



PHYSICS

BOOKS - SELINA PHYSICS (ENGLISH)

FORCE

Examples

1. A body is pivoted at a point. A force of 10N is applied at a distance of 30cm from the pivot.

Calculate the moment of force about the pivot.



[Watch Video Solution](#)

2. The moment of a force of 5N about a point P is 2 Nm. Calculate the distance of point of application of the force from the point P.



[Watch Video Solution](#)

3. A mechanic can open a nut by applying a force of 150N while using a lever handle of length 40cm. How long a handle is required if he wants to open it by applying a force of only 50 N?



Watch Video Solution

4. The iron door of a building is 3m broad. It can be opened by applying a force of 100N normally at the middle of the door. Calculate

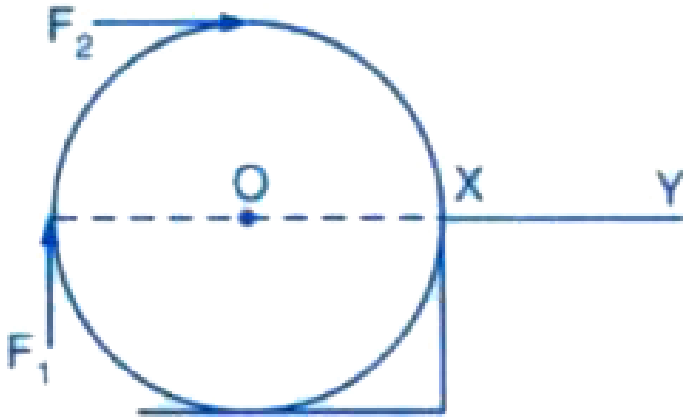
(a) the torque needed to open the door, (b) the least force and its point of application to open the door.



[Watch Video Solution](#)

5. In Fig. 1.17 a roller of diameter 0.4m is raised on the pavement XY by forces F_1 and F_2 each of magnitude 10N. Compare the torques

produced by the two forces.



[Watch Video Solution](#)

6. The wheel shown in the diagram (Fig.1.18) has a fixed axle passing through O. The wheel is kept stationary under the action of (i) a horizontal force F_1 at A and (ii) a vertical force

F_2 at B.

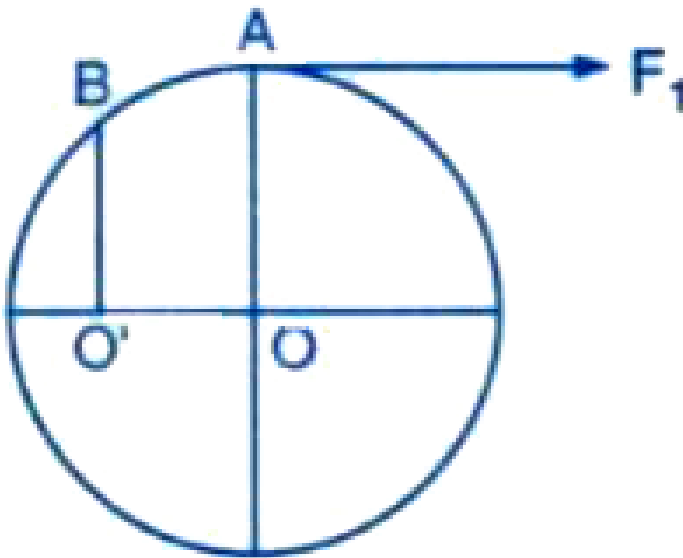
(a) Show the direction of force F_2 in the diagram.

(ii) Which of the force F_1 or F_2 is greater

(c) Find the ratio between the forces

F_1 and F_2 Given: $AO = 2.5$ cm

$BO' = 1.5$ cm and $O'O = 2.0$ cm



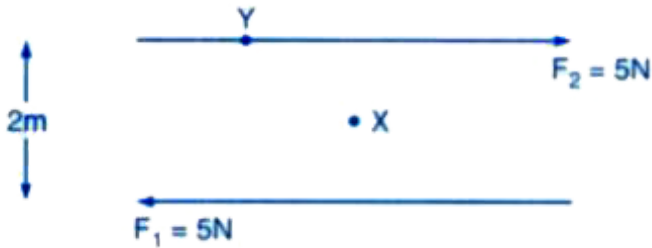


7. The following diagram (Fig. 1.20) shows two parallel and opposite forces F_1 and F_2 each of magnitude 5N, with their lines of action separated by a distance of 2m. A point X is pivoted midway between F_1 and F_2 while a point Y is pivoted on F_2

