

Name \_\_\_\_\_

Date Due: \_\_\_\_\_

UNIT 4  
Topic 6

STRUCTURES and FORCES  
Designing with Forces

1. What are three key ways engineers design structures to help them withstand forces?
  - 1.
  - 2.
  - 3.
  
2. What is the problem with building with rectangular frames?
  
3. What shape is much better at withstanding forces than a rectangle?
  
4. Why do houses have so many 2 x 4's in each wall?
  
5. What is the problem with a load-bearing horizontal beam supported only at its ends?
  
5. What are three solutions to the problem in number 4?
  - 1.
  - 2.
  - 3.
  
6. Draw an arch. Use a force diagram to show how the arch redistributes forces which are coming down on top of it.

7. What is a cantilever? Draw a diagram of a simple diving board cantilever.

8. Charles wanted to explore an abandoned mine shaft. He was worried, however, that the entrance was very unstable and would collapse, so he decided to brace it. Draw a door entrance with braces added for strength.

9. What are two problems with using solid beams in construction?

1.

2.

10. What is the advantage of using I, L, or T beams?

11. What was used to support very large buildings hundreds of years ago?

12. Concrete is very strong with \_\_\_\_\_ forces but very weak when faced with \_\_\_\_\_ or \_\_\_\_\_ forces.

In many Asian countries, \_\_\_\_\_ is used as scaffolding instead of metal.

13. In the early days of the railroad, the rails would crack and shear easily. What manufacturing mistake caused this problem?

14. What is friction?

15. Give an example where friction is used in building.

16. When you step on a certain part of a floor and it squeaks, what is causing the squeak?