Instructor(s): *Field/Furic*

PHYSICS DEPARTMENT

PHY 2053   Exam 2   November 8, 2012
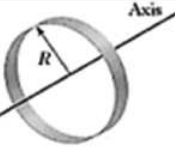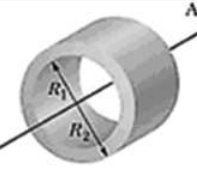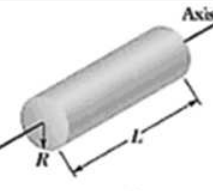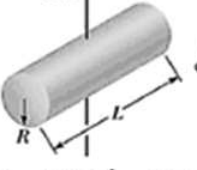
Name (print, last first): _____   Signature: _____

On my honor, I have neither given nor received unauthorized aid on this examination.

YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.

(1) **Code your test number on your answer sheet (use lines 76–80 on the answer sheet for the 5-digit number).** Code your name on your answer sheet. **DARKEN CIRCLES COMPLETELY**. Code your UFID number on your answer sheet.

(2) Print your name on this sheet and sign it also.

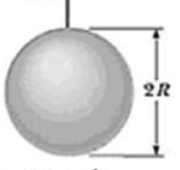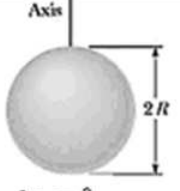(3) Do all scratch work anywhere on this exam that you like. **Circle your answers on the test form.** At the end of the test, this exam printout is to be turned in. No credit will be given without both answer sheet and printout.

(4) **Blacken the circle of your intended answer completely, using a #2 pencil or <u>blue</u> or <u>black</u> ink**. Do not make any stray marks or some answers may be counted as incorrect.

(5) **The answers are rounded off. Choose the closest to exact. There is no penalty for guessing. If you believe that no listed answer is correct, leave the form blank.**
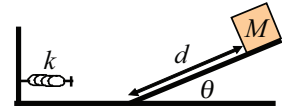
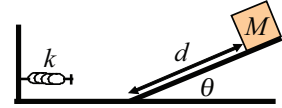(6) Hand in the answer sheet separately.

Use $g = 9.80$ m/s^2

1. Near the surface of the Earth, an ideal spring with spring constant $k = 50$ N/m is on a frictionless horizontal surface at the base of a frictionless inclined plane as shown in the figure. A block with mass $M = 0.6$ kg is released from rest a distance $d = 1.5$ m up the incline plane. If the block slides down and compresses the spring 0.5 m from its equilibrium position before coming to rest, what is the angle θ of the inclined plane relative to the horizontal?

(1) 45.1°   (2) 32.1°   (3) 20.8°   (4) 30.0°   (5) 58.4°

2. Near the surface of the Earth, an ideal spring with spring constant $k = 50$ N/m is on a frictionless horizontal surface at the base of a frictionless inclined plane as shown in the figure. A block with mass $M = 0.6$ kg is released from rest a distance $d = 2.0$ m up the incline plane. If the block slides down and compresses the spring 0.5 m from its equilibrium position before coming to rest, what is the angle θ of the inclined plane relative to the horizontal?

(1) 32.1°   (2) 45.1°   (3) 20.8°   (4) 30.0°   (5) 58.4°

3. Near the surface of the Earth, an ideal spring with spring constant $k = 50$ N/m is on a frictionless horizontal surface at the base of a frictionless inclined plane as shown in the figure. A block with mass $M = 0.6$ kg is released from rest a distance $d = 3.0$ m up the incline plane. If the block slides down and compresses the spring 0.5 m from its equilibrium position before coming to rest, what is the angle θ of the inclined plane relative to the horizontal?
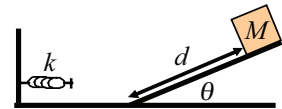

(1) 20.8°   (2) 45.1°   (3) 32.1°   (4) 30.0°   (5) 58.4°

4. A projectile is fired straight upward from Earth's surface with a speed that is 0.816 times the escape speed. If R_E is the radius of Earth, what is the highest altitude reached measured from the surface of the Earth?

