

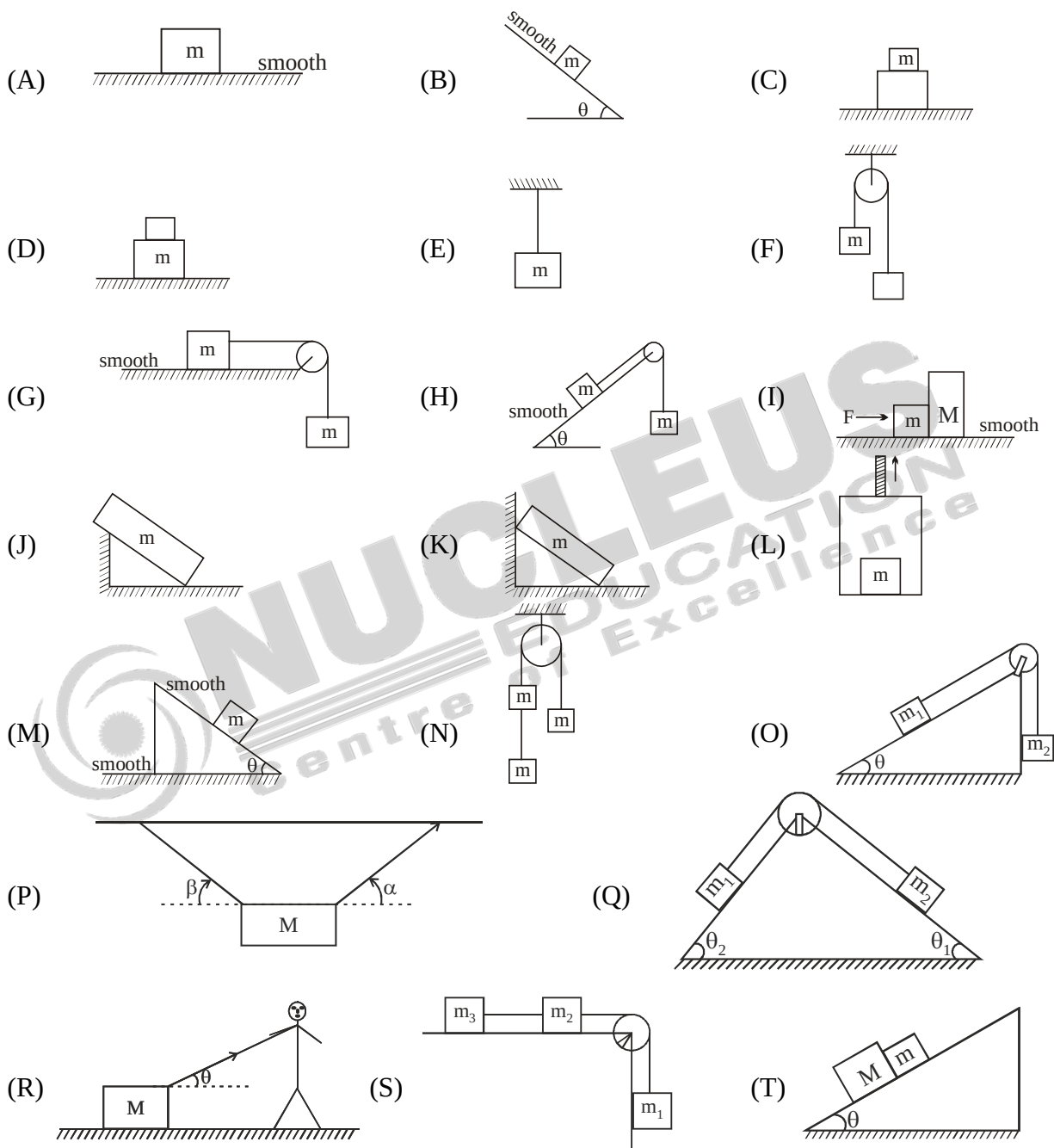
**WORK BOOK # 1**

1. A particle is moving with a constant speed along a straight line path. A force is not required to
  - (A) Increase its speed
  - (B) Decrease the momentum
  - (C) Change the direction
  - (D) keep it moving with uniform velocity
2. When a bus suddenly takes a turn, the passengers are thrown outwards because of
  - (A) Inertia of motion
  - (B) Acceleration of motion
  - (C) Speed of motion
  - (D) Both (B) and (C)
3. There are three Newton's laws of motion namely I, II and III ; we can derive :-
  - (A) II and III law from the I law
  - (B) III and I law from the II law
  - (C) I and II law from the III law
  - (D) All the laws are independent of each other
4. Action and reaction :- (For a given system)
  - (a) Act on the two different objects
  - (b) Have opposite directions
  - (c) Have equal magnitudes
  - (d) Have zero resultant
  - (A) a,b,c
  - (B) b,c,d
  - (C) All of the above
  - (D) None of the above
5. A rider on a horse falls back when the horse starts running suddenly because
  - (A) rider is taken aback
  - (B) rider is suddenly afraid of falling
  - (C) of inertia of rest of upper part of body
  - (D) none of the above
6. Explain why some of the leaves may get detached from a tree if we vigorously shake its branch.
7. When a carpet is beaten with a stick, dust comes out. Explain.
8. The action and reaction forces referred to Newton's third law of motion
  - (A) Must act upon the same body
  - (B) Must act upon different bodies
  - (C) Need not to be equal in magnitude but must have the same line of action
  - (D) Must be equal in magnitude but need not have the same line of action
9. A man getting down a running bus, falls forward because-
  - (A) due to inertia of rest, road is left behind and man reaches forward
  - (B) due to inertia of motion upper part of body continues to be in motion in forward direction while feet come to rest as soon as they touch the road
  - (C) he leans forward as a matter of habit
  - (D) of the combined effect of all the three factors stated in (A), (B) and (C)