(a) calculate the total moment of the two forces about the points (i) X, and (ii) Y

(b) State the effect produced by the two forces

about the points (i) X and (ii) Y



[Watch Video Solution](#)

8. Two forces each of magnitude 2N act vertically upwards and downwards respectively at the two ends of a uniform rod of length 1m which is pivoted at its centre. Draw a diagram of the arrangement and determine the

resultant moment of forces about the mid point of the rod.



[Watch Video Solution](#)

9. A uniform metre rule rests horizontally on a knife edge at the 60cm mark when a mass of 10g is suspended from one end. Draw a diagram of the arrangement.

(a) At which end must this mass be suspended

(b) What is the mass of the rule?

(c) The 10g mass is now shifted to the 90cm

mark. In which direction must the knife edge be shifted to make the rule horizontal again?



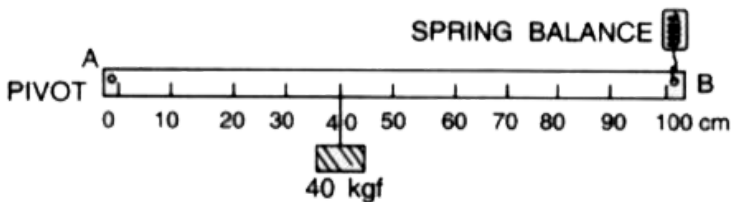
[Watch Video Solution](#)

10. On a see saw, two children of masses of 30kg and 50kg are sitting on one side of at distances 2m and 2.5m respectively from its middle. Where should a man of mass 74 kg sit to balance it?



[Watch Video Solution](#)

11. below shows a uniform metre rule AB pivoted at its end A at the zero mark and supported at the other end B by a spring balance when a weight of 40kgf is suspended at its 40cm mark. This rule stays horizontal . Find the reading of the spring balance when the rule is of (i) negligible mass (ii) mass 20kg.



[Watch Video Solution](#)

Exercise 1 A

1. State the condition when on applying a force, a body has:

(a) translational motion, (b) rotational motion



[Watch Video Solution](#)

2. Define moment of force and state its S.I unit.



[Watch Video Solution](#)

3. State whether the moment of force is a scalar or vector quantity.



[Watch Video Solution](#)

4. State two factors affecting the turning effect of a force.



[Watch Video Solution](#)

5. When does a body rotate? State one way to change the direction of rotation of the body.

Give a suitable example to explain your answer.



[Watch Video Solution](#)

6. Write the expression for the moment of force about a given axis.



[Watch Video Solution](#)

7. What do you understand by the clockwise and anticlockwise moment of force? When is it

taken positive?



[Watch Video Solution](#)

8. State one way to reduce the moment of a given force about a given axis of rotation.



[Watch Video Solution](#)

9. State one way to obtain a greater moment of a force about a given axis of rotation.



[Watch Video Solution](#)

10. Why is it easier to open a door by applying the force at the free end of it.



Watch Video Solution

11. The stone of a hand flour grinder is provided with a handle near its rim. Give reason.



Watch Video Solution

12. It is easier to turn the steering wheel of a large diameter than that of a small diameter.

Give reason.



Watch Video Solution

13. A spanner (or wrench) has a long handle.

Why?



Watch Video Solution

14. A jack screw is provided with a long arm.

Explain why?



Watch Video Solution

15. A, B and C are three forces each of magnitude 4N acting in the plane of paper as shown in fig.1.26 Point O lies in the same plane.

(i) Which force has the least moment about O?

