

EXERCISE 1(B)

Solutions:

The centre of gravity of a body is defined as the point about which the algebraic sum of moments of weights of particles constituting the body is zero and the entire weight of the body is considered to act at this point.

Solutions:

Yes, the centre of gravity of a body can be situated outside its material of the body.

Example: centre of gravity of a ring.

Solutions:

Centre of gravity of a body of given mass position depends on its shape i.e on the distribution of mass. For example: Uniform wire's centre of gravity is at its mid point. But if this wire is bent to make a circle, its centre of gravity will then be at the centre of circle.

Solutions:

(a) The position of centre of gravity of a rectangular lamina is at the point of intersection of its diagonals.

(b) The position of centre of gravity of a cylinder is at the midpoint on the axis of cylinder.

Solutions:

- (a) A triangular lamina's centre of gravity is situated at the point of intersection of its medians.
(b) A circular lamina's centre of gravity is situated at the centre of circular lamina.

Question: 6

Where is the centre of gravity of a uniform ring situated?

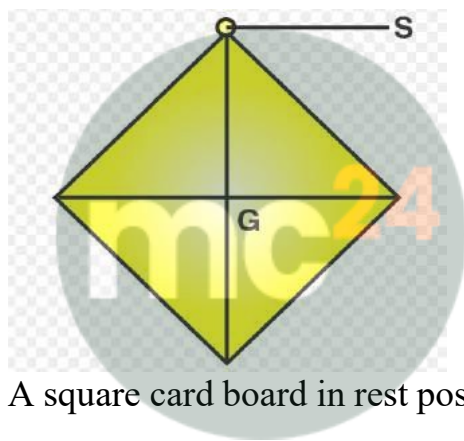
Solutions:

Uniform ring's centre of gravity is situated at the centre of ring.

Question: 7

A square card board is suspended by passing a pin through a narrow hole at its one corner. Draw a diagram to show its rest position. In the diagram mark the point of suspension by the letter S and centre of gravity by the letter G.

Solutions:



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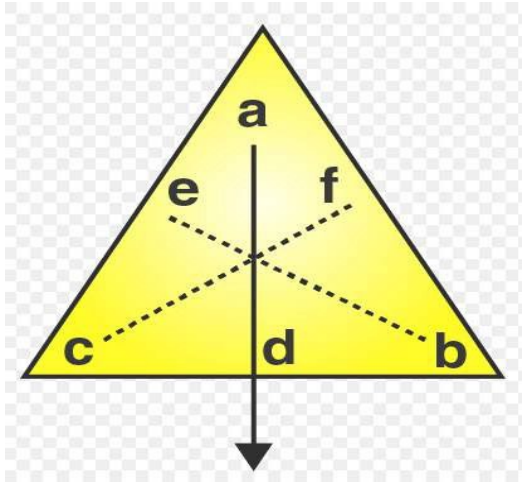
A square card board in rest position as centre of gravity as G and point of suspension as S

Question: 8

Explain how you will determine experimentally the position of centre of gravity for a triangular lamina (or a triangular piece of card board).

Solutions:

Take a triangular lamina. Near the edge of triangular lamina make three fine holes at a, b, c. Now along with a plumb line from hole 'a' suspend the given lamina. Check that the lamina is free to oscillate about the point of suspension. Draw a straight line ad along the plumb line when lamina has come to rest. We get straight lines 'be' and 'cf' respectively by repeating the experiment by suspending the lamina through hole 'b' and then through hole 'c'. It is noticed that the common point G is the position of centre of gravity of triangular lamina where the lines ad, be and cf intersect each other i.e the point of intersection of medians.



Question: 9

State whether the following statements are true or false.