10. In which of the following case the net force is not zero?  
(A) A kite skillfully held stationary in the sky.  
(B) A ball freely falling from a height.  
(C) An airplane rising upwards at an angle of 45 degree with the horizontal with a constant speed.  
(D) A cork floating on the surface of water
11. Why a boatman pushes the river bank backward with a long wooden pole on launching his boat into water ?
12. Weight is defined as :-  
(A) Force of attraction by the earth (B) Mass of a body  
(C) Nature of the body (D) None of these
13. An object will continue moving uniformly until  
(A) The resultant force acting on it begins to decrease  
(B) The resultant force on it is zero  
(C) The resultant force is at right angle to its rotation  
(D) The resultant force on it is increased continuously
14. On a stationary sail-boat, air is blown at the sails from a fan attached to the boat. The boat will  
(A) Remain stationary  
(B) Spin around  
(C) Move in a direction opposite to that in which air is blown  
(D) Move in the direction in which the air is blown
15. In a cricket match the fielder draws his hands backward after receiving the ball in order to take a catch because -  
(A) His hands will be saved from getting hurt  
(B) He deceives the player  
(C) It is a fashion  
(D) He catches the ball firmly
16. A boy sitting on the top most berth in the compartment of a train which is just going to stop on a railway station, drops an apple aiming at the open hand of his brother situated vertically below his hands at a distance of about 2m. The apple will fall -  
(A) in the hand of his brother  
(B) Slightly away from the hands of his brother in the direction of motion of the train  
(C) Slightly away from the hands of his brother in the direction opposite to the direction of motion of the train  
(D) none of the above

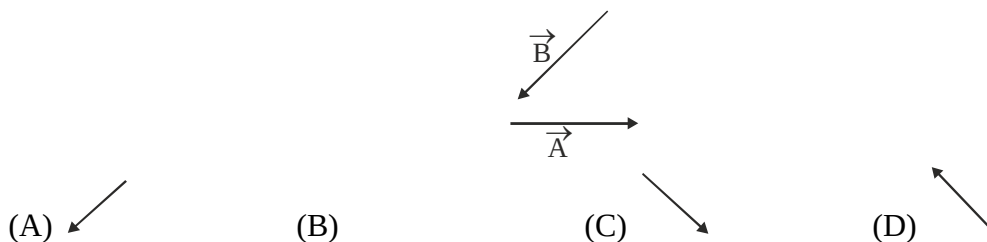
**WORK BOOK # 2**

1. Draw free body diagram of block of mass  $m$ . Assuming standard conditions.

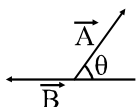


**WORK BOOK # 3**

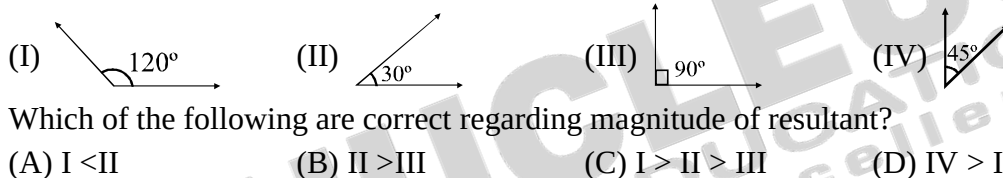
1. Resultant of vector  $\vec{A}$  &  $\vec{B}$



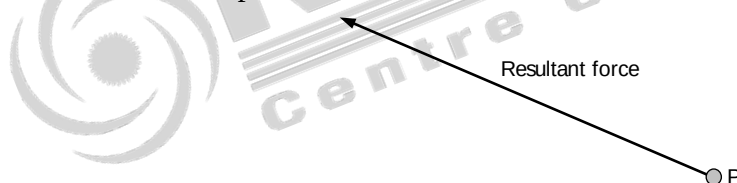
2. Angle between  $\vec{A}$  &  $\vec{B}$



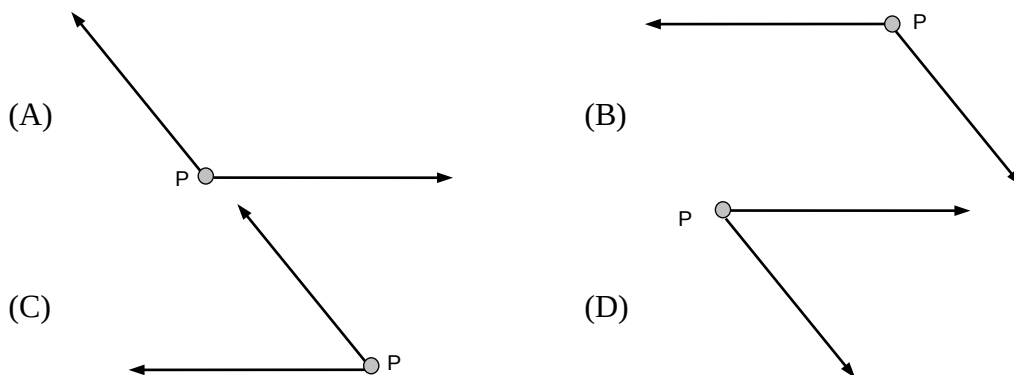
3. Two displacement vectors ( and ) of same magnitude are arranged in the following manner-



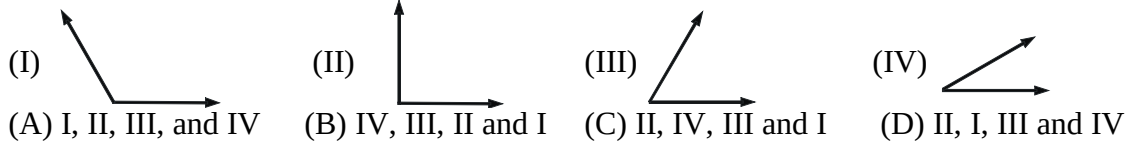
4. The vector below represents the resultant of two forces acting on a particle P.



