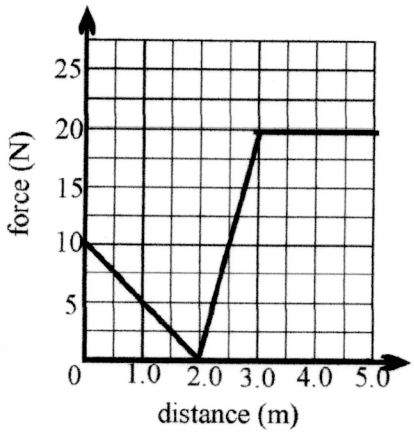
WORK WORK – WORKSHEET 5.1

(DO NOT WRITE ON, PLEASE)

1. Base your answer to the following question on the force vs. distance graph below, which is for an object being pushed along a straight line, starting at rest.



After the object has moved a distance of 2.0 m, how much work has been done on it?

1) 5 J

2) 10 J

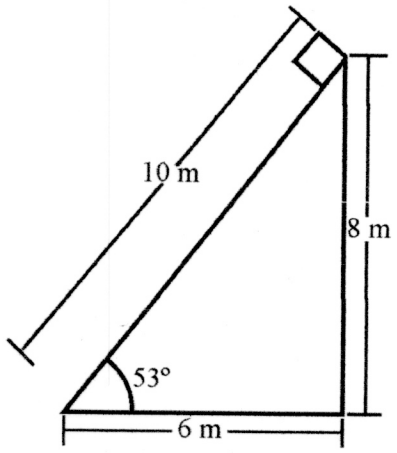
3) 15 J

4) 20 J

5) 25 J

THERE ARE SOME FONT ISSUES IN THIS... SORRY

Base your answers to questions **2** and **3** on the picture below, which represents a plane 10 m in length with a coefficient of kinetic friction of 0.2, inclined at an angle of 53°. A block of weight 30 N is placed at the top of the plane and allowed to slide down.



2. The work done on the block by the gravitational force during its 10 meter slide down the plane is most nearly

1) 60 J

2) 180 J

3) 260 J

4) 300 J

5) 390 J

3. The work done on the block by friction during its 10 m slide down the plane is most nearly

1) 10 J

2) 12.0 J

3) 18 J

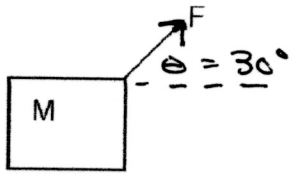
4) 24 J

5) 36 J

HINT: "LOST" ENERGY

4. Which of the following is not a vector quantity?

   1) Torque
   2) Velocity
   3) Work
   4) Momentum
   5) Force

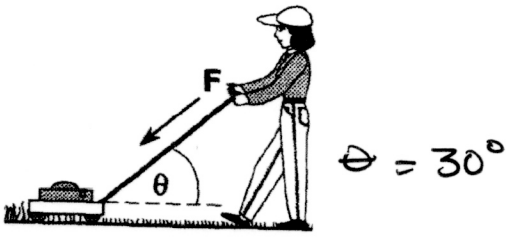
5. 

A block of mass M is pulled by a constant force F at an angle of 30° relative to the ground for a distance of L meters. What is the net work done?

   1) $MLF\cos 30$
   2) $LF\cos 30$
   3) $L\cos 30$
   4) $\frac{F\cos 30}{ML}$
   5) $\frac{ML\cos 30}{F}$

6. A ball of mass 16 kg on the end of a string is spun at a constant speed of 2.0 m/s in a horizontal circle with a radius of 1 m. What is the work done by the centripetal force during one complete revolution?

   1) 0 J
   2) 16 J
   3) 32 J
   4) 8 J
   5) 4 J

7. 

A woman pushes a lawn mower with a force of F at an angle θ to the ground. If F = 20N and θ = 30°, what is the net work done in moving the lawnmower 5m?

