piles. The soil piles have sides that slope at a 37 degree angle to the horizontal.

Using one of the materials above, build a scale model of a spoil pile in the following shape, with all angles at 37 degrees to the horizontal. If measurement of angles proves to be imprecise, use trigonometry to calculate the dimensions of the shape to provide the correct angles.

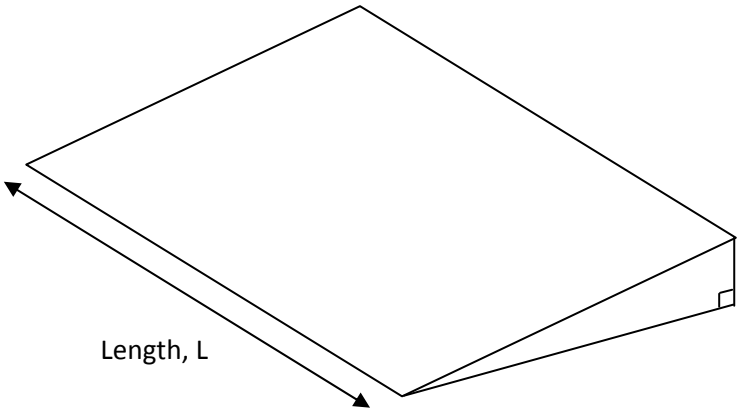
Extension option: In the real world, the ends of the spoil pile would be curved in the shape of a half-cone. Shape your spoil pile to reflect this shape.



2. Measure/calculate and record the dimensions and volume of your spoil pile. You may calculate the volume by dividing it into simpler solid shapes, or by measuring the volume of the material used at the conclusion of the activity.

3. Using the same volume of material, reshape your spoil pile into a gentle slope for rehabilitation. *The Environmental Authority specifies that the slope must be no more than one in ten.* This is the most costly part of the entire rehabilitation process, as bulldozers are expensive to operate, so be sure to move as little material as possible during your reshaping operation.

The final shape should be the same length as the original and it should be in the shape of a right-angled triangular prism, as shown:



4. Measure/calculate and record the dimensions and volume of your rehabilitation slope.
5. The top surface of your slope is the space that would be planted for regeneration. Calculate the area of this surface.
6. If the top surface is to be covered with topsoil to a depth of 2cm, what volume of topsoil is required?
7. Discuss any challenges that you faced in calculating and forming your rehabilitation surface.
8. Discuss some challenges that might be faced in a real mine in working through these processes.