Inclines Practice Name:_____

Reflection and Self-Assessment

Part 1: Circle the statement that best describes how you completed the practice:

- I answered all questions without using the online solutions. I checked my answers against the key at the back of the practice and was able to determine my mistakes and correct them without referring to the online solutions.

- I answered most questions correctly without using the online solutions. I used the online solutions to help me with some questions and was able, with help from the online solutions, to understand every question and answer them correctly.

- I used the online solutions to help me with most of the questions. I was able, with help from the online solutions, to understand each question and answer them correctly.

- Even using the online solutions, I was not able to fully understand the solution to some problems. The questions I had trouble with were:

  _____

- I did not attempt all the questions on the practice.

Part 2: Circle the statement that best describes your confidence in answering questions of this type in the future.

- I am confident I can answer nearly any question of this type correctly without using notes or other assistance.

- I am confident I can answer **MOST** questions of this type correctly without using notes or other assistance.

- I am **NOT** confident I can answer most questions of this type correctly without using notes or other assistance.

Part 3: Circle the statement below that best describes the total amount of time you spent actively working on this practice:

Less than an hour	Between one and two hours	Between two and three hours	Between three and four hours	More than four hours

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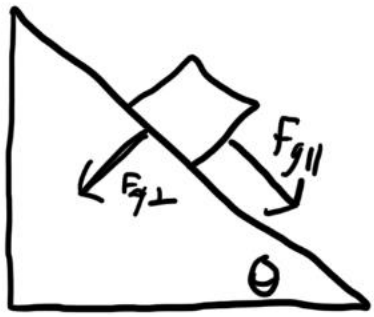
F_g is the force of gravity acting on an object. It always points straight down.

In an incline, F_g is broken into two perpendicular components:

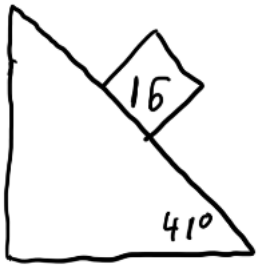
$F_{g||} = \sin\theta \times F_g$ is the component of F_g parallel to the incline, this is the force which will pull the object down the incline.

$F_{g\perp} = \cos\theta \times F_g$ is the component of F_g perpendicular to the incline, this will equal the normal force.

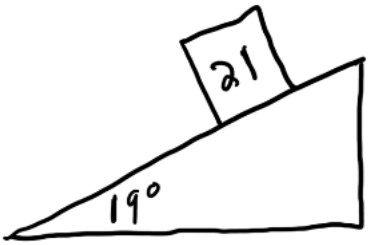


1. For each of the following determine $F_{g||}$ and $F_{g\perp}$. Masses shown are in kilograms.

a.



b.



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2. A 26 kg block is on a 23 degree incline. Determine the force pulling it down the incline and the normal force acting on it.

3. A 2.9 kg block is on a 73 degree incline. Determine the force pulling it down the incline and the normal force acting on it.

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4. A 2.5 kg block is on a 48 degree frictionless incline. Determine the acceleration of the block down the incline.

5. A 59 kg skier is atop a 25 degree, frictionless ski hill.
    a. What is the force pulling the skier down the hill?

    b. How long will it take the skier to travel down the hill if it is 250 m long and they start from rest?

    c. How fast will the skier be moving at the bottom of the hill?

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6. A 2.0 kg block is placed on top of a 35°, 4.2-metre-long frictionless incline.
    a. What is the force acting to pull the block down the incline?

    b. What is the velocity of the block at the bottom of the incline?

    c. How long does it take for the block to reach the bottom of the incline?

7. A 5.0 kg block is pushed up a frictionless, 56° incline at a constant velocity of 4.2 m/s. What is the applied force needed to do this?

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8. A 25 kg block is pushed up a frictionless 35° incline accelerating up the ramp at 2.0 m/s^2. What is the force applied to the block?

9. A 65 kg block is pushed up a frictionless 54° incline with an applied force of 725 N. What is the acceleration?

10. A 29 kg block is pushed up a frictionless 24° incline with a force of 156 N. What is the vertical and horizontal displacements after 5.0 seconds?

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Inclines with Friction

11. A 49 kg block is on a 29 degree incline. The coefficient of friction between the block and the incline is 0.26.

    a. Determine the normal force acting on the block.

    b. Determine the force of friction acting on the block.

    c. Determine the force pulling the block down the incline. ($F_{g||}$)

    d. Determine the net force acting on the block.

    e. Determine the acceleration of the block down the incline.