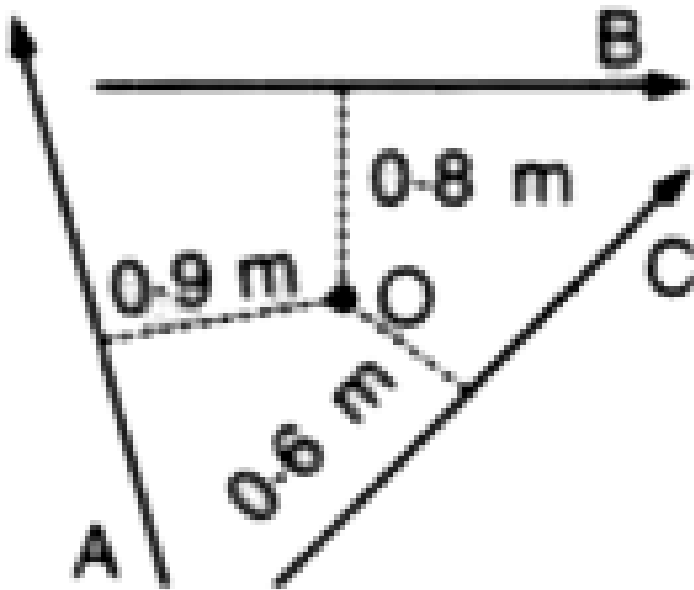
Give reason.

(ii) Which force has the greatest moment

about O? Give reason.

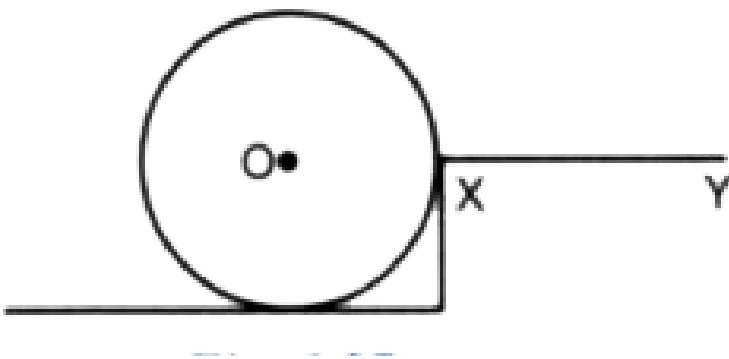
(iii) Name the forces producing (a) clockwise ,
(b) anticlockwise moments.

(iv) What is the resultant torque about the
point O?



Watch Video Solution

16. The adjacent diagram Fig 1.27 shows a heavy roller, with its axle at O, which is to be raised on a pavement XY. IF there is friction between the roller and pavement, show by an arrow on the diagram the point of application and the direction of force to be applied. If pivoted at O, now will it go up?



Watch Video Solution

17. A body is acted upon by two forces each of magnitude F , but in opposite directions. State the effect of the forces if

(a) both forces act at the same point of the body.

(b) the two forces act at two different points of the body at a separation?



[Watch Video Solution](#)

18. Draw a neat labelled diagram to show the direction of two forces acting on a body to produce rotation in it. Also mark the point O about which the rotation takes place.



Watch Video Solution

19. What do you understand by the term couple? State its effect .Give two examples in our daily life where couple is applied to turn a body.





[Watch Video Solution](#)

20. Define moment of couple. Write its S.I unit.



[Watch Video Solution](#)

21. Prove that

Moment of couple = Force \times couple arm



[Watch Video Solution](#)

22. What do you mean by equilibrium of a body?



Watch Video Solution

23. State the condition when a body is in (i) static, (ii) dynamic equilibrium, Give one example each of static and dynamic equilibrium.



Watch Video Solution

24. State two conditions for a body, acted upon by several forces, to be in equilibrium.



Watch Video Solution

25. State the principle of moments, Name one device based on it.



Watch Video Solution

26. Describe a simple experiment to verify the principle of moments, if you are supplied with the metre rule, a fulcrum and two springs with slotted weights.



Watch Video Solution

27. Complete the following sentences:

(i) The S.I unit of moment of force is.....

(ii) In equilibrium, algebraic sum of moments of all forces about all the point of rotation is

.....

(iii) In a beam balance, when the beam is balanced in a horizontal position, it is in..... equilibrium.

(iv) the moon revolving around the earth is in..... equilibrium.



Watch Video Solution

Exercise 1 A Multiple Choice Questions

1. The moment of a force about a given axis depends:

A. (a) only on the magnitude of force

B. (b) only on the perpendicular distance of force from the axis

C. (c) neither on the force nor on the perpendicular distance of force from the axis

D. (d) both, on the force and its perpendicular distance from the axis.

Answer:



[Watch Video Solution](#)

2. A body is acted upon by two unequal forces in opposite directions, but not in the same line. The effect is that:

A. (a) the body will only have rotation
motion

B. (b) the body will only have translational
motion

C. (c) the body will have neither rotational
motion nor translational motion

D. (d) the body will have rotational as well
as translational motion

Answer:



Watch Video Solution

Exercise 1 A Numericals

1. The moment of a force of 10N about a fixed point O is 5 Nm. Calculate the distance of the point O from the line of action of the force.