(1) $2R_E$ (2) $3R_E$ (3) $4R_E$ (4) R_E (5) $5R_E$

5. A projectile is fired straight upward from Earth's surface with a speed that is 0.866 times the escape speed. If R_E is the radius of Earth, what is the highest altitude reached measured from the surface of the Earth?

(1) $3R_E$ (2) $2R_E$ (3) $4R_E$ (4) R_E (5) $5R_E$

6. A projectile is fired straight upward from Earth's surface with a speed that is 0.894 times the escape speed. If R_E is the radius of Earth, what is the highest altitude reached measured from the surface of the Earth?

(1) $4R_E$ (2) $2R_E$ (3) $3R_E$ (4) R_E (5) $5R_E$

7. Two point particles with equal mass M are released from rest a distance d apart and are attracted toward each other due to the gravitational force. They move toward each other at equal speeds v as shown in the figure. What is the speed v of the two particles when they are a distance $d/5$ apart?

(1) $2\sqrt{GM/d}$ (2) $3\sqrt{GM/d}$ (3) $4\sqrt{GM/d}$ (4) $\sqrt{GM/d}$ (5) $0.5\sqrt{GM/d}$

8. Two point particles with equal mass M are released from rest a distance d apart and are attracted toward each other due to the gravitational force. They move toward each other at equal speeds v as shown in the figure. What is the speed v of the two particles when they are a distance $d/10$ apart?

(1) $3\sqrt{GM/d}$ (2) $2\sqrt{GM/d}$ (3) $4\sqrt{GM/d}$ (4) $\sqrt{GM/d}$ (5) $0.5\sqrt{GM/d}$

9. Two point particles with equal mass M are released from rest a distance d apart and are attracted toward each other due to the gravitational force. They move toward each other at equal speeds v as shown in the figure. What is the speed v of the two particles when they are a distance $d/17$ apart?

(1) $4\sqrt{GM/d}$ (2) $3\sqrt{GM/d}$ (3) $2\sqrt{GM/d}$ (4) $\sqrt{GM/d}$ (5) $0.5\sqrt{GM/d}$

10. What is the mass of a particle (in kg) with a momentum of 2 kg·m/s and a kinetic energy of 4 J?

(1) 1/2   (2) 1/3   (3) 1/4   (4) 1   (5) 2

11. What is the mass of a particle (in kg) with a momentum of 2 kg·m/s and a kinetic energy of 6 J?

(1) 1/3   (2) 1/2   (3) 1/4   (4) 1   (5) 3

12. What is the mass of a particle (in kg) with a momentum of 2 kg·m/s and a kinetic energy of 8 J?

(1) 1/4   (2) 1/2   (3) 1/3   (4) 1   (5) 4

13. Two point particles move toward the right as shown in the figure. If particle 1 has mass M and speed v, and particle 2 has mass $M/2$ and speed v/2, what is the speed of the center-of-mass of this two particle system?
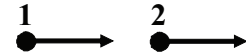
(1) 5v/6   (2) 7v/6   (3) 4v/3   (4) 3v/4   (5) 6v/5

14. Two point particles move toward the right as shown in the figure. If particle 1 has mass M and speed v, and particle 2 has mass $M/2$ and speed 3v/2, what is the speed of the center-of-mass of this two particle system?
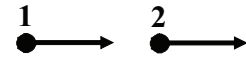
(1) 7v/6   (2) 5v/6   (3) 4v/3   (4) 3v/4   (5) 6v/5

15. Two point particles move toward the right as shown in the figure. If particle 1 has mass M and speed v, and particle 2 has mass $M/2$ and speed 2v, what is the speed of the center-of-mass of this two particle system?
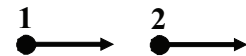
(1) 4v/3   (2) 7v/6   (3) 5v/6   (4) 3v/4   (5) 6v/5

16. A 1,000 kg piece of space debris has velocity $(5m/s)\hat{x} + (20m/s)\hat{y}$ when it collides with a second piece of space debris of mass 3,500 kg and moving with velocity $(5m/s)\hat{x}$, where $\hat{x}$ and $\hat{y}$ are unit vectors in the x and y-direction, respectively. If after the collision the two pieces are locked together, what is their speed (in m/s)?