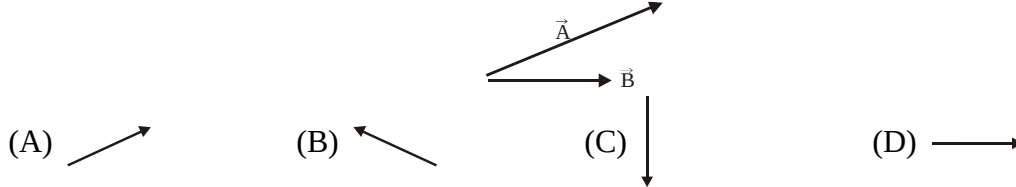
Which of the following pair of vectors best represents two forces that combine to produce this resultant force vector?



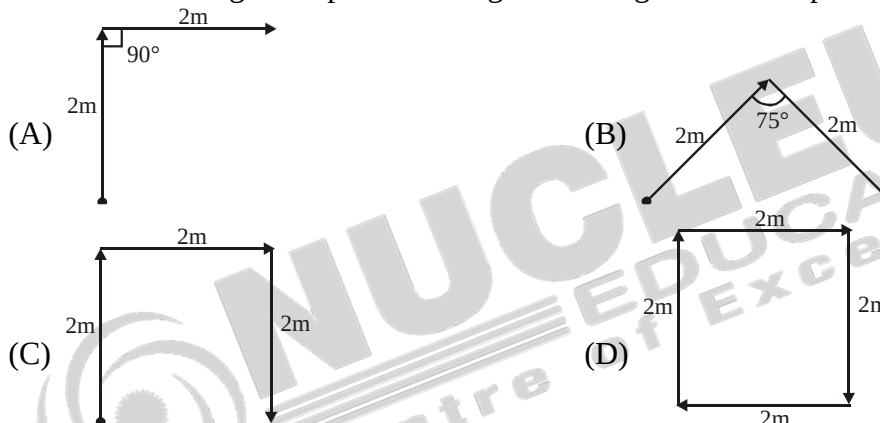
5. Refer the following arrangements consisting of two vectors of same magnitude. Arrange them in ascending order of resultant magnitudes.



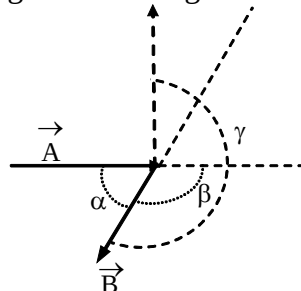
6. Two vectors  $\vec{A}$  &  $\vec{B}$  have magnitudes 2 & 1 respectively. If the angle between  $\vec{A}$  &  $\vec{B}$  is  $60^\circ$ , which of the following vectors may be equal to  $\frac{\vec{A}}{2} - \vec{B}$ .



7. Which vector diagram represents the greatest magnitude of displacement for an object?

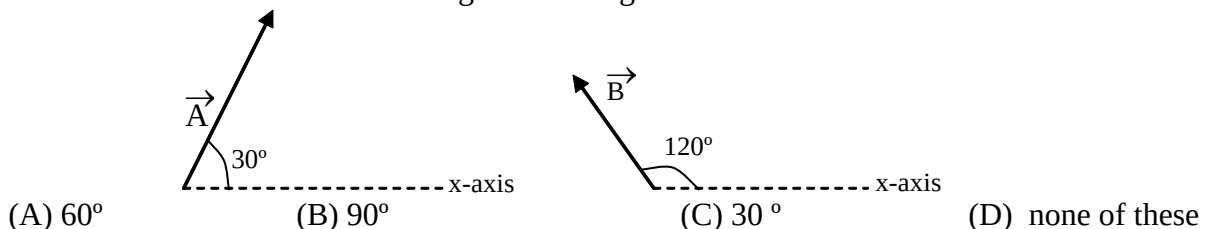


8. Vectors  $\vec{A}$  and  $\vec{B}$  are shown in figure. Then angle between these two vectors is –

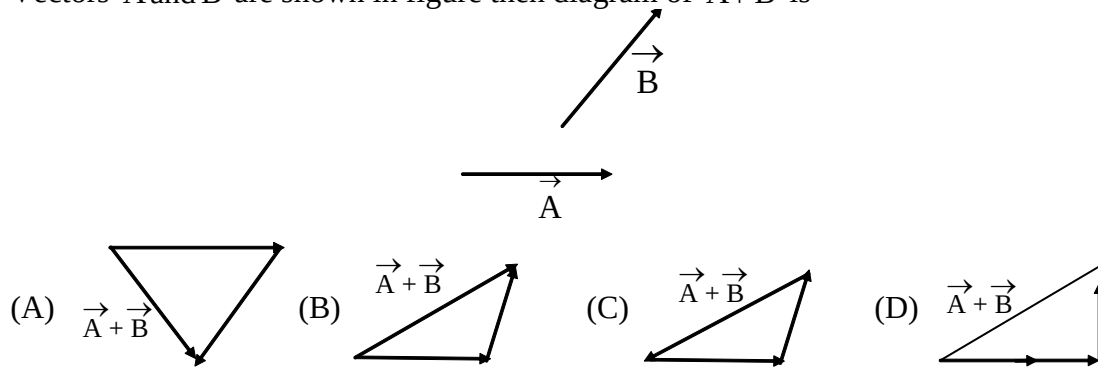


- (A)  $\alpha$  (B)  $\beta$  (C)  $\gamma$  (D) Cannot find

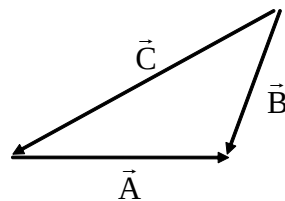
9. Vector  $\vec{A}$  and  $\vec{B}$  are shown in the figure. The angle between vector  $\vec{A}$  and  $\vec{B}$  is –



