NZTF Test Review

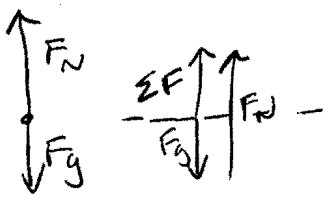
Name KEY

Show your work!

Date _____ Pd ____

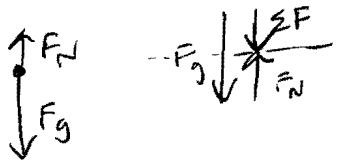
For questions 1-7, draw a labeled force diagram for the situation and then identify which direction the total force is pointing (up, down, right, left).

1. You are shooting to the top of power tower while increasing speed:



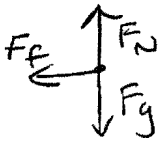
Direction of ΣF: UP

2. You are still moving up on power tower but nearing the top and slowing down:



Direction of ΣF: down

3. An ice skater is coasting to the right but friction is slowing her down:



ΣF

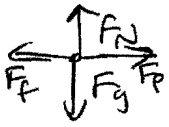
($F_N + F_g$ cancel)

Direction of ΣF: left

4. Your teacher drops a marker. As the marker falls to the floor:

Direction of ΣF: down

5. You are traveling 55MPH down the highway with your car on cruise control: → constant speed



$\Sigma F = 0$

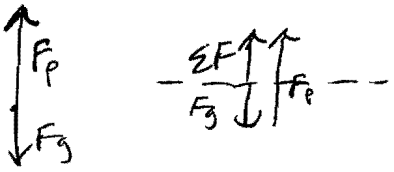
all forces balance

Direction of ΣF: NO ΣF

6. Power Tower drops you from the top:

Direction of ΣF: down

7. You are on your way down on Power Tower and slowing to a stop:



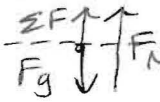
Direction of ΣF: UP

8. From a stoplight, a 30kg person accelerates at 5 m/s^2 in their Chevy Camaro. The total force, ΣF, on the person is: $\Sigma F = m \cdot a = 30kg \cdot 5\ m/s^2 = 150N$

9. A 500kg donkey is riding in the elevator of a downtown Minneapolis office building. I really don't know why. The elevator accelerates upward at 1.5 m/s^2. $\Sigma F = 500kg \cdot 1.5\ m/s^2 = 750N$

a) What is the force due to gravity on the donkey? $F_g = 9.8\ N/kg \cdot 500kg = 4900N$

b) What is the force normal, F_N, on the donkey? 5650N

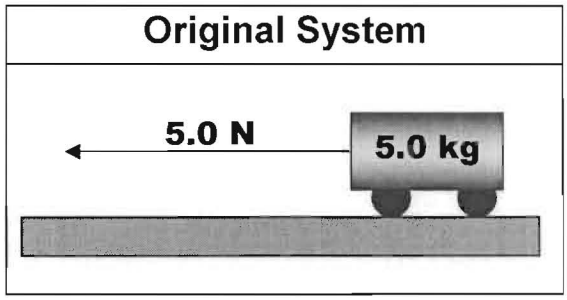


$F_N = 4900N + 750N = 5650N$

10. a) Total force is directly proportional to acceleration.
b) Mass is inversely proportional to acceleration.

11. You are standing on a bathroom scale in an elevator. Describe a situation in the elevator that would cause the reading on the scale to be less than your usual mass.
More than one answer possible. Need downward acceleration.
Could include: Falling (accelerating down) in an elevator, or coming to a stop on the way up an elevator.

For questions 12-15, consider the cart on a track shown to the right. Determine what the following changes to the system would do to the acceleration.
Answer with "increase", "decrease", "remains the same", or "cannot be determined".



12. The mass of the cart is changed to 10kg. decrease

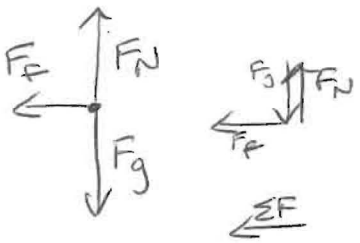
13. The pulling force is changed to 10N. increase

14. The mass changes to 10kg and the pulling force is changed to 10N. same

15. The mass is changed to 2.5kg and the pulling force changes to 10N. increase

16. A 30 kg child runs from left to right, dives, and then coasts across a Slip'n Slide™.
The coefficient of friction between the child and Slip'n Slide™ is 0.25.
a) Draw a labeled force diagram
b) Draw a vector addition diagram
c) Calculate and label F_g, F_N, and F_f
d) Determine total force on the child (ΣF)
e) Determine the child's acceleration

(Attach separate paper if needed to show work for this question)



$F_g = 9.8\frac{N}{kg} \cdot 30kg = \boxed{294N}$

$F_N = \boxed{294N}$

$F_f = \mu \cdot F_N = 0.25 \cdot 294N = \boxed{73.5N}$

$F_f = \Sigma F = \boxed{73.5N}$

$\Sigma F = ma \quad a = \frac{\Sigma F}{m} = \frac{73.5N}{30kg} = \boxed{2.45\ m/s^2}$