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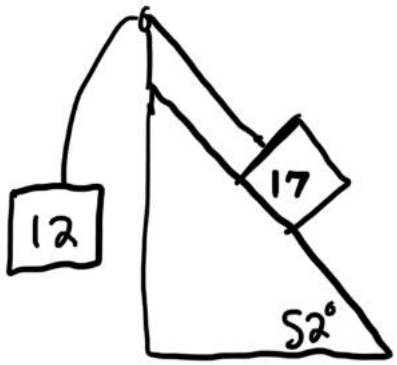
12. A 2.5 kg block is on a 48 degree incline with $\mu = 0.19$. Determine the acceleration of the block down the incline.

Inclines Practice Name:_____

13. A 17 kg block on a 52 degree incline with $\mu = 0.11$ is attached to a free hanging 12 kg block.



a. What is the magnitude of the force pulling the 12 kg block downwards?

b. What is the magnitude of the force pulling the 17 kg block down the incline?

c. Will the 17 kg block move up the incline or down the incline?

d. What is the normal force acting on the 17kg block?

e. What is the force of friction working against motion?

f. What is the net force acting on the blocks?

g. What is the acceleration of the blocks?

h. What is the tension in the rope connecting the blocks?

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14. A 10.0 kg block is on a $61°$ incline with $\mu = 0.42$. It is attached to a 46 kg block which is initially held 1.00m above the ground, the 46 kg block is then allowed to fall freely. How long will it take for the 46 kg block to fall 1.0 m?

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15. A 65 kg skier is on top of a 250 m long ski hill, with $\mu = 0.19$. The hill has an angle of $18°$. How long will it take the skier to reach the bottom of the hill and how fast will they be moving when they reach it?

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16. A person pulls a 25 kg sled up a hill with incline of $24°$. What force must they apply to pull the sled at a constant velocity if $\mu = 0.26$?

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17. A box of weight 435 N is sliding down a 40.0^{o} inclined plane. If the acceleration of the box is 0.250 m/s^{2}, what is the force of friction acting on the box?

18. A student pulls a 125 N object up a 25^{o} incline. If the coefficient of friction is 0.180, what force must the student pull with to move the object at a constant velocity? Assume the applied force is parallel to the ramp.

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19. Fluffy the cat slides freely down the long porcelain cat slide into the Beverly Hills pet pool. If the incline is 18° and $\mu = 0.10$ determine the time it takes Fluffy to reach the bottom of the 10.0 m slide.

(HINT: find "a" first, don't worry about the cat's mass, it cancels out)

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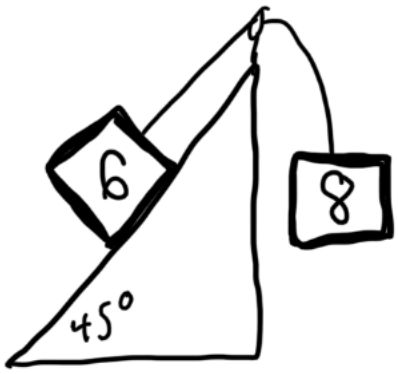
20. A 6.0 kg block on a 45 degree incline is attached to an 8.0 kg block which hangs freely. What is the coefficient of friction between the 6.0 kg block and the incline if the 6.0 kg block is pulled up the ramp at 1.0 m/s^2?



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21. A trucker is driving down a hill when he loses his brakes, luckily there is a runaway truck ramp which is a steep upwards offshoot of the main road. He is travelling at 150 km/h when he reaches the runaway ramp which is inclined upwards at 50.0° and friction coefficient is 0.20. If the runoff road is 100.0 m long, is it long enough? Note that the mass of the truck is not important for this problem.

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Answer Key				
1a)$F_{g\|\|} = 1.0 \times 10^2 N$ $F_{g\perp} = 120\ N$	1b) $F_{g\|\|} = 67\ N$ $F_{g\perp} = 190\ N$	2) Force pulling it down is $1.0 \times 10^2\ N$ Normal force is 230 N	3) Force pulling it down is 27 N Normal force is 8.3 N	4) 7.3 m/s^2 down the ramp
5a) 240 N	5b) 11 sec	5c) 46 m/s	6a) 11N	6b) 6.9 m/s
6c) 1.2 sec	7) 41 N	8) 190 N	9) 3.2 m/s^2 up ramp	10) Vertical displacement is 7.1 m Horizontal displacement is 16 m
11a) 420 N	11b) 110 N	11c) 230 N	11d) 120 N	11e) 2.5 m/s^2
12) 6.0 m/s^2	13a) 120 N	13b)130 N	13c) 17 kg block goes down the ramp, 12 kg block is pulled upwards	13d) $1.0 \times 10^2 N$
13e) 11 N	13f) 2.4 N	13g) 0.083 m/s^2	13h) 120 N	14) 0.57 sec
15) t= 2.0×10^1 sec Final velocity is 25 m/s	16) 160 N	17) 270 N	18) 73 N	19) 3.1 sec
20) 0.55	21) Just barely long enough, stops 1 metre before end.			