Name:	Date:

Strength of Materials Math Worksheet

1. Calculate the maximum tensile and compressive forces allowed for the cross-sectional area shown in Figure 1. The maximum tensile strength is 500 lb/in² (pounds per inches squared). The maximum compressive strength is 5,000 lb/in². Use the following equations to complete the problem. Show your work and calculations.

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cross-sectional area = (B) \times (L)
maximum tensile force = (maximum tensile strength) \times (cross-sectional area)
maximum compressive force = (maximum compressive strength) \times (cross-sectional area)
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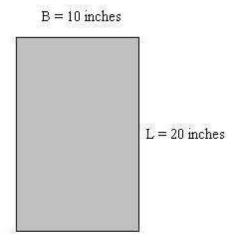


Figure 1: Cross-sectional area.

2. Calculate the maximum tensile and compressive forces allowed for the following two cross-sectional areas shown in Figure 2. The maximum tensile strength is 3,750 lb/in². The maximum compressive strength is 4,850 lb/in². Use the following equations along with those in #2 to complete the problem. Show your work and calculations.

L = 2 inches

cross-sectional area = π x (radius)² π = 3.14

B = 15 inches

L = 2 inches

B = 2 inches

L = 20 inches

Figure 2: Cross-sectional areas.

3. Part 1: Calculate the compressive force for the cross-sectional area shown in Figure 3. The original length of the member was 100-in long. After applying the compressive force, the member was 99-in long. The modulus of elasticity for the material used in the cross section is 10,000 lb/in². Use the following equations along with those in #2 and #3 to complete the problem. Show your work and calculations.

Part 2: Calculate the tension force for the cross-sectional area shown in Figure 3. The original length of the member was 100-in long. After applying the tensile force, the member was 103-in long. The modulus of elasticity for the material used in the cross section is the same as in #2 above. Use the following equations along with those in #2 and #3 to complete the problem. Show your work and calculations.

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\sigma = E * \epsilon \sigma = stress \epsilon = change in length / original length \epsilon = strain E = modulus of elasticity \text{change in length} = (\text{length after force applied}) - (\text{original length}) If the change in length is negative, take the absolute value to get a positive number force = \sigma * cross-sectional area
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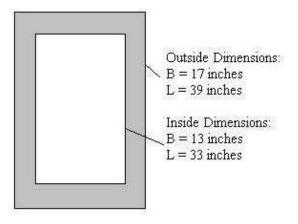


Figure 3: Cross-sectional area.