21. (3)

$$r = \frac{L}{2\pi}$$

$$I = mr^2 + mr^2 = 2mr^2$$

$$= 2m\left(\frac{L}{2\pi}\right)^2 = \frac{mL^2}{2\pi^2}$$

22. (2)

$$x_1 = \frac{m_2 d}{m_1 + m_2} = \frac{10 \times 1}{15} = \frac{2}{3}\,m = 67\,cm$$

23. (2)

24. (3)

$$\vec{v}_{CM} = \frac{m_1\vec{v}_1 + m_2\vec{v}_2}{m_1 + m_2} = \frac{200(10\hat{i}) + 500\left(3\hat{i} + 5\hat{j}\right)}{700}$$

$$\vec{v}_{CM} = 5\hat{i} + \frac{25}{7}\hat{j}$$

25. (1)

26. (3)

27. (1)

$$v_{CM} = \text{constant} = 0.5\ ms^{-1}$$

28. (1)

29. (4)

$$I = MK^2 \Rightarrow K = \sqrt{\frac{I}{M}} = \sqrt{\frac{160}{10}} = 4\,m$$

30. (1)