

Titan Learning Center
Science ACT Prep
Week 10

A student lab group is investigating the effect of the angle of an incline upon the amount of force required and the amount of work done in pulling a cart up an incline at a constant speed. They use a force probe to measure the force (**F**) for various incline angles (Θ) and they use a meter stick to measure the displacement (**d**) of the cart. The work is calculated from the **F** and **d** values. In **Experiment 1**, the lab group uses a 2.1-kg cart and pulls it to a height of 1.05 m during each trial. In **Experiment 2**, the lab group uses a 3.8-kg cart and pulls it to a height of 1.05 m during each trial. In **Experiment 3**, the lab group uses a 2.7-kg cart and pulls it to a height of 0.85 m during each trial. Their data are shown in the tables below.

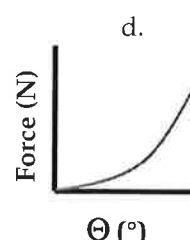
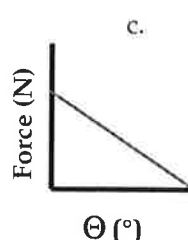
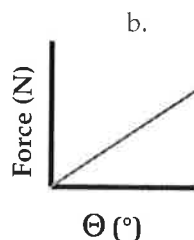
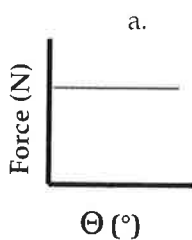
Experiment 1			
Θ ($^{\circ}$)	F (N)	d (m)	W (J)
31.8	10.7	2.01	21.5
38.4	12.9	1.67	21.5
46.7	14.8	1.44	21.3
54.2	16.7	1.30	21.7
61.9	18.4	1.17	21.5

Experiment 2			
Θ ($^{\circ}$)	F (N)	d (m)	W (J)
30.6	19.1	2.05	39.2
38.1	23.0	1.69	38.9
47.2	27.1	1.45	39.3
55.8	30.6	1.28	39.2
63.7	33.5	1.16	38.9

Experiment 3			
Θ ($^{\circ}$)	F (N)	d (m)	W (J)
31.8	14.0	1.61	22.6
37.2	15.9	1.41	22.4
43.5	18.2	1.24	22.6
52.9	21.2	1.06	22.5
59.2	22.6	0.99	22.4

Questions:

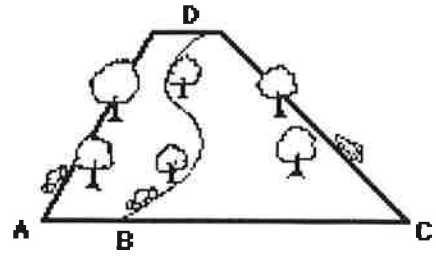
- Which statement describes the effect that increasing incline angle (Θ) has upon the force required to pull the cart up the hill?
 - As the incline angle increases, the force increases.
 - As the incline angle increases, the force decreases.
 - As the incline angle increases, the force first increases and then decreases.
 - Changes in the incline angle have no effect upon the force; it remains relatively constant.
- Which statement describes the effect that increasing incline angle (Θ) has upon the work done in pulling the cart up the hill?
 - As the incline angle increases, the work increases.
 - As the incline angle increases, the work decreases.
 - As the incline angle increases, the work first decreases and then increases.
 - Changes in the incline angle have no effect upon the work; it remains relatively constant.
- Which of the following graphs best represent the relationship between force and incline angle?



- Compare the results of **Experiment 3** with those of **Experiment 1** and **Experiment 2**. Based on the data, what conclusion can be made regarding the effect of height upon the amount of work done?
 - Less height results in less work as evidenced by the fact that work was less in **Experiment 3**.
 - Less height results in more work as evidenced by the fact that work was greater in **Experiment 3**.
 - Height has no effect upon the work since the values were similar in **Experiments 1** and **3**.
 - No conclusion can be made since **Experiment 3** involved an alteration of both mass and height.

5. Predict the amount of work that would be done in pulling a 3.0-kg cart up a 30.0° incline angle to a height of 1.05 meter at a constant speed.
- a. 15 J b. 21 J c. 31 J d. 39 J

6. The work done in elevating the carts is equal to the energy acquired by the carts. Now consider three car paths from the base of a hill to the top of a summit. The relative steepness of the paths are shown in the diagram. They are labeled Path AD, Path BD, and Path CD. Based on the results of this study which path would require the most energy?
- a. Path AB b. Path BD c. Path CD
d. Each path requires the same amount of energy.



TLC Stamp

