TUNNELWORKS
KS3 SCIENCE LESSON 1 WORKSHEET
SAFE & STABLE: FORCES & PRESSURE

Site Report: Battersea
The main drive site at Battersea lies on London Clay soils. The site will be compacted before construction begins. The maximum safe pressure under any equipment is 125,000 Pa. This must not be exceeded for safety.

The site will be compacted using a heavy roller. Only a tiny fraction of the roller's surface touches the ground. Give two reasons why this is a good design for compacting the ground:

Jane, a site engineer, changes her shoes when she arrives. She takes off her office shoes, which have a small heel area. She puts on safety shoes that will protect her feet while on site. These have a large heel area. Which shoes leave the deepest prints in the site's car park, and why?

Challenge 1: Which crane?
Select the correct crane that will lower the Tunnel Boring Machine (TBM) in parts into the main shaft. The heaviest part of the TBM has a mass of 20 tonnes.

Which crane should you use? Remember 1kg mass acts with a force of 10N.

Crane	Mass	Tyre area (m2)	Pad area (m2)
A	48 tonnes	1.2	4.0
B	40 tonnes	1.2	3.6
C	52 tonnes	1.2	4.5

Challenge 2: How many rings?
The Thames Tideway Tunnel will be made of concrete segments. A ring of segments has a mass of 33,000 kg.

A gantry crane will lower each ring of segments down the shaft. The gantry crane has a mass of 125,000 kg. This rests on two foundations each measuring 2m x 5m.

How many whole rings of segments can the gantry crane safely lower at one time? _____