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| Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**Forces - Pulleys and Multi-Mass Systems**

Assume: T1 = and a1 =

**Vertical Pulley Systems**:

Note: There are two distinct objects, and each object has forces acting on and accelerating it

Each object has a separate FB-Diagram and system of equations (up to two perpendicular axes each)

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| m1  m2 | **EX**) A pulley system is set up as shown in the diagram where, m1 = 6 kg and m2 = 8 kg   1. Draw the FBD for each object including distinct labels for each force 2. State your assumptions 3. Write separate force equations for both object 1 and object 2 4. Calculate a2 (a system of 2 equations, various methods possible) 5. Recalculate a2 if m1 = 7 kg, and m2 = 9 kg (same difference of 2 kg) 6. Recalculate a2 if m1 = 60 g, and m2 = 80 g (same ratio 6:8) |

**Pulleys and Multi-Mass Systems - Practice Problems**

Do the following problems on a separate sheet (or on the back of this sheet)

Redraw the diagram given for each problem (you may include your FBD directly on your diagram)

The conditions or solved variable changes in each problem so do not blindly reuse the same work

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| Q1) Two masses are attached to a massless and frictionless vertical pulley systems as shown in the diagram, where  m1 = 190 g and m2 = 135 g (Note: this time m1 > m2)  a) Draw and label the FBD for each object  b) State assumptions and write the ΣFy for each object  c) Calculate the time it would take m1 to drop 1.7 m from rest | m1  m2 |

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| Q2) Two masses are attached to a massless and frictionless vertical pulley systems as shown in the diagram, where  m1 = 5 kg m2 = ??? and a1 = 1.28 m/s2 upward  a) Draw and label the FBD for each object  b) State assumptions and write the ΣFy for each object  c) Calculate m2 | m1  m2 |

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| Q3) Two masses are attached to a massless and frictionless horizontal pulley system on a smooth surface as shown in the diagram, where  m1 = 10kg and m2 = 3 kg (Note: m2 can be less than m1)  a) Draw and label the FBD for each object  b) State assumptions and write the ΣF1y , ΣF1x , ΣF2y  c) Calculate the velocity of m2 after it has fallen 146 cm from rest | m1  m2 |

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| Q4) Two masses are attached to a massless and frictionless horizontal pulley system on a rough surface as shown in the diagram, where  m1 = 4 kg m2 = 11 kg and **μ = 0.27** (between m1 and surface)  a) Draw and label the FBD for each object  b) State assumptions and write the ΣF1y , ΣF1x , ΣF2y  (Note: ΣF1x needs an Ff term, and the FN comes from ΣF1y)  c) Calculate a2 | m1  m2 |