   1) 25 J
   2) 50 J
   3) 86.67 J
   4) 14.4 J
   5) 35 J

8. A vertical force of 500 N acts on a 12 kg mass over a horizontal displacement of 2 m. The work done by the force is

   1) 0 J
   2) 24 J
   3) 1000 J
   4) 6000 J
   5) 12000 J

9. An object with a mass of 2 kg is attached to the end of a 3 m long string and is whirled horizontally in a circle with a constant speed of 5 m/s. When the object has traveled half a revolution, how much work has been done by the centripetal force?

   1) 0 J
   2) 50**p** J
   3) 100**p** J
   4) 150**p** J
   5) 300**p** J

ignore the "p"

10. A person lifts a box with a mass of 2.0 kg from the ground to a shelf 0.5 m high. The work that gravity does on the box is equal to

1) −10 J

2) −5 J

3) 0 J

4) 5 J

5) 10 J

11. If L, M and T denote the dimensions of length, mass, and time, respectively, what are the dimensions of energy?

1) M/T^2

2) ML/T^2

3) ML^2/T^2

4) M/L^2

5) T^2/M

12. How much work is done as a box of weight W is vertically lifted with an acceleration g, to a height h?

1) Wh

2) Whg^2

3) $\frac{Wh}{g}$

4) $\frac{2Wh}{g}$

5) $2Wh$

13. A horizontal force of 40 N is used to push a block along a horizontal surface at a constant speed of 2 meters per second. How much work is done on the block in 6 seconds?

1) 80 J

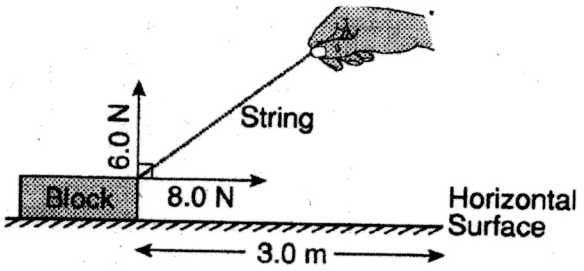
2) 120 J

3) 180 J

4) 240 J

5) 480 J

14. A student pulls a block 3.0 meters along a horizontal surface at constant velocity. The diagram below shows the components of the force exerted on the block by the student.



How much work is done against friction?

1) 6 J

2) 18 J

3) 24 J

4) 30 J

5) 42 J

15. In order to demonstrate some concepts of physics, a physics teacher pushes against a wall with a force of 300 N for 5 s. As you can imagine, the wall remains stationary. How much work does the teacher do on the wall in this time period?

1) 0 J

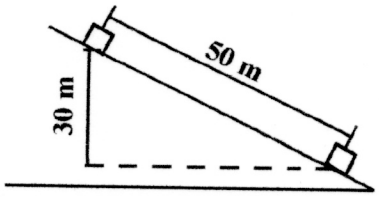
2) 0.017 J

3) 60 J

4) 750 J

5) 1500 J

1. Base your answer to the following question on the picture below which shows a 3 kg block sliding 50 m down a frictionless inclined plane dropping a distance of 30 m.



What is the kinetic energy of the block at the end of the drop?

1) 90 J

2) 300 J

3) 500 J

4) 900 J

5) 1500 J

2. A 5 kg object slides 100 m down a frictionless inclined plane dropping 45 m. It then slides along a horizontal surface with a coefficient of kinetic friction of 0.75 until it stops. How long does it take to stop after it leaves the inclined plane?

1) 3.0 s

2) 4.0 s

3) 6.0 s

4) 12.0 s

5) 15.0 s

3. Base your answer to the following question on the information below.

A 4.0 kg block rests at the edge of a platform that is 20 m above level ground. The block is launched horizontally with an initial velocity of 15 m/s.