(1) 6.7   (2) 8.3   (3) 5.5   (4) 2.5   (5) 12.2

17. A 1,000 kg piece of space debris has velocity $(5m/s)\hat{x} + (30m/s)\hat{y}$ when it collides with a second piece of space debris of mass 3,500 kg and moving with velocity $(5m/s)\hat{x}$, where $\hat{x}$ and $\hat{y}$ are unit vectors in the x and y-direction, respectively. If after the collision the two pieces are locked together, what is their speed (in m/s)?

(1) 8.3   (2) 6.7   (3) 5.5   (4) 2.5   (5) 12.2

18. A 1,000 kg piece of space debris has velocity $(5m/s)\hat{x} + (10m/s)\hat{y}$ when it collides with a second piece of space debris of mass 3,500 kg and moving with velocity $(5m/s)\hat{x}$, where $\hat{x}$ and $\hat{y}$ are unit vectors in the x and y-direction, respectively. If after the collision the two pieces are locked together, what is their speed (in m/s)?

(1) 5.5   (2) 8.3   (3) 6.7   (4) 2.5   (5) 12.2

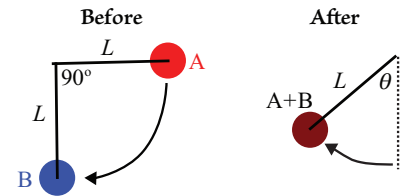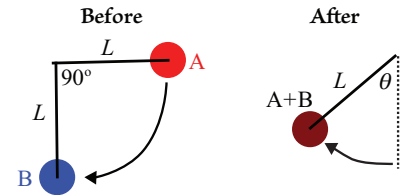19. Two pendulum bobs have masses $M_A = 5$ kg and $M_B = 2$ kg and equal lengths L as shown in the figure. Bob A is initially held horizontally while bob B hangs vertically at rest. Bob A is released and collides with bob B. The two masses then stick together and swing upward to the left to a maximum angle θ. What is the maximum swing angle θ?

(1) 60.7°   (2) 56.3°   (3) 50.2°   (4) 45.0°   (5) 75.2°

20. Two pendulum bobs have masses $M_A = 4$ kg and $M_B = 2$ kg and equal lengths L as shown in the figure. Bob A is initially held horizontally while bob B hangs vertically at rest. Bob A is released and collides with bob B. The two masses then stick together and swing upward to the left to a maximum angle θ. What is the maximum swing angle θ?

(1) 56.3°   (2) 60.7°   (3) 50.2°   (4) 45.0°   (5) 75.2°

21. Two pendulum bobs have masses $M_A = 3$ kg and $M_B = 2$ kg and equal lengths L as shown in the figure. Bob A is initially held horizontally while bob B hangs vertically at rest. Bob A is released and collides with bob B. The two masses then stick together and swing upward to the left to a maximum angle θ. What is the maximum swing angle θ?
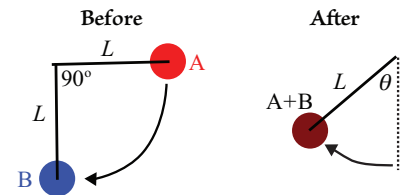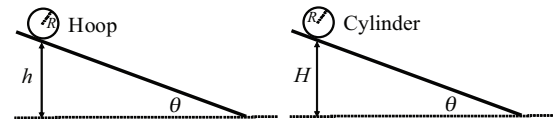

(1) 50.2°   (2) 56.3°   (3) 60.7°   (4) 45.0°   (5) 75.2°

22. A hoop with moment of inertia $I = MR^2$ and radius R starts from rest at a height h above the ground and rolls without slipping down an incline as shown in the figure. A solid cylinder also with radius R but with moment of inertia $I = MR^2/2$ starts from rest at a height H above the ground and rolls without slipping down an incline. If the translational speed of the hoop and the cylinder are the same when they reach the ground, what is the height H?

