Name:

- 1) Gravitational force of attraction *F* exists between two point masses *A* and *B* when they are separated by a fixed distance. After mass *A* is tripled and mass *B* is halved, the gravitational attraction between the two masses is
  - A) 6F B)  $\frac{2}{3}F$  C)  $\frac{1}{6}F$  D)  $\frac{3}{2}F$

2) Two point masses are located a distance, *D*, apart. The gravitational force of attraction between them can be quadrupled by changing the distance to

- A)  $\frac{1}{2}D$  B)  $\frac{1}{4}D$  C) 4D D) 2D
- 3) As the mass of a body increases, its gravitational force of attraction on the Earth

A) remains the same	C) decreases
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B) increases

- 4) If the distance between a spaceship and the center of the Earth is increased from one Earth radius to four Earth radii, the gravitational force acting on the spaceship becomes approximately
  - A) 16 times greater B)  $\frac{1}{4}$  as great C)  $\frac{1}{16}$  as great D) 4 times greater

5) If the distance between a spaceship and the center of the Earth is increased from one Earth radius to four Earth radii, the gravitational force acting on the spaceship becomes approximately

A) 16 times greater B)  $\frac{1}{16}$  as great C) 4 times greater D)  $\frac{1}{4}$  as great

6) When a satellite is a distance d from the center of the Earth, the force due to gravity on the satellite is F. What would be the force due to gravity on the satellite when its distance from the center of the Earth is 3d?

A)  $\frac{F}{9}$  B)  $\frac{F}{3}$  C) 9F D) F

7) If the Earth were twice as massive as it is now, then the gravitational force between it and the Sun would be

A) the same B) half as great C) four times as great D) twice as great

8) Two objects of fixed mass are moved apart so that they are separated by three times their original distance. Compared to the original gravitational force between them, the new gravitational force is

A) three times greater	B) one-third as great	C) one-ninth as great	D) nine times greater
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9) Two point masses that are equal are separated by a distance of 1 meter. If one mass is doubled, the gravitational force between the two masses would be

A) four times greater B)	one-half as great	C) two times greater	D) one-fourth as great
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10) Two objects of equal mass are a fixed distance apart. If the mass of each object could be tripled, the gravitational force between the objects would

A) decrease by one-ninth B) triple C) increase 9 times D) decrease by one-third

- 11) The magnitude of the gravitational force between two objects is 20. newtons. If the mass of each object were doubled, the magnitude of the gravitational force between the objects would be
  - A) 20. N B) 10. N C) 5.0 N D) 80. N
- 12) The magnitude of the gravitational force of attraction between the Earth and the Moon is approximately

A)  $7.8 \times 10^{28}$  N B)  $6.7 \times 10^{41}$  N C)  $6.0 \times 10^{24}$  N D)  $2.1 \times 10^{20}$  N

- 13) What is the gravitational force of attraction between a planet and a 17-kilogram mass that is freely falling toward the surface of the planet at 8.8 meters per second<sup>2</sup>?
  - A) 150 N B) 8.8 N C) 0.52 N D) 1.9 N
- 14) A 50.-kilogram student stands on the surface of the Earth. What is the magnitude of the gravitational force of the Earth on the student?
  - A) 50. N B) 490 N C)  $6.7 \times 10^{-11}$  N D) 9.8 N
- 15) The diagram below shows spheres A and B with masses of M and 3M, respectively.

If the gravitational force of attraction of sphere A on sphere B is 2 newtons, then the gravitational force of attraction of sphere B on sphere A is

A) 4 N B) 2 N C) 9 N D) 3 N

## Questions 16 and 17 refer to the following:

Spacecraft S is traveling from planet  $P_1$  toward planet  $P_2$ . At the position shown, the magnitude of the gravitational force of planet  $P_1$  on the spacecraft is equal to the magnitude of the gravitational force of planet  $P_2$  on the spacecraft.



- 16) If distance X is greater than distance Y, then the mass of  $P_1$  must be
  - A) less than the mass of  $P_2$  C) greater than the
  - B) equal to the mass of  $P_2$

C) greater than the mass of  $P_2$ 

17) As the spacecraft moves from the position shown toward planet  $P_2$ , the ratio of the gravitational force of  $P_2$  on the spacecraft to the gravitational force of  $P_1$  on the spacecraft will

A) decrease

C) remain the same

- B) increase
- 18) A 50-kilogram student, standing on the Earth, attracts the Earth with a force *closest* to
  - A) 5 newtons B) 50 newtons C) 0 newtons D) 500 newtons