[Watch Video Solution](#)

2. A nut is opened by a wrench of length 10cm. IF the least force required is 5.0N, find the

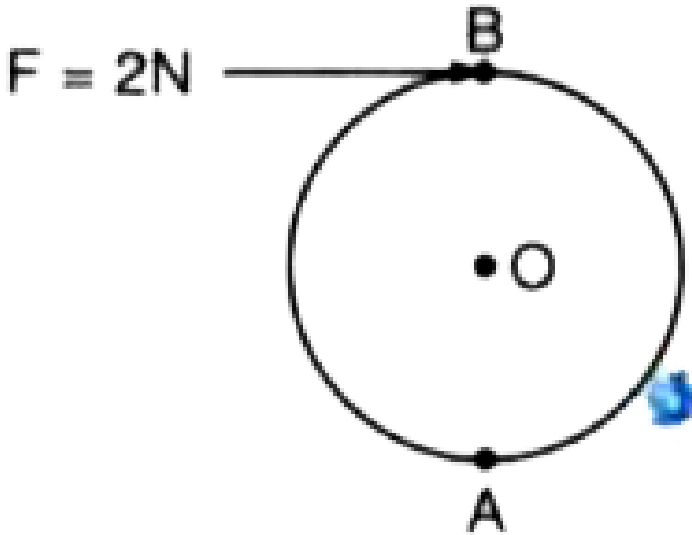
moment of force needed to turn the nut.



[Watch Video Solution](#)

3. A wheel of diameter 2m is shown in Fig 1.28 with axle at O . At force $F = 2\text{N}$ is applied at B in the direction shown in figure, Calculate the moment of force about (i) the centre O , and (ii)

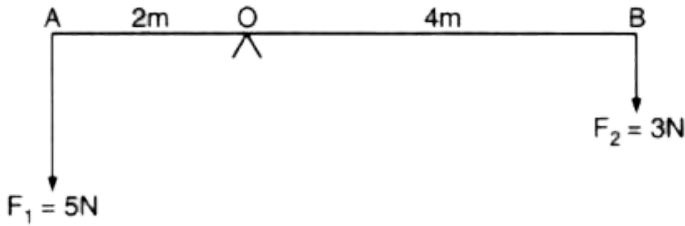
the point A.



[Watch Video Solution](#)

4. The diagram in Fig.1.29 shows two forces $F_1 = 5N$ and $F_2 = 3N$ acting at points A and B of a rod pivoted at a point O, such that

OA=2m and OB=4m



Calculate:

(i) the moment of force F_1 about O.

(ii) the moment of force F_2 about O.

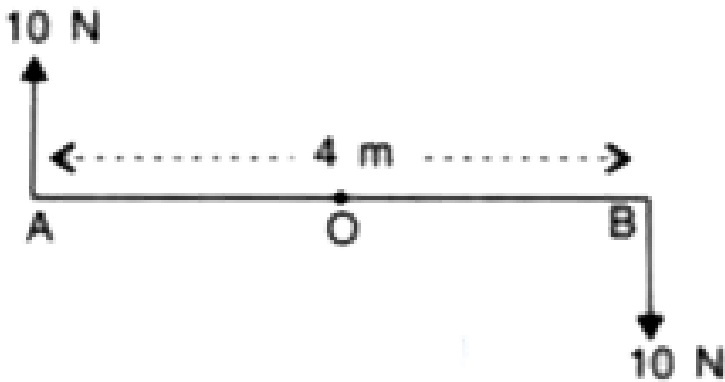
(iii) total moment of the two forces about O.