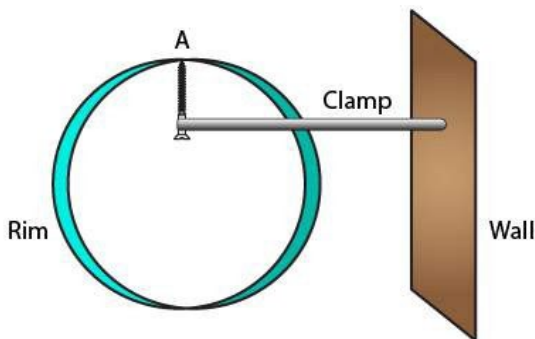
- (i) 'The position of centre of gravity of a body remains unchanged even when the body is deformed'.
- (ii) 'The centre of gravity of a freely suspended body always lies vertically below the point of suspension'.

Solutions:

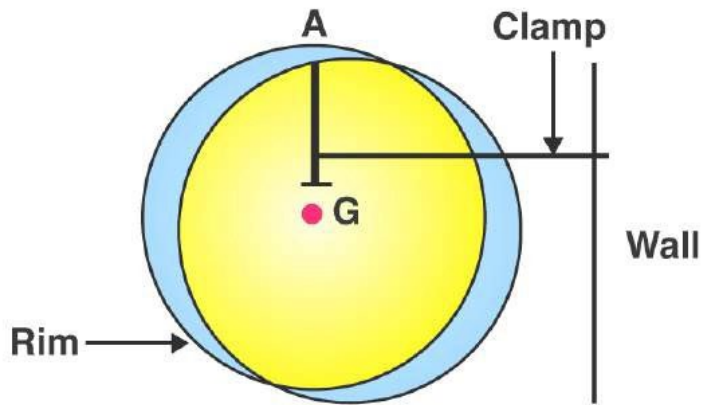
- (i) False, the centre of gravity of a body of given mass position depends on its shape i.e on the distribution of mass in it.
- (ii) True

Question: 10

A uniform flat circular rim is balanced on a sharp vertical nail by supporting it at point A, as shown in Fig. Mark the position of centre of gravity of the rim in the diagram by the letter G.

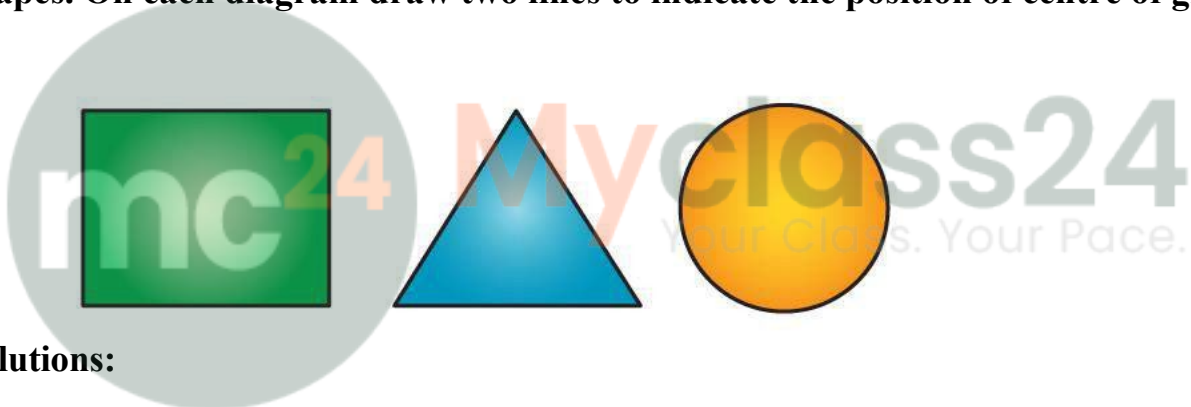


Solutions:

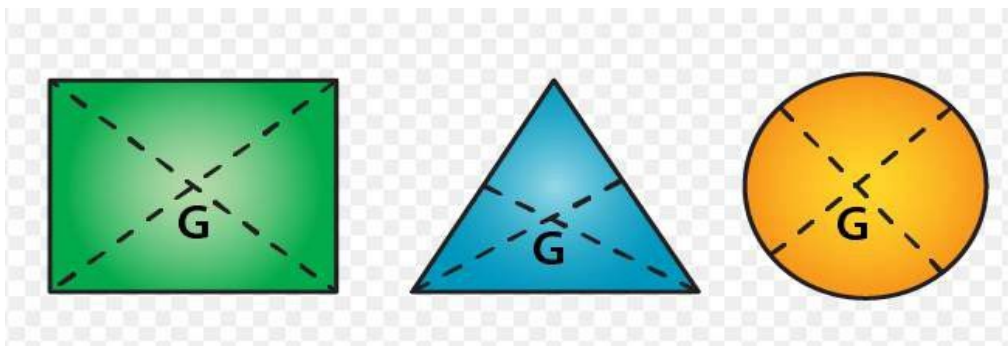


Question: 11

Figure shows three pieces of card board of uniform thickness cut into three different shapes. On each diagram draw two lines to indicate the position of centre of gravity G.



Solutions:



MULTIPLE CHOICE TYPE

Question: 1

The centre of gravity of a uniform ball is

- (a) At its geometrical centre
- (b) At its bottom
- (c) At its topmost point
- (d) At any point on its surface

Solutions:

The centre of gravity of a uniform ball is at its geometrical centre.

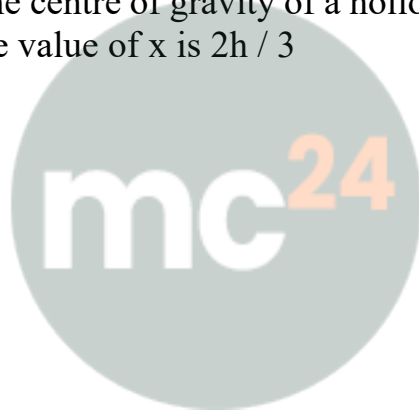
Question: 2

The centre of gravity of a hollow cone of height h is at distance x from its vertex where the value of x is:

- (a) $h/3$
- (b) $h/4$
- (c) $2h/3$
- (d) $3h/4$

Solutions:

The centre of gravity of a hollow cone of height h is at distance x from its vertex where the value of x is $2h / 3$



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EXERCISE 1(C)

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Question: 1

Explain the meaning of uniform circular motion. Why is such motion said to be accelerated?

Solutions:

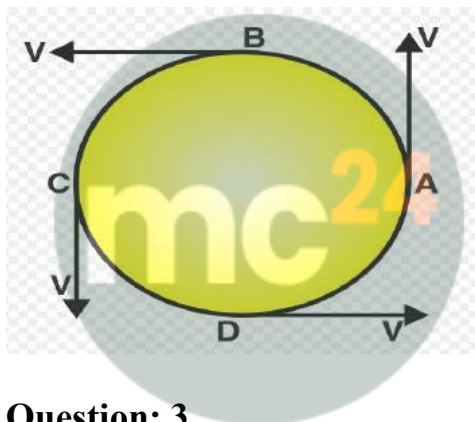
The motion is said to be in circular motion when the particle moves with a constant speed in a circular path. For example: Earth's revolution around the sun is an example of uniform circular motion.

Question: 2

Draw a neat labelled diagram for a particle moving in a circular path with a constant speed. In your diagram show the direction of velocity at any instant.

Solutions:

Movement of a particle in a circular path with a constant speed.



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Question: 3

Is it possible to have an accelerated motion with a constant speed? Name such type of motion.

Solutions:

Yes, it's possible to have an accelerated motion with a constant speed. Such type of motion is uniform circular motion.

Question: 4

Give one example of motion in which speed remains uniform, but the velocity changes.

Solutions:

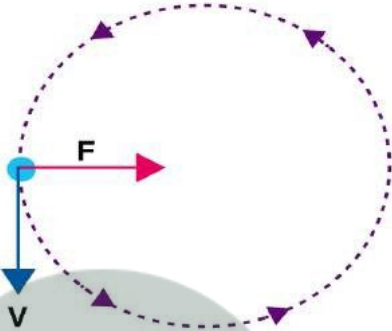
A cyclist's motion on a circular track is an example of motion in which speed remains uniform, but the velocity changes.

Question: 5

A uniform circular motion is an accelerated motion. Explain it. State whether the acceleration is uniform or variable? Name the force responsible to cause this acceleration. What is the direction of force at any instant? Draw diagram in support of your answer.

