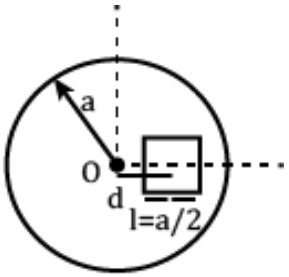
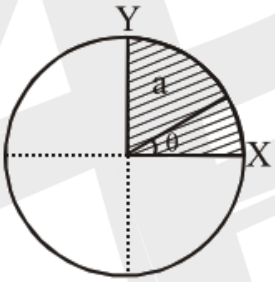
DPP-1

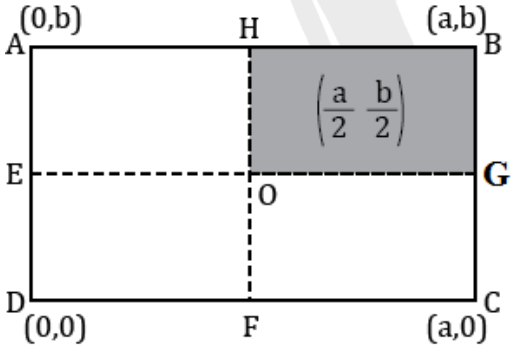
Q.1 A square shaped hole of side $l = \frac{a}{2}$ is carved out at a distance $d = \frac{a}{2}$ from the centre ' O ' of a uniform circular disk of radius a . If the distance of the centre of mass of the remaining portion from O is $-\frac{a}{\alpha+.12}$ value of α is____.



Q.2 A disc of mass M with uniform surface mass density σ is shown in the figure. The centre of mass of the quarter disc (the shaded area) is at the position $\frac{x}{3}\frac{a}{\pi}, \frac{x}{3}\frac{a}{\pi}$ where x is _____. (Round off to the nearest integer) [a is an area as shown in the figure]



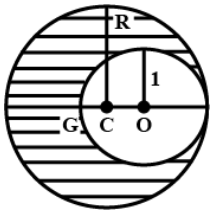
Q.3 A uniform rectangular thin sheet ABCD of mass M has length a and breadth b, as shown in the figure. If the shaded portion HBGO is cut-off, the coordinates of the centre of mass of the remaining portion in x- direction is $\frac{\beta a}{12}$. Value of β is _ _ _



Q.4 Two bodies of mass 1 kg and 3 kg have position vectors $\hat{i} + 2\hat{j} + \hat{k}$ and $-3\hat{i} - 2\hat{j} + \hat{k}$ respectively. The magnitude of position vector of centre of mass of this system will be similar to the magnitude of vector

(A) $\hat{i} + 2\hat{j} + \hat{k}$ (B) $-3\hat{i} - 2\hat{j} + \hat{k}$ (C) $-2\hat{i} + 2\hat{k}$ (D) $-2\hat{i} - \hat{j} + 2\hat{k}$

Q.5 As shown in figure when a spherical cavity (centred at O) of radius 1 is cut out of a uniform sphere of radius R (centred at C), the centre of mass of remaining (shaded) part of sphere is at G, i.e., on the surface of the cavity. R can be determined by the equation



(A) $(R^2 + R + 1)(2 - R) = 1$ (B) $(R^2 + R - 1)(2 - R) = 1$

(C) $(R^2 - R - 1)(2 - R) = 1$ (D) $(R^2 - R + 1)(2 - R) = 1$

Q.6 Two blocks of masses 10 kg and 30 kg are placed on the same straight line with coordinates (0,0)cm and (x, 0)cm respectively. The block of 10 kg is moved on the same line through a distance of 6 cm towards the other block. The distance through which the block of 30 kg must be moved to keep the position of centre of mass of the system unchanged is

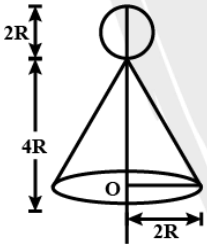
(A) 4 cm towards the 10 kg block

(B) 2 cm away from the 10 kg block

(C) 2 cm towards the 10 kg block

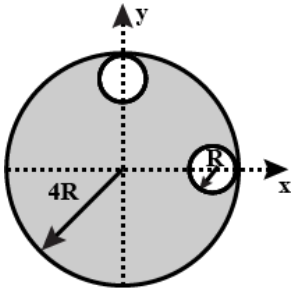
(D) 4 cm away from the 10 kg block

Q.7 A man has constructed a toy as shown in figure. If density of the material of the sphere is 12 times of the cone compute the position of the centre of mass. [Centre of mass of a cone of height h is at height of h/4 from its base.]



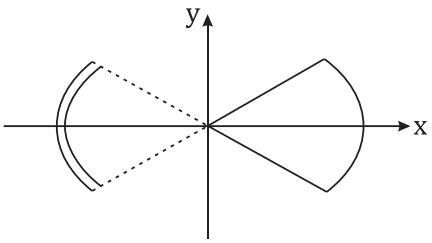
(A) 4R (B) 2.5R (C) 2.8R (D) 3.2R

Q.8 From the circular disc of radius 4R two small disc of radius R are cut off. The centre of mass of the new structure will be:



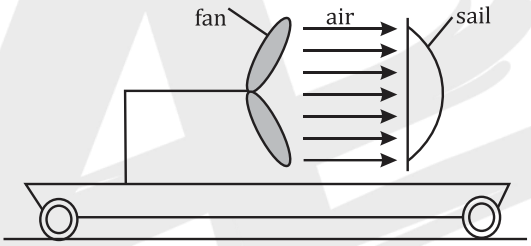
(A) $i\frac{R}{5} + j\frac{R}{5}$ (B) $-i\frac{R}{5} + j\frac{R}{5}$ (C) $\frac{-3R}{14}(\hat{i} + \hat{j})$ (D) None of these

Q.9 A sector cut from a uniform disk of radius 12 cm and a uniform rod of the same mass bent into shape of an arc are arranged facing each other as shown in the figure. If center of mass of the combination is at the origin, what is the radius of the arc?



(A) 8 cm (B) 9 cm (C) 12 cm (D) 18 cm

Q.10 A fan and a sail are mounted vertically on a cart that is initially at rest on a horizontal table as shown in the diagram. When the fan is turned on, an air stream is blown towards the right and is incident on the sail. The cart is free to move with negligible resistance forces. After the fan has been turned on the cart will



(A) move to the right and then to the left (B) remain at rest

(C) move towards the right (D) move towards the left

ANSWER KEY

1. (23) **2.** (4) **3.** (5) **4.** (A) **5.** (A) **6.** (C) **7.** (A)
8. (C) **9.** (A) **10.** (B)

Home Work

Ex. 1	Q. 1,2,3,
Ex. 2	Q. 1,2,3,4,9,
Ex.3	Q. 1,2,15
Ex.4	Q. 1,2,3,21,22,23,24,
Ex.5	Q.15,