[Watch Video Solution](#)

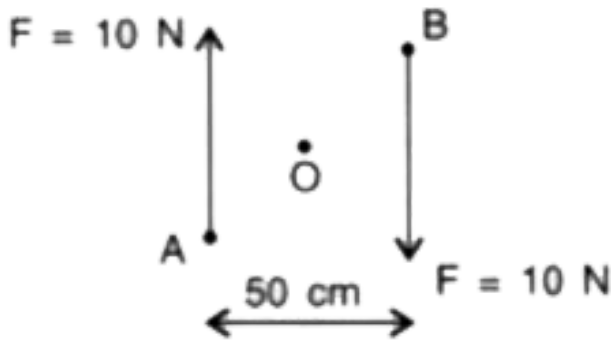
5. The forces each of magnitude 10N act vertically upwards and downwards respectively

at the two ends A and B of a uniform rod of length 4m which is pivoted at its mid point O as shown is fig. 1.30, Determine the magnitude of the resultant moment of forces about the pivot O.



[Watch Video Solution](#)

6. Fig.1.31 shows two forces each of magnitude 10N acting at points A and B at a separation of 50cm, in opposite directions. Calculate the resultant moment of the two forces about the point (i) A (ii) B and (iii) O situated exactly at the middle of the two forces.



[Watch Video Solution](#)

7. A steering wheel of diameter 0.5m is rotated anticlockwise by applying two forces each of magnitude 5N. Draw a diagram to show the application of forces and calculate the moment of the force applied.



[Watch Video Solution](#)

8. A uniform metre rule is pivoted as its mid point. A weight of 50gf is suspended at one end of it. Where should a weight of 100gf be suspended to keep the rule horizontal?



[Watch Video Solution](#)

9. A uniform metre rule is placed horizontally on a knife edge placed at the 58cm mark when a weight of 20gf is suspended from one end.

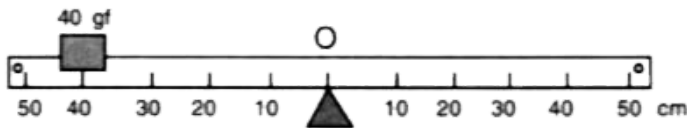
(i) Draw a diagram of the arrangement.

(ii) What is the weight of the rule?



[Watch Video Solution](#)

10. The diagram below (Fig.1.32) shows a uniform bar supported at the middle O. A weight of 40gf is placed at a distance 40cm to the left of point O. How can you balance the bar with the weight of 80gf.

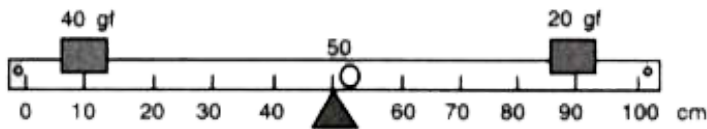


[Watch Video Solution](#)

11. Fig.1.33 shows a uniform metre rule placed on a fulcrum at its mid point O and having a

weight 40gf at the 10cm mark and a weight of 20gf at the 90cm mark. (i) Is the metre rule in equilibrium? If not , how will the turn?

(ii) How can the rule be brought in equilibrium by using an additional weight of 40 gf?



 [Watch Video Solution](#)

12. When a boy weighing 20 kgf sits at one end of a 4m long see saw, if gets depressed at this

end. How can it be brought to the horizontal position by a man weighing 40 kgf.



[Watch Video Solution](#)

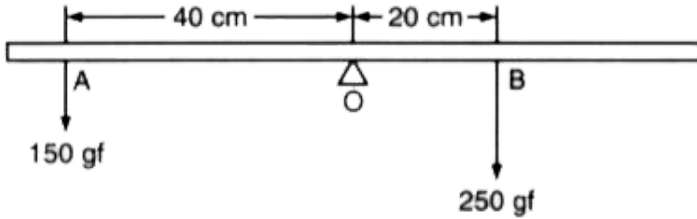
13. A physical balance has its arms of length 60cm and 40cm. What weight kept on the pan of the longer arm will balance an object of weight 100 gf kept on the other pan?



[Watch Video Solution](#)

14. The diagram in Fig.1.34 shows a uniform metre rule weighing 100gf, pivoted at its centre O. Two weights 150 gf and 250 gf hang from the points A and B respectively of the metre rule such that $OA = 40\text{cm}$ and $OB = 20\text{cm}$. Calculate (i) the total anticlockwise moment about O, (ii) the total clockwise moment about O, (iii) the difference of anticlockwise and clockwise moments, and (iv) the distance from O where a 100gf weight should be placed to

balanced the metre rule.