Solutions:

When the object with uniform speed moves in a circular path, it means that its magnitude of velocity does not change, it only changes its direction continuously. Therefore it is considered as uniformly accelerated motion.



Question: 6

Differentiate between a uniform linear motion and a uniform circular motion.

Solutions:

Uniform linear motion	Uniform circular motion
The body moves along a straight line	The body moves along a circular path
Speed and direction both remains constant	Speed is constant but direction changes continuously.
Not an accelerated motion.	An accelerated motion.

Question: 7

Name the force required for circular motion. State its direction.

Solutions:

The force required for circular motion is centripetal force. The direction of centripetal force is always directed towards the centre of circle.

Question: 8

What is centripetal force?

Solutions:

The centripetal force is defined as the force acting on a body moving in a circular path, in a direction towards the centre of circular path.

Question: 9

Explain the motion of a planet around the sun in a circular path.

Solutions:

A planet moves around the sun in a circular path for which the gravitational force of attraction by the sun provides the necessary centripetal force required for circular motion on the planet.

Question: 10

(a) How does a centripetal force differ from a centrifugal force with reference to the direction in which they act?

(b) Is centrifugal force the force of reaction of the centripetal force?

(c) Compare the magnitudes of centripetal and centrifugal force.

Solutions:

(a) Both forces act in opposite direction with reference to the direction in which they act.

(b) No, centrifugal force is not the force of reaction of the centripetal force.

(c) The magnitudes of centripetal and centrifugal force is 1: 1

Question: 11

Is centrifugal force a real force?

Solutions:

No, centrifugal force is a fictitious force.

Question: 12

A small pebble tied at one end of a string is placed near the periphery of a circular disc, at the center of which the other end of the string is tied to a peg. The disc is rotating about an axis passing through its centre.

(a) What will be your observation when you are standing outside the disc? Explain.

(b) What will be your observation when you are standing at the centre of the disc. Explain.

Solutions:

(a) When we are standing outside the disc, we observe that the pebble is moving on a circular path.

(b) When we are standing inside the disc, we observe that the pebble is stationary placed in front of us.

Question: 13

Solutions:

A piece of stone tied at the end of a thread is whirled in a horizontal circle with uniform speed with the help of hand. Answer the following questions.

a. Is the velocity of stone uniform or variable?

- b. Is the acceleration of stone uniform or variable?**
c. What is the direction of acceleration of stone at any instant?
d. What force does provide the centripetal force required for circular motion?
e. Name the force and its direction which acts on the hand.

Solutions:

- (a) The velocity of stone is variable
(b) The acceleration of stone is variable
(c) The direction of acceleration of stone is towards the centre of the circular path.
(d) Force of tension in the string provides the centripetal force required for circular motion.
(e) The reaction of tension away from the centre of the circular path.

Question: 14

State two differences between the centripetal and centrifugal force.

Solutions:

Centripetal force	Centrifugal force
Acts towards the centre of the circle	Acts away from the centre of the circle
A real force	A fictitious force

Question: 15

State whether the following statements are true or false by writing T/F against them.

- (a) The earth moves around the sun with a uniform velocity.
(b) The motion of the moon around the earth in circular path is an accelerated motion.
(c) A uniform linear motion is unaccelerated, while a uniform circular motion is an accelerated motion.
(d) In a uniform circular motion, the speed continuously changes because the direction of the motion changes.
(e) A Boy experiences a centrifugal force on his hand when he rotates a piece of stone tied at one end of a string, holding the other end in the hand.

Solutions:

- (a) False
(b) True
(c) True
(d) False
(e) False

MULTIPLE CHOICE TYPE

Question: 1

Which of the following quantity remains constant in uniform circular motion:

- (a) Velocity
- (b) Speed
- (c) Acceleration
- (d) Both velocity and speed

Solutions:

Speed remains constant in uniform circular motion.

Question: 2

The centrifugal force is:

- (a) a real force
- (b) the force of reaction of centripetal force
- (c) a fictitious force
- (d) directed towards the centre of circular path

Solutions:

A centrifugal force is a fictitious force.





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