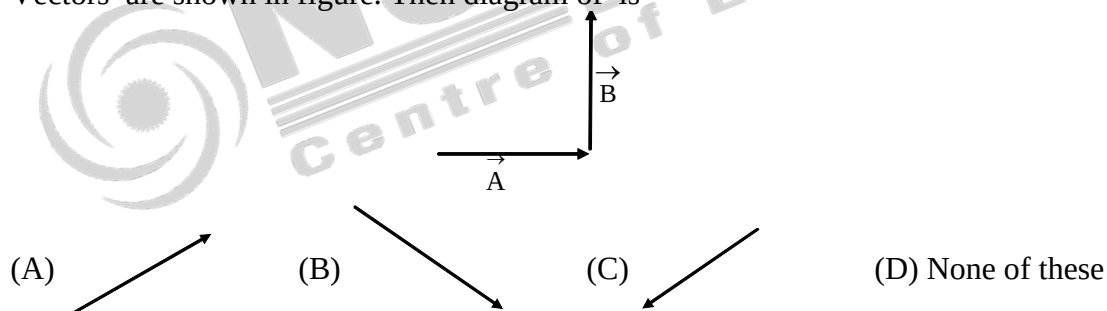
10. Vectors  $\vec{A}$  and  $\vec{B}$  are shown in figure then diagram of  $\vec{A} + \vec{B}$  is



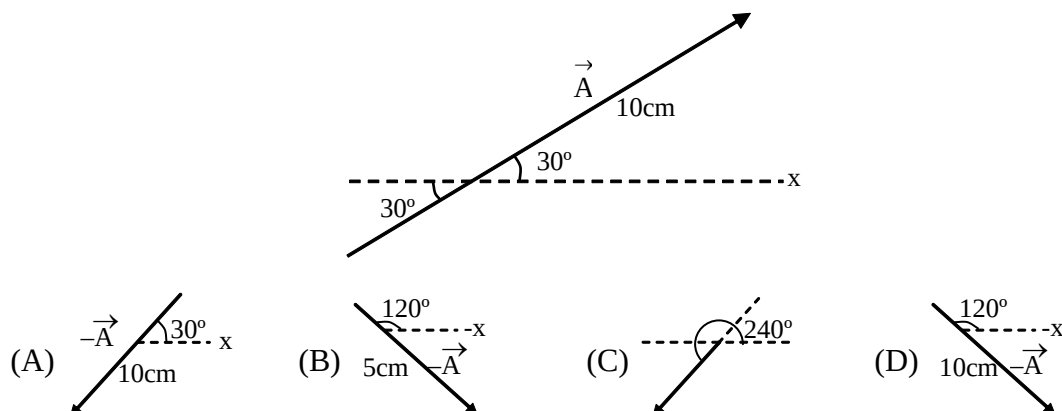
11. For the fig. -



- (A)  $\vec{A} + \vec{B} = \vec{C}$  (B)  $\vec{B} + \vec{C} = \vec{A}$  (C)  $\vec{C} + \vec{A} = \vec{B}$  (D)  $\vec{A} + \vec{B} + \vec{C} = 0$
12. A vector  $\vec{A}$  is rotated through an angle  $2\pi$ , the magnitude of new vector is -  
 (A)  $2A$  (B)  $A$   
 (C)  $A/2$  (D) none of these
13. Vectors are shown in figure. Then diagram of is

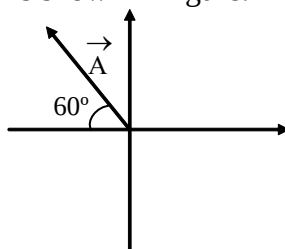


14. Vector is shown in the figure. Negative of vector is given by -

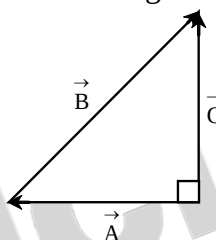


**WORK BOOK # 4**

1. Vector  $\vec{A}$  of magnitude 10 unit is shown in figure. The x-component of is



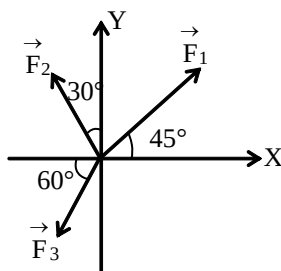
- (A) 5 unit                      (B)  $5\sqrt{3}$  unit                      (C)  $-5\sqrt{3}$  unit                      (D)  $-5$  unit
2. In the above mentioned question, the y-component of  $-\vec{A}$  is  
(A) 4 unit                      (B)  $5\sqrt{3}$  unit                      (C)  $-5\sqrt{3}$  unit                      (D)  $-5$  unit
3. In the adjoining vector diagram, what is the angle between  $\vec{A}$  and  $\vec{B}$ ? (Given:  $C = B/2$ ).



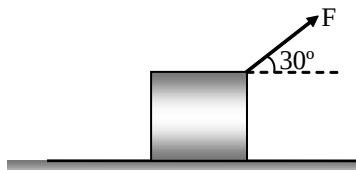
- (A)  $30^\circ$                       (B)  $60^\circ$                       (C)  $120^\circ$                       (D)  $150^\circ$
4. If  $\vec{A}$  is a vector magnitude 4 units due east. What is the magnitude and direction of a vector  $-4\vec{A}$ .  
(A) 4 units due east                      (B) 4 units due west  
(C) 16 units due west                      (D) 16 units due east
5. A displacement vector  $\mathbf{r}$  has magnitude of 25 m and makes an angle of  $210^\circ$  with the x-axis. Then its y-component is -  
(A) 21.7 m                      (B)  $-21.7$  m                      (C) 12.5 m                      (D)  $-12.5$  m

**Passage for Ques. 6 to 7**

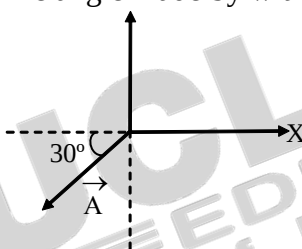
Three forces  $\vec{F}_1$ ,  $\vec{F}_2$  and  $\vec{F}_3$  act on a particle as shown in the figure. Where  $|\vec{F}_1| = 5\text{N}$ ,  $|\vec{F}_2| = 10\text{N}$  and  $|\vec{F}_3| = 20\text{N}$ .