 [Watch Video Solution](#)

15. A uniform metre rule of weight 10gf is pivoted at its 0 mark.

- (i) What moment of force depresses the rule?
- (ii) How can it can be made horizontal by applying a least force?

 [Watch Video Solution](#)

16. A uniform half metre rule can be balanced at the 29.0cm mark when a mass 20g is hung from its one end.

(a) Draw a diagram of the arrangement

(b) Find the mass of the half metre rule.

(c) In Which direction would the balancing point shift if 20g mass is shifted inside from its one end?



Watch Video Solution

17. A uniform metre rule of mass 100g is balanced on a fulcrum at mark 40cm by suspending an unknown mass m at the mark 20cm.

(i) Find the value of m .

(ii) To which side the rule will tilt if the mass m is moved to the mark 10cm?

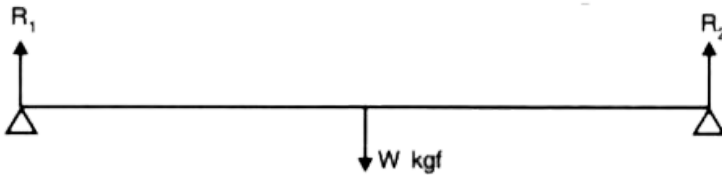
(iii) What is the resultant moment now?

(iv) How can it be balanced by another mass of 50 g?



[Watch Video Solution](#)

18. In Fig.1.35 a uniform bar of length l m is supported at its ends and loaded by a weight W kgf at its middle. In equilibrium find the reaction R_1 and R_2 at the ends.



[Watch Video Solution](#)

Exercise 1 B

1. Define the term centre of gravity of a body?



[Watch Video Solution](#)

2. Can the centre of gravity of a body situated outside its material? Give an example.



[Watch Video Solution](#)

3. State the factor on which the position of the centre of gravity of a body depends. Explain your answer with an example.



[Watch Video Solution](#)

4. What is the position of the centre of gravity of a:

(a) rectangular lamina

(b) cylinder?



[Watch Video Solution](#)

5. Where does the position of centre of gravity lie for

(1) A circular lamina

(2) A triangular lamina



[Watch Video Solution](#)

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



[Watch Video Solution](#)

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 the centre of gravity by the letter G.



[Watch Video Solution](#)

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



[Watch Video Solution](#)

9. State whether the following statements are true or false?

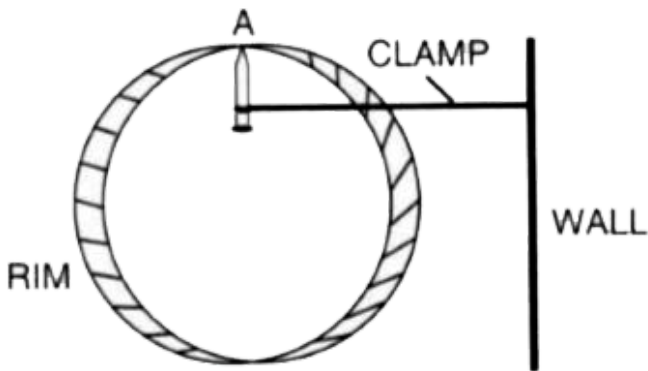
(i) The position of the centre of gravity of a body remains unchanged even when the body is deformed

(ii) The centre of gravity of a freely suspended body always lies vertically below the point of suspension.



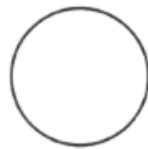
[Watch Video Solution](#)

10. A uniform flat circular rim is balanced on a sharp vertical nail by supporting it at a point A, as shown in Fig 1.41 Mark the position of the centre of gravity of the rim in the diagram by the letter G.



Watch Video Solution

11. Fig.1.42 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 the centre of gravity G .



Watch Video Solution

Exercise 1 B Multiple Choice Questions

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

Answer:



Watch Video Solution

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. $3h / 4$

Answer:



Watch Video Solution

Exercise 1 C

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



[Watch Video Solution](#)

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.



[Watch Video Solution](#)

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



[Watch Video Solution](#)

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



[Watch Video Solution](#)

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 a diagram in support of your answer.



Watch Video Solution

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



Watch Video Solution

7. Name the force required for circular motion.

State its direction.