(1) 0.750h   (2) 0.667h   (3) 0.625h   (4) 0.333h   (5) 0.825h

23. A hoop with moment of inertia $I = MR^2$ and radius R starts from rest at a height h above the ground and rolls without slipping down an incline as shown in the figure. A solid cylinder also with radius R but with moment of inertia $I = MR^2/3$ starts from rest at a height H above the ground and rolls without slipping down an incline. If the translational speed of the hoop and the cylinder are the same when they reach the ground, what is the height H?
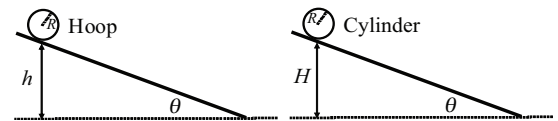
(1) 0.667h   (2) 0.750h   (3) 0.625h   (4) 0.333h   (5) 0.825h

24. A hoop with moment of inertia $I = MR^2$ and radius R starts from rest at a height h above the ground and rolls without slipping down an incline as shown in the figure. A solid cylinder also with radius R but with moment of inertia $I = MR^2/4$ starts from rest at a height H above the ground and rolls without slipping down an incline. If the translational speed of the hoop and the cylinder are the same when they reach the ground, what is the height H?

(1) 0.625h   (2) 0.667h   (3) 0.750h   (4) 0.333h   (5) 0.825h

25. A thin stick with mass M, length L, and moment of inertia $ML^2/3$ is hinged at its lower end and allowed to fall freely as shown in the figure. If its length $L = 2$ m and it starts from rest at an angle $\theta = 60°$ with respect to the horizontal, what is the speed (in m/s) of the free end of the stick when it hits the table?

(1) 7.14   (2) 6.15   (3) 4.48   (4) 2.71   (5) 3.71

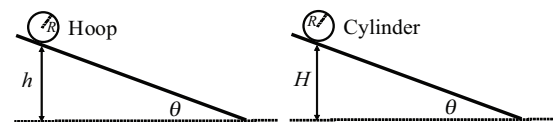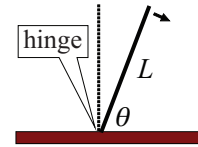26. A thin stick with mass M, length L, and moment of inertia $ML^2/3$ is hinged at its lower end and allowed to fall freely as shown in the figure. If its length $L = 2$ m and it starts from rest at an angle $\theta = 40°$, what is the speed (in m/s) of the free end of the stick when it hits the table?
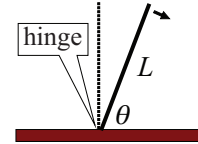
(1) 6.15   (2) 7.14   (3) 4.48   (4) 2.71   (5) 3.71

27. A thin stick with mass M, length L, and moment of inertia $ML^2/3$ is hinged at its lower end and allowed to fall freely as shown in the figure. If its length $L = 2$ m and it starts from rest at an angle $\theta = 20°$, what is the speed (in m/s) of the free end of the stick when it hits the table?
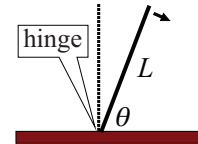
(1) 4.48   (2) 7.14   (3) 6.15   (4) 2.71   (5) 3.71

28. If a 0.5 kg point particle has velocity $\vec{v} = (2m/s)\hat{y}$ when it is located at $\vec{r} = (3m)\hat{x} + (3m)\hat{y}$, what is the magnitude of its angular momentum (in kg·m^2/s) about the point P $= (0, 0)$, as shown in the figure?

(1) 3.0
(2) 4.0
(3) 5.0
(4) 1.5
(5) 2.0
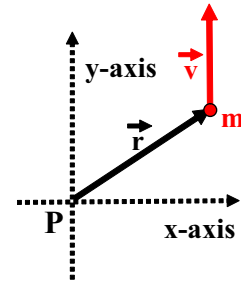
29. If a 0.5 kg point particle has velocity $\vec{v} = (2m/s)\hat{y}$ when it is located at $\vec{r} = (4m)\hat{x} + (4m)\hat{y}$, what is the magnitude of its angular momentum (in kg·m^2/s) about the point P $= (0, 0)$, as shown in the figure?