6. X component of  $\vec{F}_2$  is –  
 (A) 5N (B) -5N (C)  $5\sqrt{3}$  N (D)  $-5\sqrt{3}$  N
7. Y component of  $\vec{F}_3$  is –  
 (A)  $10\sqrt{3}$  N (B)  $-10\sqrt{3}$  N (C) -10 N (D) 10 N
8. A child pulls a box with a force of 200N at an angle of  $30^\circ$  above the horizontal. Then the horizontal and vertical components of the force are -



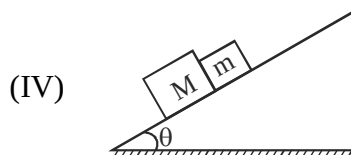
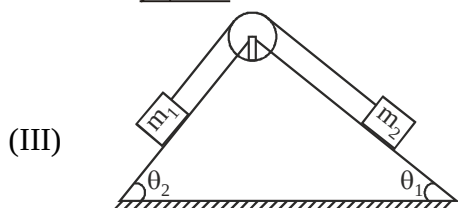
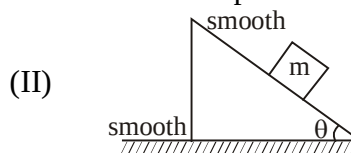
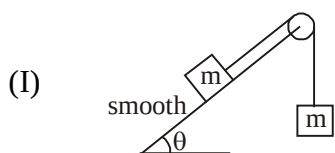
- (A) 173 N, 100N (B) 86.6N, 100N (C) 100N, 86.6N (D) 100N, 0N
9. Vector  $\vec{A}$  is shown in figure. The angle made by with positive X-axis is –



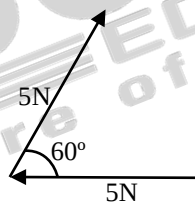
- (A)  $30^\circ$  (B)  $90^\circ$  (C)  $210^\circ$  (D)  $60^\circ$

**WORK BOOK # 5**

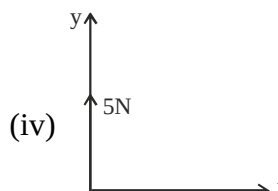
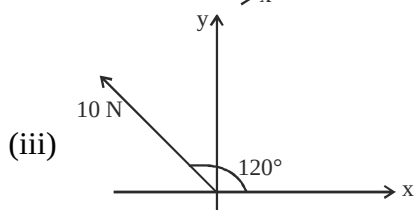
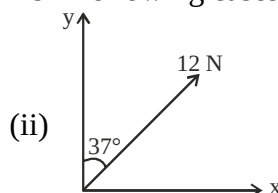
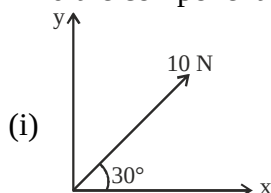
1. Resolve all the forces along parallel to the plane and  $\perp$  to the plane in following cases.



2. The component of a vector is -  
 (A) always less than its magnitude  
 (B) always greater than its magnitude  
 (C) always equal to its magnitude  
 (D) none of these
3. Which of the following forces cannot be a resultant of 5N force and 7N force?  
 (A) 2N  
 (B) 10N  
 (C) 14N  
 (D) 5N
4. Two forces, each numerically equal to 5 N, are acting as shown in the Fig. Then the resultant is-

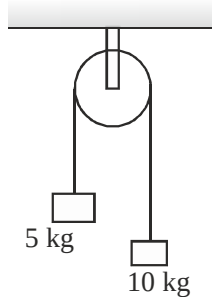


- (A) 2.5 N  
 (B) 5 N  
 (C)  $5\sqrt{3}$  N  
 (D) 10 N.
5. A displacement vector, at an angle of  $30^\circ$  with y-axis has an x-component of 10 units. Then the magnitude of the vector is -  
 (A) 5.0  
 (B) 10  
 (C) 11.5  
 (D) 20
6. Find the component of forces along X & Y axis if following cases.



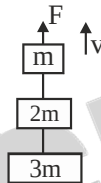
**WORK BOOK # 6**

1. Two masses of 5 kg and 10 kg are connected to a pulley as shown. What will be the acceleration if the pulley is set free : ( $g$  = acceleration due to gravity)



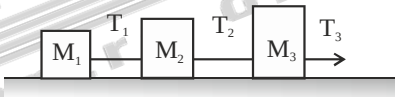
- (A)  $g$  (B)  $g/2$  (C)  $g/3$  (D)  $g/4$

2. Three blocks with masses  $m$ ,  $2m$  and  $3m$  are connected by strings, as shown in the figure. After an upward force  $F$  is applied on block  $m$ , the masses move upward at constant speed  $v$ . What is the net force on the block of mass  $2m$  ? ( $g$  is the acceleration due to gravity)



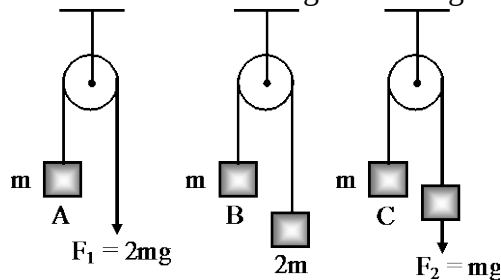
- (A)  $6mg$  (B) zero (C)  $2mg$  (D)  $3mg$

3. Three blocks are connected as shown in fig. on a horizontal frictionless table if  $m_1 = 1$  kg,  $m_2 = 8$  kg,  $m_3 = 27$  kg and  $T_3 = 36$  N,  $T_2$  will be :-



- (A) 18 N (B) 9 N (C) 3.375 N (D) 1.75 N

4. In the figure, the blocks A, B and C of mass  $m$  each have accelerations  $a_1$ ,  $a_2$  and  $a_3$  respectively.  $F_1$  and  $F_2$  are external forces of magnitude  $2mg$  and  $mg$  respectively.