The object's kinetic energy when it hits the ground is most nearly

1) 450 J

2) 800 J

3) 1050 J

4) 1250 J

5) 2450 J

4. A man standing a certain height above the ground throws a rock straight up with an initial velocity of 10 m/s. A few moments later, the rock hits the ground with a kinetic energy of 450 J. If the man threw this rock horizontally with an initial velocity of 10 m/s at the same height, how much kinetic energy would it have just before it hits the ground?

1) 50 J

2) 100 J

3) 450 J

4) 800 J

5) 950 J

5. A man standing a certain height above the ground throws a rock of mass 1 kg straight up with an initial velocity of 10 m/s. A few moments later, the rock hits the ground with a kinetic energy of 450 J. If the man dropped this rock from rest, how much kinetic energy would it have right before it hits the ground?

1) 100 J

2) 200 J

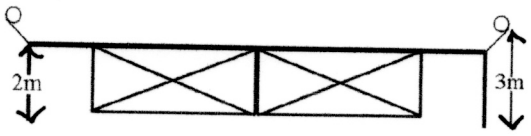
3) 300 J

4) 400 J

5) 500 J

6. Base your answer to the following question on the following information.

Two balls of different masses are set at a height of 3 m above the ground on a frictionless table. The ball on the left is of mass $2M$ and the ball on the right has a mass of $3M$. They both are released simultaneously and slide onto the part of the table 2m above the ground.



What is the total energy of the system?

1) $+1Mg$

2) $+5Mg$

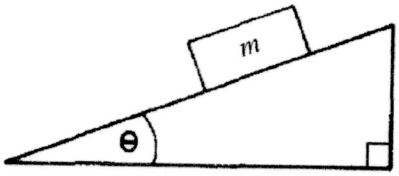
3) $+10Mg$

4) $+15Mg$

5) $+20Mg$

HINT: CALL TABLE $h = 0$

7. Base your answer to the following question on the diagram below. In the diagram, a box of mass m is sliding down a frictionless ramp of length L with an incline of θ to the horizontal. The mass takes t seconds to slide down the ramp.



If released from rest at the top, the velocity of the block at the bottom of the ramp will be

1) $gLt\sin\theta$

2) $\frac{gL\sin\theta}{t}$

3) $\sqrt{gt\sin\theta}$

4) $\sqrt{2gL\sin\theta}$

5) $\sqrt{gL\sin\theta}$

8. A crate with mass m slides down a frictionless ramp with length L and vertical height h. The crate's change in kinetic energy from the top to the bottom is equal to:

1) $\frac{mL^2}{2}$

2) $-\frac{mL^2}{2}$

3) $-mgh$

4) mgh

5) Cannot be determined from the information given.

9. A block with a mass of 10 kg slides down a frictionless inclined plane of length 25 m and height 20 m. It's speed at the bottom is most nearly

1) 15 m/s

2) 20 m/s

3) 30 m/s

4) 37 m/s

5) 45 m/s

10. An object with a mass of 4 kg is released from rest at the top of a ramp with length 10 m that makes an angle of 30° with the horizontal. The coefficient of kinetic friction between the block and the ramp is 0.4. The speed the block will have when it has traveled 5 m down the ramp is most nearly

1) 3.9 m/s

2) 5.6 m/s

3) 7 m/s

4) 7.9 m/s

5) 10.4 m/s

11. An object is falling from a height of h in a vacuum and reaches a final velocity of v. When the object has fallen a distance of $h/2$, its velocity is

1) $\frac{v}{\sqrt{2}} \leftarrow \frac{v}{\sqrt{2}}$

2) $\frac{v}{2}$

3) $\frac{v}{4}$

4) $v\sqrt{2}$

5) $4v$

12. Base your answer to the following question on the following situation.

An object weighing 10 N swings at the end of a rope that is 0.72 m long as a simple pendulum. At the bottom of the of the swing, the tension in the string is 12 N.

What is the maximum height above its lowest point that the object reaches?