(1) 4.0
(2) 3.0
(3) 5.0
(4) 1.5
(5) 2.0
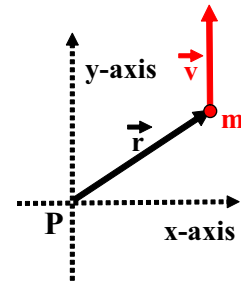
30. If a 0.5 kg point particle has velocity $\vec{v} = (2m/s)\hat{y}$ when it is located at $\vec{r} = (5m)\hat{x} + (5m)\hat{y}$, what is the magnitude of its angular momentum (in kg·m^2/s) about the point P $= (0, 0)$, as shown in the figure?

(1) 5.0
(2) 3.0
(3) 4.0
(4) 1.5
(5) 2.0
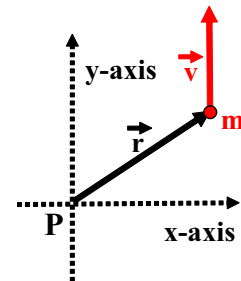
31. A block of mass m is attached to a cord that is wrapped around the rim of a flywheel of radius R and hangs vertically, as shown. If, when the block is released and the cord unwinds, the acceleration of the block is equal to $g/3$, what is the rotational inertia of the flywheel?

    (1) $2mR^2$ (2) $3mR^2$ (3) $4mR^2$ (4) mR^2 (5) $mR^2/2$

32. A block of mass m is attached to a cord that is wrapped around the rim of a flywheel of radius R and hangs vertically, as shown. If, when the block is released and the cord unwinds, the acceleration of the block is equal to $g/4$, what is the rotational inertia of the flywheel?

    (1) $3mR^2$ (2) $2mR^2$ (3) $4mR^2$ (4) mR^2 (5) $mR^2/2$
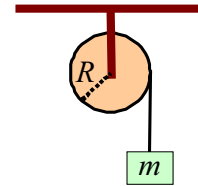
33. A block of mass m is attached to a cord that is wrapped around the rim of a flywheel of radius R and hangs vertically, as shown. If, when the block is released and the cord unwinds, the acceleration of the block is equal to $g/5$, what is the rotational inertia of the flywheel?

    (1) $4mR^2$ (2) $2mR^2$ (3) $3mR^2$ (4) mR^2 (5) $mR^2/2$
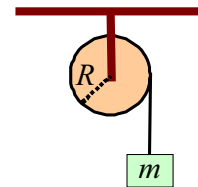
34. A mouse of mass $2M$ lies on the rim of a solid uniform disk of mass M and radius R ($I_{\mathrm{disk}} = MR^2/2$). The disk can rotate freely about its c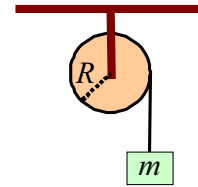enter like a merry-go-round. Initially the mouse and disk rotate together with an angular velocity of ω. The mouse walks to a new position that is a distance r from the center of the disk and the new angular velocity of the mouse-disk system is 2.5ω. Where is the mouse (*i.e.*, what is r)?

    (1) $r = R/2$ (2) $r = R/4$ (3) $r = 0$ (4) $r = 3R/4$ (5) $r = R/3$

35. A mouse of mass $2M$ lies on the rim of a solid uniform disk of mass M and radius R ($I_{\mathrm{disk}} = MR^2/2$). The disk can rotate freely about its center like a merry-go-round. Initially the mouse and disk rotate together with an angular velocity of ω. The mouse walks to a new position that is a distance r from the center of the disk and the new angular velocity of the mouse-disk system is 4ω. Where is the mouse (*i.e.*, what is r)?

    (1) $r = R/4$ (2) $r = R/2$ (3) $r = 0$ (4) $r = 3R/4$ (5) $r = R/3$

36. A mouse of mass $2M$ lies on the rim of a solid uniform disk of mass M and radius R ($I_{\mathrm{disk}} = MR^2/2$). The disk can rotate freely about its center like a merry-go-round. Initially the mouse and disk rotate together with an angular velocity of ω. The mouse walks to a new position that is a distance r from the center of the disk and the new angular velocity of the mouse-disk system is 5ω. Where is the mouse (*i.e.*, what is r)?