Watch Video Solution

8. What is a centripetal force?



Watch Video Solution

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



Watch Video Solution

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.



[Watch Video Solution](#)

11. Is centrifugal force a real force?



[Watch Video Solution](#)

12. A small pebble tied at one end of a string in placed near the periphery of a circular disc, at the centre 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.



[Watch Video Solution](#)

13. A piece of stone tied at the end of a thread is whirled in a horizontal circle with uniform speed by 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) which force provides the centripetal force required for circular motion?

(e) Name the force and its direction which acts on the hand.



Watch Video Solution

14. State two differences between centripetal and centrifugal force.



Watch Video Solution

Exercise 1 C

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

(a) Earth moves around Sun with a uniform velocity.

(b) The motion of moon around Earth in a

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 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.



[Watch Video Solution](#)

Exercise 1 C Multiple Choice Questions

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

(a) velocity

(b) speed

(c) acceleration

(d) both velocity and speed

A. velocity

B. speed

C. acceleration

D. both velocity and speed

Answer:



Watch Video Solution

2. Centrifugal force is:

A. a) a real force

B. b) the force of reaction of centripetal
force

C. c) a fictitious force

D. d) directed towards the centre of
circular path

Answer:



[Watch Video Solution](#)

Theory Based Mcq

1. Moment of force is proportional to the distance of point of application of force and fulcrum.

A. inversely

B. directly

C. not

D. none of these

Answer: B



Watch Video Solution

2. Lesser the force applied is the moment of force.

A. greater

B. lesser

C. equal

D. none of these

Answer: B



Watch Video Solution

3. Clockwise moments are considered to be

.....

A. positive

B. negative

C. zero

D. all of these

Answer: B



Watch Video Solution

4. moments are considered to be positive.

A. Clockwise

B. Anticlockwise

C. Total

D. None of these

Answer: B



Watch Video Solution

5. For equilibrium, sum of all moments is equal to sum of all anticlockwise moments.

A. Arithmetic, arithmetic

B. Algebraic, algebraic

C. Total, none of

D. All of these

Answer: B



Watch Video Solution

6. The weight of an object lies at the

A. Centre of mass

B. Centre of buoyancy

C. Centre of gravity

D. Geometric centre always

Answer: C



Watch Video Solution

7. The C.G of a regular object would lie

A. on the body

B. outside the body

C. inside the body

D. all of these

Answer: D



Watch Video Solution

8. The C.G of a regular object will depend on

.....

A. distribution of mass

B. Volume of the body

C. Density of the body

D. All of these

Answer: A



Watch Video Solution

9. Uniform circular motion has

A. constant speed and variable velocity

B. variable speed and constant velocity

C. circular motion with uniform speed

D. None of the above

Answer: A



Watch Video Solution

10. Uniform linear motion has

A. Constant speed, variable velocity

B. Constant speed, constant velocity

C. Variable speed, constant velocity

D. Variable speed, variable velocity

Answer: B



Watch Video Solution

11. As a body moves in a circular path, inward seeking force is called

A. Centrifugal force

B. Tension force

C. Tangential force

D. Centripetal force

Answer: D



Watch Video Solution

12. When a body moves in a circular path, outward force is called a

A. Pseudo force

B. Centrifugal force

C. Centripetal force

D. Reaction force

Answer: B



Watch Video Solution

Application Based Mcq

1. Longer the size of the key it is to open a safe vault.

A. easier

B. lesser the force required by

C. convenient

D. all of the above

Answer: D



Watch Video Solution

2. Huge trailer trucks have their steering wheel of diameter.

A. large

B. small

C. least

D. all of these

Answer: A



View Text Solution

3. Can a couple pair of forces keep the body in equilibrium?

A. Yes

B. No

C. data is not given

D. None of the above

Answer: B



View Text Solution

4. Centre of gravity is When it is a hollow cone.

A. raised from the base

B. lower towards the base

C. centre of vertical axis

D. none of these

Answer: A



View Text Solution

5. C.G of a solid and hollow sphere are

A. the same

B. different

C. almost the same

D. Geometric centre

Answer: C



View Text Solution

Numerical Based Mcq

1. Find the maximum force required to open a nut by a spanner of length 50 cm producing a torque of 50 Nm?

A. 10 N

B. 100 N

C. 0.1 N

D. None of these

Answer: B



View Text Solution

2. 100 dyne cm is equal to Nm.

