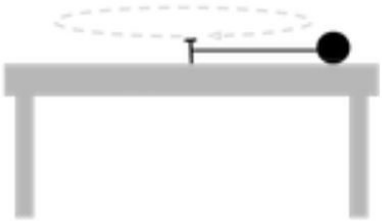
AP Physics 1 – Algebra-Based: Circular Motion and Gravitation Practice Test

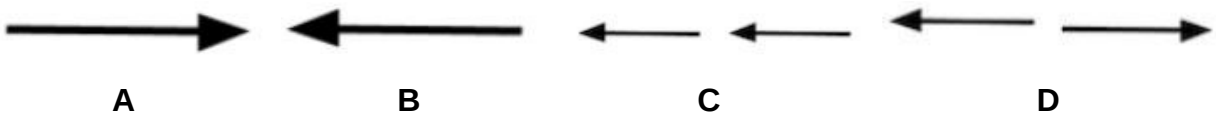
Question 1:

A van drives over to the top of a circular hill as shown above. Which set of force vectors shows the vertical forces on the van?

Question 2:



A ball is attached to a string that is staked to the center of a frictionless table and the ball circles around the tabletop as shown above. Which set of force vectors shows all the horizontal forces on the ball?



Question 3:

Two factors effecting the magnitude of the force of gravity between 2 objects are:

- **A.** mass and distance
- **B.** distance and weight
- **C.** mass and matter
- **D.** weight and mass

Question 4:

Two asteroids exert a gravitational force, F, on each other. Some time later, the asteroids are now three times as far from each other as before. Which on the following represents the gravitational force at this distance?

- **A.** $\frac{F}{3}$
- **B.** $\frac{F}{2}$
- **C.** $\frac{F}{6}$
- **D.** $\frac{F}{9}$

Question 5:

As distance between two objects increase the pull of gravity

- **A.** increases
- **B.** stays the same
- **C.** decreases

Question 6:

Two objects are attracted to each other with 36 N of gravitational force. What would the force between them be if the distance between them were doubled?

- **A.** 9
- **B.** 18
- **C.** 72
- **D.** 144

Question 7:

Planet Kling has half the radius and 2 times the mass of the Earth. What is the best estimate for the magnitude of the gravitational field at the surface of planet Kling?

A. $80\frac{m}{s^2}$

B. $2.0\frac{m}{s^2}$

C. $40\frac{m}{s^2}$

D. $160\frac{m}{s^2}$

Question 8:

The planet Delta has 2 times the gravitational field strength and 3 times the radius of Earth. How does the mass of the planet Delta compare with the mass of Earth?

A. $m_{Delta} = 18\, m_{Earth}$

B. $m_{Delta} = 324\, m_{Earth}$

C. $m_{Delta} = m_{Earth}$

D. $m_{Delta} = \sqrt{18}\, m_{Earth}$

Question 9:

A scientist on Earth places a marble on one side of a double balance pan. He adds weights of known mass to the other side until both sides are balanced.

An astronaut takes the same marble, weights, and double pan to the Moon. She places the marble on one side of the double balance pan. She adds weights of known mass to the other side until both sides are balanced. How does the number of weights the scientist used to balance the scale compare with the number of weights the astronaut uses?

A. The astronaut on the Moon uses more weights

B. The scientist on Earth uses more weights.

C. They are the same.

Question 10:

Calculate the centripetal force required to make a $5\,kg$ ball move $4\,\frac{m}{s}$ in a circle with a radius of $2\,m$

- **A.** 10 N
- **B.** 40 N
- **C.** 20 N
- **D.** 30 N

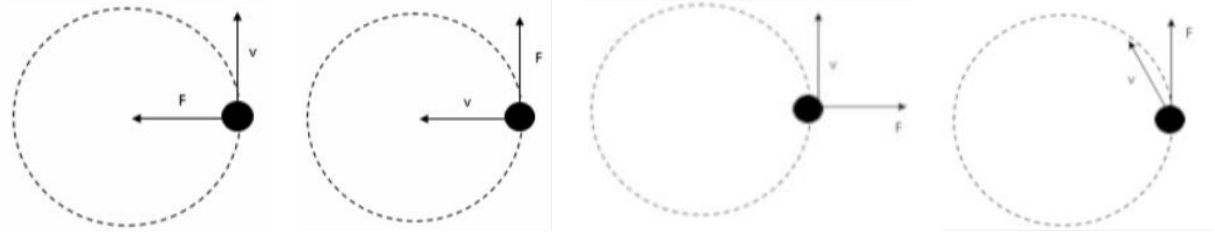
Question 11:

Centripetal acceleration acts towards the _____ of the circular motion.