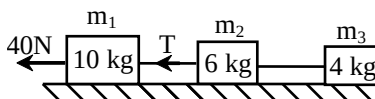


- (A)  $a_1 = a_2 = a_3$  (B)  $a_1 > a_3 > a_2$  (C)  $a_1 = a_2, a_2 > a_3$  (D)  $a_1 > a_2, a_2 = a_3$

5. A block of mass  $M$  is pulled along a horizontal frictionless surface by a rope of mass  $m$ . If a force  $P$  is applied at the free end of the rope, the force exerted by the rope on the block is -

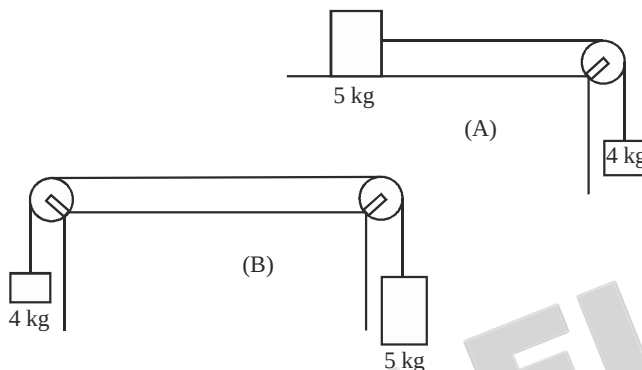
- (A)  $\frac{Pm}{M+m}$  (B)  $\frac{Pm}{M-m}$  (C)  $P$  (D)  $\frac{PM}{M+m}$

6. Three blocks of masses  $m_1$ ,  $m_2$  and  $m_3$  are placed on a horizontal frictionless surface. A force of 40 N pulls the system then calculate the value of T, if  $m_1 = 10\text{ kg}$ ,  $m_2 = 6\text{ kg}$ ,  $m_3 = 4\text{ kg}$  –



- (A) 40 N (B) 20 N (C) 10 N (D) 5 N

7. Two bodies of masses 5 kg and 4 kg are arranged in two position as shown in fig. (A) and (B), if the pulleys and the table are perfectly smooth, the acceleration of the 5 kg, body in case (A) and (B) are :-

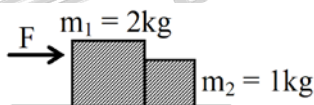


- (A)  $g$  and  $(5/9)g$  (B)  $(4/9)g$  and  $(1/9)g$  (C)  $g/5$  and  $g/5$  (D)  $(5/9)g$  and  $(1/9)g$

8. In tug of war two groups of men pull in opposite direction on either end of rope. Each group applies 2000 N of force. The tension in the rope is -

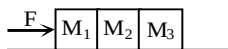
- (A) 0 N (B) 1000 N (C) 2000 N (D) 4000 N

9. Blocks are in contact on a frictionless table. A horizontal force  $F = 3\text{ N}$  is applied to one block as shown. The force exerted by the smaller block  $m_2$  on block  $m_1$  is-



- (A) 1 N (B) 2 N (C) 3 N (D) 6 N

10. A system of masses  $M_1$ ,  $M_2$  and  $M_3$  is shown in the diagram. Then match the following columns



**Column I**

- (a) acceleration of system  
(b) Reaction force of  $M_2$  on  $M_1$  is  
(c) Reaction force of  $M_2$  on  $M_3$  is

**Column II**

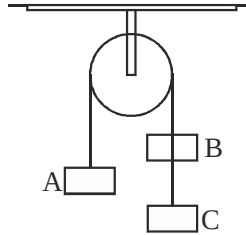
- (p)  $\frac{F(M_2 + M_3)}{M_1 + M_2 + M_3}$   
(q)  $\frac{F}{M_1 + M_2 + M_3}$   
(r)  $\frac{F(M_3)}{M_1 + M_2 + M_3}$

- (A)  $a \rightarrow p$ ,  $b \rightarrow r$ ,  $c \rightarrow q$   
(C)  $a \rightarrow q$ ,  $b \rightarrow r$ ,  $c \rightarrow p$

- (B)  $a \rightarrow q$ ,  $b \rightarrow p$ ,  $c \rightarrow r$   
(D)  $a \rightarrow r$ ,  $b \rightarrow p$ ,  $c \rightarrow q$

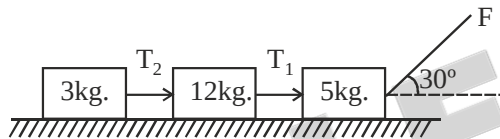
**WORK BOOK # 7**

1. Three equal weights of mass 2 kg each are hanging on a string passing over a fixed pulley as shown in fig. What is the tension in the string connecting weights B and C



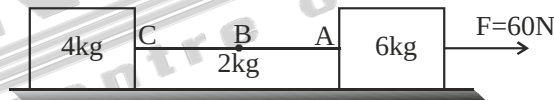
- (A) Zero (B) 13.3 N (C) 3.3 N (D) 19.6 N

2. The surfaces are frictionless, the ratio of  $T_1$  and  $T_2$  is :-



- (A)  $\sqrt{3} : 1$  (B)  $1 : \sqrt{3}$  (C)  $1 : 5$  (D)  $5 : 1$

3. Two blocks of masses 6 kg and 4 kg are connected by a rope of mass 2 kg are resting on a frictionless floor as shown in the following figure :