A. 10^5

B. 10^{-5}

C. 0

D. 0.001

Answer: B



View Text Solution

3. 10^{-10} Nm is equal to dyne cm.

A. 10^{-4}

B. 10

C. 0.001

D. None of these

Answer: C



View Text Solution

4. Find the weight of half meter scale balanced at 5 cm mark when a weight of 10 gf is suspended at one of its ends.

A. 2.5gf

B. 100gf

C. 0.2gf

D. 50gf

Answer: A



View Text Solution

5. Find the resultant moment of couple if two equal forces each of 6N are acting at a distance of 3cm each from the centre.

A. 36Nm

B. 360Nm

C. 3.6Nm

D. 0.36Nm

Answer: D



View Text Solution

6. Find the weight of a metre scale balanced at 30cm mark such that two weights one of 30gf and 10gf are suspended at 5cm mark and 40cm mark respectively.

A. 10gf

B. 105gf

C. 25gf

D. 32.5gf

Answer: D



View Text Solution

7. The weight of a uniform half meter scale would act at mark.

A. 25cm

B. 50cm

C. 0cm

D. 100cm

Answer: A



View Text Solution

8. Three girls Shivangi, Radhika and Saili sat on one side of see saw at distances of 1m, 1.2m and 1.5m from the fulcrum that is situated at the center of the see saw. The masses of the three girls were 30kg, 40kg and 50kg respectively. Where should Rakesh sit on the

other side of seesaw so as to balance it? Given the mass of Rakesh is 80kg.

A. 2m

B. 1.5m

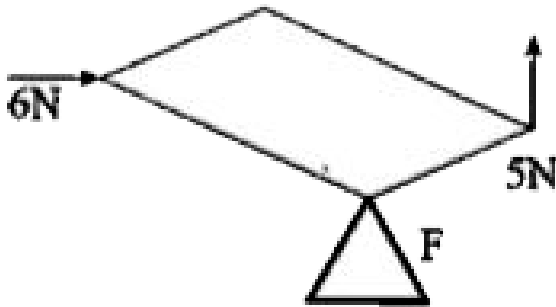
C. 1.91m

D. 1.75m

Answer: C



View Text Solution



1.

A rectangular thin plate of dimension 3m x 4m is balanced on the fulcrum as shown above.

Find the resultant moment of force?

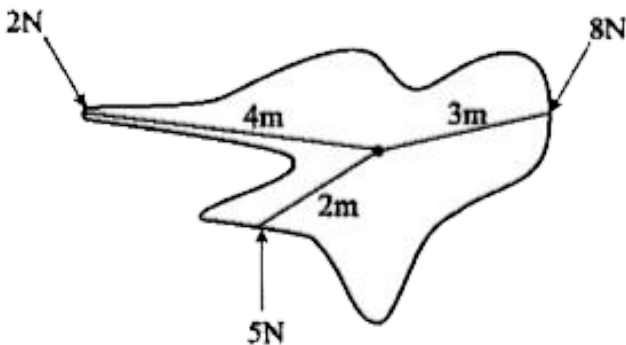
- A. 9Nm clockwise
- B. 9Nm anticlockwise
- C. 5Nm anticlockwise

D. 6Nm clockwise

Answer: A

 [View Text Solution](#)

2. An irregular plane lamina is acted upon by several combination of forces. Is the lamina in equilibrium?



A. Yes

B. No

C. insufficient data

D. None of the above

Answer: B



View Text Solution

3. A pole vaulter during Tokyo olympics used a 2.5m long rod which weighed 10kg. If the mass of the pole vaulter was 65kg, calculate the

moment of force created by the pole vaulter?

$$[g = 10Nkg^{-1}]$$



A. 162.5kgm

B. 1625Nm

C. 16.25Nm

D. 1625kgm

Answer: B



View Text Solution

4. Karan of mass 45kg and Geeta of mass 30kg are sitting on a see saw at a distance of 2m and 1.5m respectively from the centre of the see saw in an amusement park as shown in the

figure. Is the see saw in rotational equilibrium?



A. Yes

B. No

C. data incomplete

D. None of the above

Answer: B



View Text Solution