- **A.** outside
- **B.** circumference
- **C.** center
- **D.** radius

Question 12:

An object is moving with uniform speed in a counterclockwise, horizontal circle. Which of the following images correctly depicts the force vector and velocity vector at a point in time?



A **B** **C** **D**

Question 13:

A student sits on a merry-go-round that has a period of revolution of $45\,seconds$. If the student is on a carousel horse that is $4.5\,meters$ from the center, what is the student's centripetal acceleration?

A. $9.80\,\frac{m}{s^2}$

B. $0.0532\,\frac{m}{s^2}$

C. $1.23\,\frac{m}{s^2}$

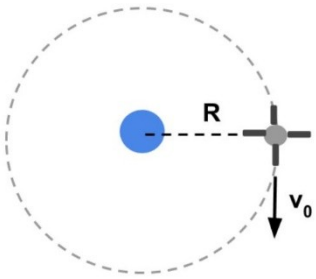
D. $0.0876\,\frac{m}{s^2}$

Question 14:

If the Earth's mass was cut in half, what would happen to your mass?

A. It will increase because gravitational force increases.
B. It will decrease because gravitational force decreases.
C. It will decrease because gravitational force increases.
D. Nothing, since mass is not affected by gravitational force.

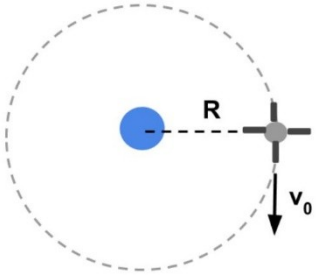
Question 15:



A satellite of mass m orbits Earth at a radius R and speed v_0 as shown above. An aerospace engineer decides to launch a second satellite that is half the mass into the same orbit. The mass of Earth is M. What is the speed v of the lighter satellite in terms of v_0 ?

A. v_0
B. $2v_0$
C. $\frac{v_0}{2}$
D. $\frac{v_0}{\sqrt{2}}$

Question 16:



A satellite of mass m orbits Earth at a radius R with speed v_0 and period T_0 as shown above. An aerospace engineer decides to launch an identical satellite into the same orbit around a planet that is nine times the mass of Earth. The mass of Earth is M. What is the period T of the satellite around the heavier planet in terms of T_0 ?

A. $T_0\sqrt{3}$
B. T_0
C. $\frac{T_0}{3}$
D. $3T_0$

Question 17:

A $0.12\,m-radius$ grinding wheel takes $5.5\,s$ to speed up from $2.0\frac{rad}{s}$ to $11.0\frac{rad}{s}$. What is the wheel's average angular acceleration?

A. $9.6\frac{\frac{rad}{s}}{s}$
B. $4.8\frac{\frac{rad}{s}}{s}$

C. $3.1\frac{\frac{rad}{s}}{s}$

D. $1.6\frac{\frac{rad}{s}}{s}$

Question 18:

You are moving a ball in a circle using $72\,N$ of centripetal force. What would the force be if you doubled the velocity of the circle?

A. 244 N
B. 288 N
C. 36 N
D. 72 N

Question 19:

A car drives with a constant linear speed v_i down a road with two curves. The first curve has a radius R and the second curve has a radius $\frac{1}{2}R$. How does the magnitude of the car's centripetal acceleration change after the radius decreases?

A. Increases by factor of 2
B. Increases by factor of 4
C. Decreases by factor of 2
D. No change.

Answer Key:

1. D
2. B
3. A
4. D
5. C
6. A
7. A
8. A
9. C
10. B
11. C
12. A
13. D
14. D
15. A
16. C
17. D
18. B
19. A