    (1) $r = 0$ (2) $r = R/2$ (3) $r = R/4$ (4) $r = 3R/4$ (5) $r = R/3$

37. A block of wood weighs 150 N and has a density of 600 kg/m^3. In water (density 1,000 kg/m^3) the block floats. How much downward force must you supply to fully submerge the block so that it rests just below the water surface?

    (1) 100 N   (2) 50 N   (3) 150 N   (4) 200 N   (5) 25 N

38. A block of wood weighs 75 N and has a density of 600 kg/m³. In water (density 1,000 kg/m³) the block floats. How much downward force must you supply to fully submerge the block so that it rests just below the water surface?

(1) 50 N   (2) 100 N   (3) 150 N   (4) 200 N   (5) 25 N

39. A block of wood weighs 225 N and has a density of 600 kg/m³. In water (density 1,000 kg/m³) the block floats. How much downward force must you supply to fully submerge the block so that it rests just below the water surface?

(1) 150 N   (2) 100 N   (3) 50 N   (4) 200 N   (5) 25 N

40. An object hangs from a spring balance. When submerged in water the object weighs 60% what it weighs in air. If when submerged in an unknown liquid with density ρ_x the object weighs 80% what it weighs in air, what is the density of the unknown liquid?
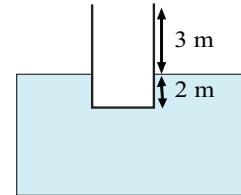
(1) $\frac{1}{2}\rho_{\text{water}}$ (2) $\frac{2}{5}\rho_{\text{water}}$ (3) $\frac{1}{3}\rho_{\text{water}}$ (4) $2\rho_{\text{water}}$ (5) $3\rho_{\text{water}}$

41. An object hangs from a spring balance. When submerged in water the object weighs 50% what it weighs in air. If when submerged in an unknown liquid with density ρ_x the object weighs 80% what it weighs in air, what is the density of the unknown liquid?

(1) $\frac{2}{5}\rho_{\text{water}}$ (2) $\frac{1}{2}\rho_{\text{water}}$ (3) $\frac{1}{3}\rho_{\text{water}}$ (4) $2\rho_{\text{water}}$ (5) $3\rho_{\text{water}}$

42. An object hangs from a spring balance. When submerged in water the object weighs 40% what it weighs in air. If when submerged in an unknown liquid with density ρ_x the object weighs 80% what it weighs in air, what is the density of the unknown liquid?

(1) $\frac{1}{3}\rho_{\text{water}}$ (2) $\frac{2}{5}\rho_{\text{water}}$ (3) $\frac{1}{2}\rho_{\text{water}}$ (4) $2\rho_{\text{water}}$ (5) $3\rho_{\text{water}}$

43. When a stone of weight W is suspended from a scale and submerged in water the scale reads 9 N. When the same stone is suspended from a scale and submerged in oil the scale reads 12 N. If the density of the oil is 0.8 the density of the water (*i.e.*, $\rho_{\text{oil}} = 0.8\rho_{\text{water}}$), what is the true weight W (in N) of the stone?

(1) 24   (2) 21   (3) 39   (4) 18   (5) 14

44. When a stone of weight W is suspended from a scale and submerged in water the scale reads 9 N. When the same stone is suspended from a scale and submerged in oil the scale reads 12 N. If the density of the oil is 0.75 the density of the water (*i.e.*, $\rho_{\text{oil}} = 0.75\rho_{\text{water}}$), what is the true weight W (in N) of the stone?

(1) 21   (2) 24   (3) 39   (4) 18   (5) 14

45. When a stone of weight W is suspended from a scale and submerged in water the scale reads 9 N. When the same stone is suspended from a scale and submerged in oil the scale reads 12 N. If the density of the oil is 0.9 the density of the water (*i.e.*, $\rho_{\text{oil}} = 0.9\rho_{\text{water}}$), what is the true weight W (in N) of the stone?