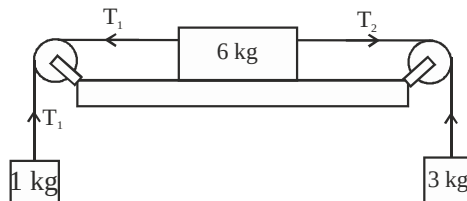


If a constant force of 60 N is applied to 6 kg block then the tension in the rope at points A, B (mid-point) and C are respectively given by :

- (A) 60 N, 60 N, 60 N (B) 30 N, 25 N, 20 N  
(C) 20 N, 25 N, 30 N (D) 20 N, 20 N, 20 N

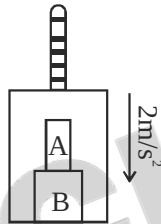
4. Three masses of 1 kg, 6 kg and 3 kg are connected to each other with threads and are placed on a table as shown in figure. What is the acceleration with which the system is moving ?

Take  $g = 10 \text{ ms}^{-2}$  :



- (A) Zero (B)  $2 \text{ ms}^{-2}$  (C)  $4 \text{ ms}^{-2}$  (D)  $3 \text{ ms}^{-2}$

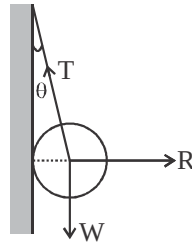
5. The ratio of weight of a man is stationary lift and in a lift accelerating downwards with a uniform acceleration is 3:2. The acceleration of the lift is :-  
 (A)  $\frac{g}{3}$  (B)  $\frac{g}{2}$  (C)  $g$  (D)  $\frac{4}{3}g$
6. The force exerted by the person on the floor of the elevator is more than the weight of the person if the elevator is –  
 (a) Going up and slowing down  
 (b) Going up and speeding up  
 (c) Going down and slowing down  
 (d) Going down and speeding up  
 (A) a, c (B) b, c (C) a, d (D) b, d
7. The elevator shown in figure is descending, with an acceleration of  $2 \text{ ms}^{-2}$ . the mass of the block A is 0.5 kg. The force exerted by the block A on the block B is :



- (A) 2 N (B) 4 N (C) 6 N (D) 8 N

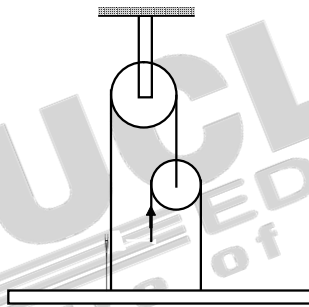
**WORK BOOK # 8**

1. A metal sphere is hung by a string fixed to a wall. The force acting on the sphere are shown in fig. Which of the following statement is correct :-



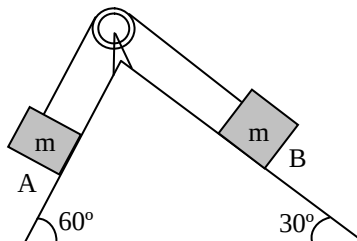
- (a)  $\vec{R} + \vec{T} + \vec{W} = 0$       (b)  $T^2 = R^2 + W^2$       (c)  $T = R + W$       (d)  $R = W \tan \theta$   
 (A) a, b, c      (B) b, c, d      (C) a, b, d      (D) a, b, c, d

2. In the given diagram, with what force must the man pull the rope to hold the plank in position? Weight of the man is 60 kgf. Neglect the weights of plank, rope and pulley.



- (A) 15 kgf      (B) 30 kgf      (C) 60 kgf      (D) 120 kgf

3. Two blocks each of mass  $m$  are resting on a frictionless inclined plane as shown in figure. Then -

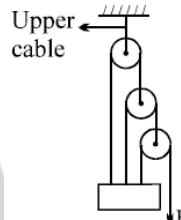


- (A) The block A moves down the plane      (B) The block B moves down the plane  
 (C) Both the blocks remains at rest      (D) Both the blocks moves down the plane

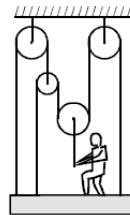
4. A man weighs 80 kg. He stands on a weighing scale in a lift which is moving upwards with a uniform acceleration of  $5 \text{ m/s}^2$ . What would be the reading on the scale ? ( $g = 10 \text{ m/s}^2$ )

- (A) Zero      (B) 400N      (C) 800 N      (D) 1200N

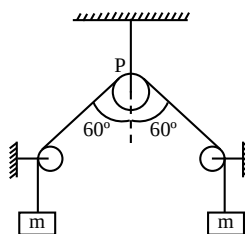
5. A person is standing in an elevator. In which situation he finds his weight less :-  
 (A) when the elevator moves upward with constant acceleration  
 (B) when the elevator moves downward with constant acceleration  
 (C) when the elevator moves upward with uniform velocity  
 (D) when the elevator moves downward with uniform velocity
6. A chain of mass  $M$  and length  $L$  held vertical by fixing its upper end to a rigid support. The tension in the chain at a distance  $y$  from the rigid support is  
 (A)  $Mg$  (B)  $Mg(L-y)/L$   
 (C)  $MgL(L-y)$  (D)  $Mgy/4$
7. The pull  $P$  is just sufficient to keep the  $14N$  block in equilibrium as shown. Pulleys are ideal. Find the tension (in  $N$ ) in the upper cable.



8. In the figure shown, the mass of the man = mass of the platform =  $60\text{ kg}$ . With what force should the man pull the rope down to remain in equilibrium?