1) 0.036 m

2) 0.060 m

3) 0.072 m

4) 0.144 m

5) 0.360 m

13. Units of energy include which of the following?

I. Newton-meter
II. Ampere-volt
III. Volt-coulomb

1) I only.

2) I and II only.

3) I and III only.

4) II and III only.

5) I, II, and III.

$\text{AMPERE} = \frac{\text{COULOMB}}{\text{SEC}}$

$\text{VOLT} = \frac{\text{JOULE}}{\text{COULOMB}}$

$\text{JOULE} = \text{N} \cdot \text{m}$

14. A student throws a stone upward at an angle of 30°. Which statement best describes the stone at the highest point that it reaches?

1) Its acceleration is zero.

2) Its acceleration is at a maximum.

3) Its potential energy is at a minimum.

4) Its kinetic energy is at a minimum.

5) Its potential and kinetic energies are equal

15. Units of energy include which of the following?

I. Joule
II. Ampere-volt per second
III. Volt-coulomb

1) I only.

2) I and II only.

3) I and III only.

4) II and III only.

5) I, II, and III.

16. Tarzan of mass m_1 swings from a height of h on a vine. When potential energy is at its minimum, he picks up Jane (mass m_2). What height will the Tarzan-Jane system reach when its potential energy reaches a maximum?

1) $(m_1 + m_2)h$

2) $(m_1h)/(m_1 + m_2)$

3) $(m_1 + m_2)/(2hm_2)$

4) $(m_1 + m_2)/(2hm_1)$

5) $2hm_1$

17. Tarzan (90 kg) carries Jane (55 kg) with one arm while swinging on a vine. They began at a height of 15 m. If Tarzan drops Jane when their kinetic energy is a maximum, how high will Tarzan swing?

1) 20 m

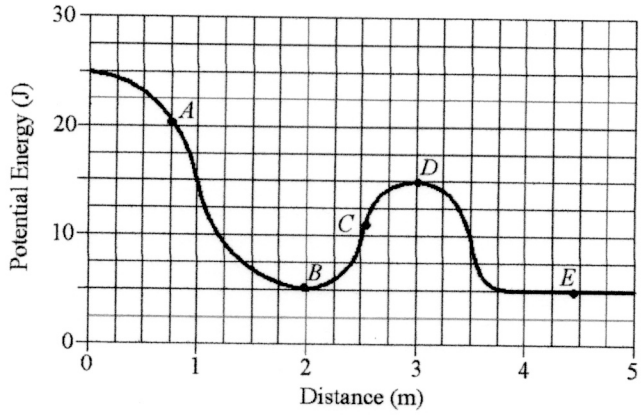
2) 24 m

3) 27 m

4) 31 m

5) 35 m

Base your answers to questions **18** through **22** on the diagram below which shows a frictionless track.



18. At which point would an object at rest be in unstable equilibrium?

1) A

2) B

3) C

4) D

5) E

Hint: $W = -\Delta U = \int F\,dx$

$\therefore \quad \frac{dW}{dx} = F$,

$-\frac{dU}{dx} = F$

19. At which point is an object at rest in stable equilibrium?

1) A

2) B

3) C

4) D

5) E

20. If an object is released at the beginning of the track, which of the following is true at point E?

1) It is in static equilibrium

2) It is losing kinetic energy

3) It is in dynamic equilibrium

4) There is a net force acting on the object

5) Its kinetic energy is 25 J

21. Which of the following best describes the motion of an object as it approaches point B, if it was released from rest at the beginning of the track?

1) It is losing potential energy only.

2) It is gaining kinetic energy only.

3) It is gaining potential energy and gaining kinetic energy

4) It is losing potential energy and gaining kinetic energy

5) It is gaining heat energy, gaining kinetic energy, and losing potential energy

22. If an object of mass 5 kg is released from rest at the beginning of the track, what is its velocity at point D?

1) 1 m/s

2) 1.4 m/s

3) 2 m/s

4) 2.2 m/s

5) 3 m/s