(1) 39   (2) 24   (3) 21   (4) 18   (5) 14

46. A large cargo container has a square base with an area of 5 m² and height $H = 5$ m. When empty it floats on the water ($\rho_{\text{water}} = 1,000$ kg/m³) with 3 meters above the surface of the water and 2 m below the surface as shown in the figure. The cargo container is being loaded with small 50-kg boxes. What is the maximum number of boxes the cargo container can hold without sinking?

(1) 300   (2) 200   (3) 150   (4) 250   (5) 100

47. A large cargo container has a square base with an area of 5 m² and height $H = 5$ m. When empty it floats on the water ($\rho_{\text{water}} = 1,000$ kg/m³) with 3 meters above the surface of the water and 2 m below the surface as shown in the figure. The cargo container is being loaded with small 75-kg boxes. What is the maximum number of boxes the cargo container can hold without sinking?

(1) 200   (2) 300   (3) 150   (4) 250   (5) 100

48. A large cargo container has a square base with an area of 5 m² and height $H = 5$ m. When empty it floats on the water ($\rho_{\text{water}} = 1,000$ kg/m³) with 3 meters above the surface of the water and 2 m below the surface as shown in the figure. The cargo container is being loaded with small 100-kg boxes. What is the maximum number of boxes the cargo container can hold without sinking?
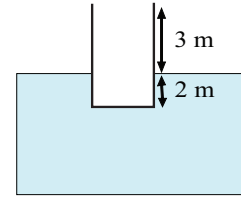
(1) 150   (2) 300   (3) 200   (4) 250   (5) 100

49. Use Bernoulli's equation to estimate the upward force (in kN) on an airplane's wing if the average flow speed of the air is 200 m/s above the wing and 180 m/s below the wing. The density of air is 1.3 kg/m³ and the area of the wing surface is 25 m².

(1) 124   (2) 63   (3) 152   (4) 191   (5) 48

50. Use Bernoulli's equation to estimate the upward force (in kN) on an airplane's wing if the average flow speed of the air is 200 m/s above the wing and 190 m/s below the wing. The density of air is 1.3 kg/m³ and the area of the wing surface is 25 m².

(1) 63   (2) 124   (3) 152   (4) 191   (5) 48

51. Use Bernoulli's equation to estimate the upward force (in kN) on an airplane's wing if the average flow speed of the air is 200 m/s above the wing and 175 m/s below the wing. The density of air is 1.3 kg/m³ and the area of the wing surface is 25 m².

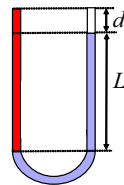(1) 152   (2) 124   (3) 63   (4) 191   (5) 48

52. The U-tube shown in the figure contains two liquids in static equilibrium: water of density ρ_w is in the right arm, and an oil of unknown density is in the left arm. What is the density of the unknown oil if $d = L/4$?

(1) $0.80\rho_w$
(2) $0.75\rho_w$
(3) $0.87\rho_w$
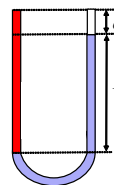(4) $0.60\rho_w$
(5) $0.50\rho_w$
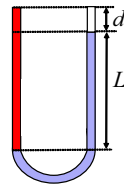
53. The U-tube shown in the figure contains two liquids in static equilibrium: water of density ρ_w is in the right arm, and an oil of unknown density is in the left arm. What is the density of the unknown oil if $d = L/3$?

(1) $0.75\rho_w$
(2) $0.80\rho_w$
(3) $0.87\rho_w$
(4) $0.60\rho_w$
(5) $0.50\rho_w$

54. The U-tube shown in the figure contains two liquids in static equilibrium: water of density ρ_w is in the right arm, and an oil of unknown density is in the left arm. What is the density of the unknown oil if $d = 3L/20$?

