Compound Machines
Division C

School Name_____

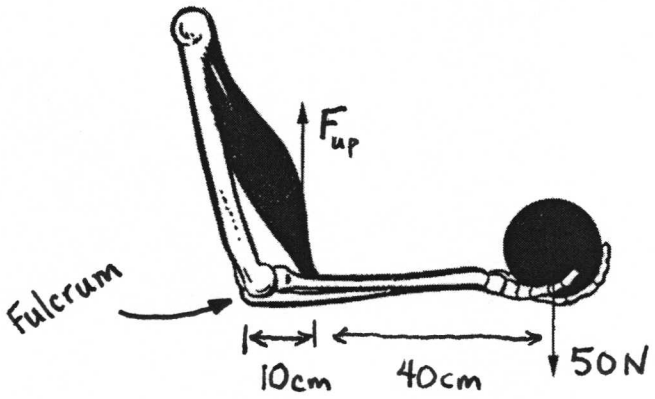
Team_____

Directions:

There are 13 multiple choice questions.

Write your answers (A, B, C, D or E) on the answer sheet provided.

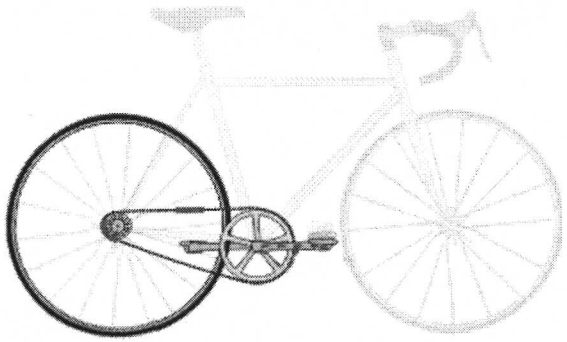
1. Human arm



What is the upward component of the force exerted by the bicep muscle, F_{up}? (Assume static equilibrium)

A) 10 N
B) 12.5 N
C) 50 N
D) 200 N
E) 250 N

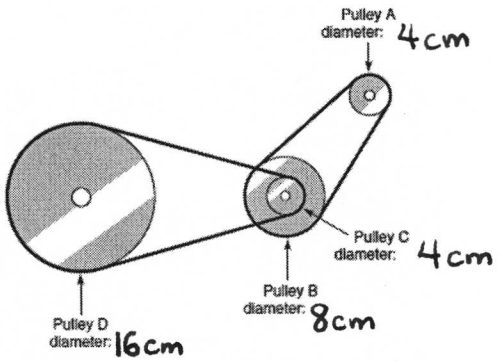
2. Bicycles



A bike is resting on the pavement. The radius of the front gear is 12 cm. The radius of the back gear is 6 cm. The radius of the back wheel is 40 cm. How far forward does the bike travel when the pedals are turned one full revolution? (~~Choice~~ Choose the closest answer)

A) 1.25 m
B) 2.5 m
C) 5.0 m
D) 7.5 m
E) 10 m

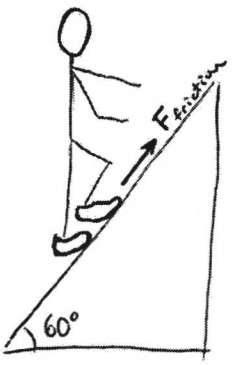
3. Belts and pulleys



The figure shows a belt and pulley system. Pulley B and pulley C are rigidly connected. Pulley D is turned one full revolution. How many revolutions does Pulley A turn?

A) 1
B) 2
C) 4
D) 8
E) 16

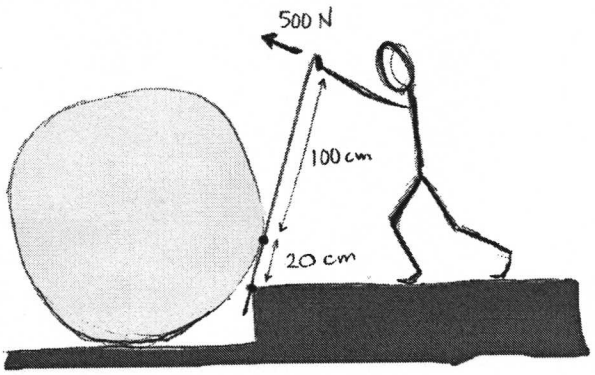
4. Rock climbing



The climber is ascending a rock face. The gravitational force on the rock climber is 600 N (straight down). The friction between the climbers shoes and the rock is large enough to stop the climber from slipping. What is the magnitude of the friction force, F_{friction}?

A) $600/\sqrt{3}$ N
B) $300/\sqrt{3}$ N
C) 600 N
D) $300\sqrt{3}$ N
E) $600\sqrt{3}$ N

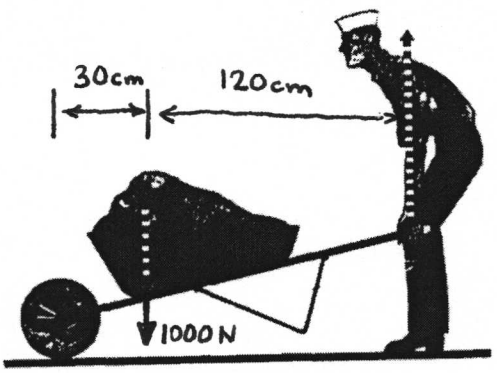
5. Rock in the street



The picture shows a man using a steel bar (total length 125 cm) to try and move a rock. The steel bar touches both the rock and the edge of the curb. The separation between contact points is 20 cm. The man applies 500 N of force to the top of the steel bar. The rock won't budge! How much force was applied to the rock?

A) 100 N
B) 500 N
C) 2000 N
D) 2500 N
E) 3000 N

6. Wheelbarrow



What is the upward force exerted on the handle of the wheelbarrow by the man's hands?
A) 200 N
B) 250 N
C) 1000 N
D) 4000 N
E) 5000 N