

Structural Engineering Note Packet

PV=100

NAME: _____ **Period:** _____

Directions: Complete this note packet while viewing the PowerPoint presentation.

1. List the 4 types of bridges, and **sketch** a picture of each:

1. _____ bridge sketch picture →

2. _____ bridge sketch picture →

3. _____ bridge sketch picture →

4. _____ bridge sketch picture →

2. Which type of bridge can span the farthest distance?

_____ bridge

3. What is your goal as a “Structural Engineer” in our competition?

4. What is the definition of “efficiency”?

Efficiency- _____

5. Write down the **efficiency formula** in the space below:

Efficiency = _____

First, watch the example in the PowerPoint...

Next, calculate the efficiency costs for the people below, and fill in the amounts on the chart. Remember, this is how much it costs each of them to support 1 pound! Who is the *real* winner? (You may use the calculator on your computer!)

| Engineer | Cost (cost to build) | Critical Load (pounds held) | Efficiency (cost to support 1 pound) |
|-----------------|--------------------------------|---------------------------------------|--|
| Tim | \$ 114.89 | 16 | \$ |
| Joe | \$ 138.35 | 36 | \$ |
| Jenny | \$ 163.72 | 40 | \$ |
| Sarah | \$ 220.21 | 50 | \$ |

Now answer the questions below:

6. Which engineer *held the most* amount of weight? _____
7. Which engineer *held the least* amount of weight? _____
8. Which engineer *spent the most* money per pound held? _____
9. Which engineer *spent the least* money per pound held? _____
10. Which engineer is the *most efficient* (best performance at lowest cost)? _____
11. Why is this person the *most efficient*? What makes them the overall winner? Explain your answer below:

Definitions:

12. **Critical Load-** _____

13. **Optimization-** _____

14. **Trade-offs-** _____

5 Forces Lab:

15. A *squeezing or pushing* force is called _____.

Sketch a picture below of this force in action:

Your Picture 

16. A *stretching or pulling* force is called _____.

Sketch a picture below of this force in action:

Your Picture 

17. When a straight material flexes and becomes *curved*, the force is called _____.

Sketch a picture below of this force in action:

Your Picture 

18. A *sliding* force is called _____.

Sketch a picture below of this force in action:

Your Picture 

19. A *twisting or turning* force is called _____.

Sketch a picture below of this force in action:

Your Picture 

Loads Lab:

20. The weight of a structure itself is called the _____.
21. The weight of objects on the structure, like cars or people, is called the _____.
22. When the soil below a structure settles unevenly, it is called a _____.
23. When a structure expands or shrinks with changing temperatures, it is called a _____.
24. To allow movement, _____ are used in structures that get really hot or cold.
25. _____ walls are added for support to prevent an earthquake from shaking a structure.
26. _____ are used to stiffen a structure that experiences wind loads.
27. Bouncing and vibrating loads that change over time are called _____.

Materials Lab:

28. Of the 8 materials listed, which are the 2 **most expensive**? _____ and _____.
29. Which material is the **lightest**? _____.
30. Which material is the **heaviest**? _____.
31. Circle the one that is **stronger** in compression and tension: concrete -OR- reinforced concrete
32. What are the ingredients in concrete? _____ and _____.
33. What is a con (or weakness) about steel? _____.
34. List all of the materials that would not rust or rot. These usually work well around water:

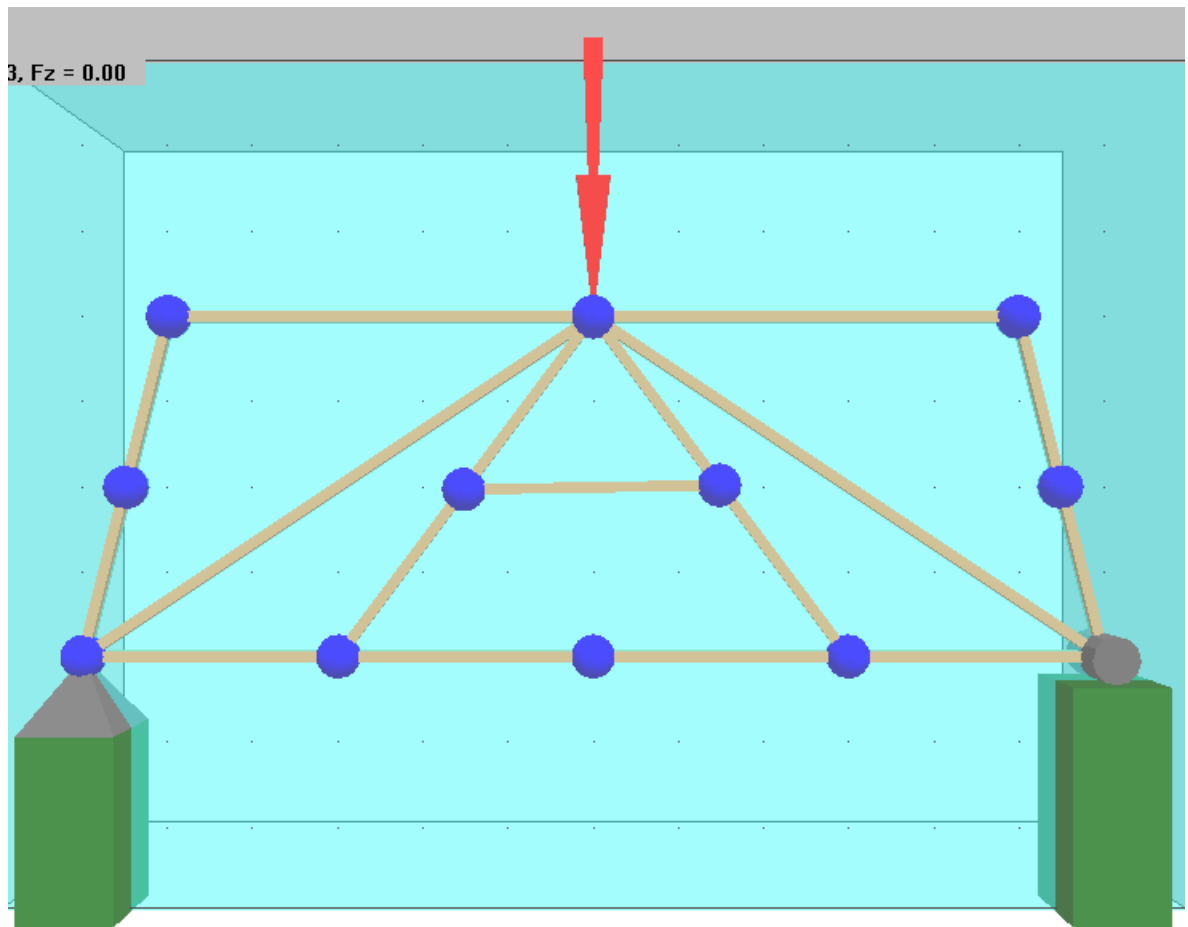
Shapes Lab:

35. Of the 3 shapes shown, which is the **strongest**? _____.
36. What makes it the strongest shape (hint—think about balancing forces!)

37. Of the 3 shapes shown, which is the **weakest**? _____.
38. What could be done to make the weakest shape **reinforced**, or stronger? **Sketch** your answer:

Your Picture 

Parts of a truss:



Label each part on the picture above,
and then complete the definitions on the next page...

Parts of a truss- Definitions:

39. Truss- _____

40. Roadbed- _____

41. Span- _____

42. Members- _____

43. Joints- _____

44. Coordinates- _____

45. Gusset Plates- _____

46. Force Vector- _____