(1) $0.87\rho_w$
(2) $0.80\rho_w$
(3) $0.75\rho_w$
(4) $0.60\rho_w$
(5) $0.50\rho_w$

55. A marble statue of volume 1.5 m^3 is being transported from New York to England by ship. The statue falls into the ocean and ends up on the ocean floor, 1.0 km below the surface. If the bulk modulus of marble is 70×10^9 Pa and the density of sea water is 1,025 kg/m^3, what is the decrease in volume (in cm^3) of the statue due to the pressure of the water?

(1) 215   (2) 287   (3) 359   (4) 195   (5) 425

56. A marble statue of volume 2.0 m^3 is being transported from New York to England by ship. The statue falls into the ocean and ends up on the ocean floor, 1.0 km below the surface. If the bulk modulus of marble is 70×10^9 Pa and the density of sea water is 1,025 kg/m^3, what is the decrease in volume (in cm^3) of the statue due to the pressure of the water?

(1) 287   (2) 215   (3) 359   (4) 195   (5) 425

57. A marble statue of volume 2.5 m^3 is being transported from New York to England by ship. The statue falls into the ocean and ends up on the ocean floor, 1.0 km below the surface. If the bulk modulus of marble is 70×10^9 Pa and the density of sea water is 1,025 kg/m^3, what is the decrease in volume (in cm^3) of the statue due to the pressure of the water?

(1) 359   (2) 215   (3) 287   (4) 195   (5) 425

58. A 2,000 kg wrecking ball is to be lifted by a crane with a steel cable that has a diameter of 2.0 cm and an unstretched length of 40 m. The Young's modulus of steel is 2.0×10^{11} Pa. Ignoring the weight of the cable itself, when the ball is lifted and held at rest, how much does the cable stretch (in cm)?

(1) 1.25   (2) 4.99   (3) 2.22   (4) 0.25   (5) 0.85

59. A 2,000 kg wrecking ball is to be lifted by a crane with a steel cable that has a diameter of 1.0 cm and an unstretched length of 40 m. The Young's modulus of steel is 2.0×10^{11} Pa. Ignoring the weight of the cable itself, when the ball is lifted and held at rest, how much does the cable stretch (in cm)?

(1) 4.99   (2) 1.25   (3) 2.22   (4) 0.25   (5) 0.85

60. A 2,000 kg wrecking ball is to be lifted by a crane with a steel cable that has a diameter of 1.5 cm and an unstretched length of 40 m. The Young's modulus of steel is 2.0×10^{11} Pa. Ignoring the weight of the cable itself, when the ball is lifted and held at rest, how much does the cable stretch (in cm)?

(1) 2.22   (2) 1.25   (3) 4.99   (4) 0.25   (5) 0.85

FOLLOWING GROUPS OF QUESTIONS WILL BE SELECTED AS ONE GROUP FROM EACH TYPE
TYPE 1
Q# S 1
Q# S 2
Q# S 3
TYPE 2

Q# S 4
Q# S 5
Q# S 6
TYPE 3
Q# S 7
Q# S 8
Q# S 9
TYPE 4
Q# S 10
Q# S 11
Q# S 12
TYPE 5
Q# S 13
Q# S 14
Q# S 15
TYPE 6
Q# S 16
Q# S 17
Q# S 18
TYPE 7
Q# S 19
Q# S 20
Q# S 21
TYPE 8
Q# S 22
Q# S 23
Q# S 24
TYPE 9
Q# S 25
Q# S 26
Q# S 27
TYPE 10
Q# S 28
Q# S 29
Q# S 30
TYPE 11
Q# S 31
Q# S 32
Q# S 33
TYPE 12
Q# S 34
Q# S 35
Q# S 36
TYPE 13
Q# S 37
Q# S 38
Q# S 39
TYPE 14
Q# S 40
Q# S 41
Q# S 42
TYPE 15
Q# S 43
Q# S 44
Q# S 45
TYPE 16
Q# S 46
Q# S 47
Q# S 48
TYPE 17
Q# S 49
Q# S 50
Q# S 51
TYPE 18
Q# S 52
Q# S 53
Q# S 54
TYPE 19
Q# S 55
Q# S 56
Q# S 57
TYPE 20
Q# S 58
Q# S 59
Q# S 60