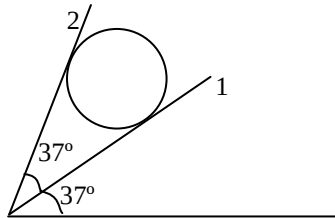


9. The force exerted by the string on pulley  $P$  is –



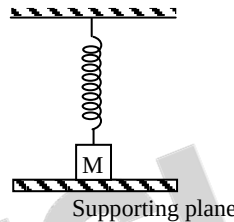
- (A)  $mg$  (B)  $2\ mg$  (C)  $\sqrt{2}\ mg$  (D)  $4\ mg$

10. A sphere of mass  $m$  is held between two smooth inclined walls. For  $\sin 37^\circ = 3/5$ , the normal reaction of the wall (2) is equal to -



- (A)  $mg$  (B)  $mg \sin 74^\circ$  (C)  $mg \cos 74^\circ$  (D) None of these

11. A block of mass  $m$  is attached to an ideal spring and system lies in vertical plane as shown. Initially the supporting plane is placed so that spring remains in its natural length then the plane is moved very slowly downwards. The graph showing variation of normal reaction applied by mass on supporting plane with distance travelled by block is -



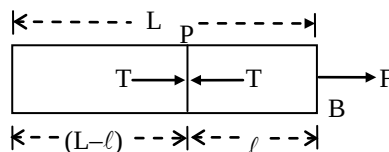
- (A) (B) (C) (D) None of these

12. A flexible chain of weight  $w$  hangs between two fixed points A and B as shown in fig. at the same level. Then the vector force exerted by the chain on each end point, and the tension in the chain at the lowest point.



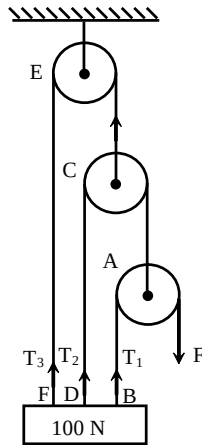
- (A)  $2w \sin \theta$ ,  $2w \cot \theta$  (B)  $2w \cot \theta$ ,  $2w \sin \theta$   
(C)  $w/2 \sin \theta$ ,  $w/2 \cot \theta$  (D)  $w/2 \cos \theta$ ,  $w/2 \tan \theta$

13. A uniform rope of length  $L$ , resting on a frictionless horizontal surface is pulled at one end by a force  $F$ . What is the tension of the rope at a distance  $l$  from the end where the force is applied ?



- (A)  $F(1 - l/L)$  (B)  $F(1 + l/L)$  (C)  $F/(1 - l/L)$  (D)  $F/(1 + l/L)$

14. In the arrangement shown below, force  $F$  is just sufficient to keep equilibrium of 100 N block.  $T_1$ ,  $T_2$  and  $T_3$  are tension in string AB, CD, and EF and  $T_4$  is total force of all tensions on block 100 N.



**Column I**

(A)  $T_1$

(B)  $T_2$

(C)  $T_3$

(D)  $T_4$

**Column II**

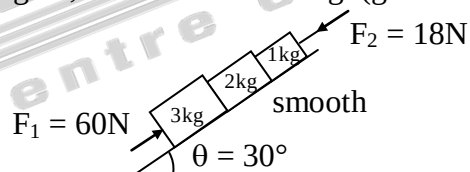
(P)  $\frac{400}{7}$  N

(Q)  $\frac{100}{7}$  N

(R)  $\frac{200}{7}$  N

(S) 100 N

15. In the diagram shown in figure, match the following: ( $g = 10 \text{ m/s}^2$ )



**Column I**

- (A) Acceleration of 2 kg block  
(B) Net force on 3 kg block  
(C) Normal reaction between 2 kg and 1 kg  
(D) Normal reaction between 3 kg and 2 kg

**Column II**

- (P) 8 SI unit  
(Q) 25 SI unit  
(R) 2 SI unit  
(S) 24 S.I. unit  
(T) None

**ANSWER KEY**
**WORK BOOK # 1**

- |       |       |       |       |       |       |      |
|-------|-------|-------|-------|-------|-------|------|
| 1. D  | 2. A  | 3. D  | 4. A  | 5. C  | 8. B  | 9. B |
| 10. B | 12. A | 13. B | 14. A | 15. A | 16. B |      |

**WORK BOOK # 3**

- |      |                   |          |       |       |       |       |
|------|-------------------|----------|-------|-------|-------|-------|
| 1. C | 2. $\pi - \theta$ | 3. A,B,D | 4. C  | 5. A  | 6. B  | 7. A  |
| 8. B | 9. B              | 10. B    | 11. C | 12. B | 13. D | 14. A |

**WORK BOOK # 4**

- |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|
| 1. D | 2. C | 3. D | 4. C | 5. D | 6. B | 7. B |
| 8. A | 9. C |      |      |      |      |      |

**WORK BOOK # 5**

- |      |      |      |      |
|------|------|------|------|
| 2. D | 3. C | 4. B | 5. D |
|------|------|------|------|

**WORK BOOK # 6**

- |      |      |       |      |      |      |      |
|------|------|-------|------|------|------|------|
| 1. C | 2. B | 3. B  | 4. B | 5. D | 6. B | 7. B |
| 8. C | 9. A | 10. B |      |      |      |      |

**WORK BOOK # 7**

- |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|
| 1. B | 2. D | 3. B | 4. B | 5. A | 6. B | 7. B |
|------|------|------|------|------|------|------|

**WORK BOOK # 8**

- |                                                                                        |      |       |       |       |       |       |
|----------------------------------------------------------------------------------------|------|-------|-------|-------|-------|-------|
| 1. C                                                                                   | 2. A | 3. A  | 4. D  | 5. B  | 6. B  | 7. 16 |
| 8. 400 N                                                                               | 9. A | 10. A | 11. C | 12. C | 13. A |       |
| 14. (A) $\rightarrow$ Q; (B) $\rightarrow$ R; (C) $\rightarrow$ P; (D) $\rightarrow$ S |      |       |       |       |       |       |
| 15. A $\rightarrow$ R ; B $\rightarrow$ T ; C $\rightarrow$ Q ; D $\rightarrow$ T      |      |       |       |       |       |       |