Laws of Motion

1. **Assertion (A):** According to Newton's third law of motion, action and reaction forces are equal in magnitude and opposite in direction.

   Reason (R): Net force on a body due to action-reaction pair is always equal to zero.

   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false

   (4) Both (A) and (R) are false

2. **Assertion (A):** For an upward moving elevator (Lift), pseudo force on a block may be downward.

   Reason (R): Pseudo force is the force applied by lift on block in opposite direction of motion.

   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false

   (4) Both (A) and (R) are false

3. **Assertion (A):** When a person walks on a rough surface, the net force exerted by surface on the person is in the direction of his motion.

   Reason (R): Friction force by road on person is against motion.

   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false

   (4) Both (A) and (R) are false

4. A moongphaliwala sells his moongphali using a weighing machine in an elevator.

   Assertion (A): He gains more profit if the elevator is accelerating up.

   Reason (R): The apparent weight of an object increases in an elevator while accelerating upward.

   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false

   (4) Both (A) and (R) are false

5. **Assertion (A):** The driver of a moving car sees a wall in front of him. To avoid collision, he should apply brakes rather than taking a turn away from the wall.

   Reason (R): Friction force is needed to stop the car or taking a turn on a horizontal road.

   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false

   (4) Both (A) and (R) are false

6. **Assertion (A):** A bird sits on a stretched wire depressing it slightly. The increase in tension of the wire is more than the weight of the bird.

   Reason (R): The tension must be more than the weight as it is required to balance weight.

   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false

   (4) Both (A) and (R) are false

7. **Assertion (A):** When two particles interact, net force on either particle is zero.

   Reason (R): Both experience action and reaction which are equal and opposite.

   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false

   (4) Both (A) and (R) are false

8. **Assertion (A):** Two smooth blocks are kept on a smooth inclined plane such that one block is kept over other. When a force is applied on upper block acceleration of lower block is unaffected.

   Reason (R): Acceleration of a block on smooth inclined plane is $g \sin\theta$.

   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false

   (4) Both (A) and (R) are false

9. **Assertion (A):** A man standing at rest on ground. Force exerted by man on ground is equal to weight of man.

Reason (R): Earth attracts man by force mg hence by Newton's third law, man also attracts earth by same force.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** If a body has no acceleration, then there are no forces acting on it.

Reason (R): If a single force acts on a body, then the body will move in the direction of force.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** Walking on horizontal slippery ice can be much more tiring than walking on ordinary pavement.

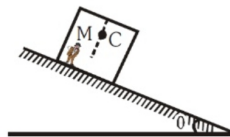**Reason (R):** Walking on ice requires small steps to prevent slipping.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** A particle on earth found to be at rest when seen from a frame U_1 and moving with a constant velocity when seen from another frame U_2. Then both frames may be non-inertial.

Reason (R): A reference frame attached to the earth must be an inertial frame.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** A coin dropped in a closed trolley moving down the smooth inclined plane, appears to fall normal to the floor of the trolley to a man fixed with the trolley.

Reason (R): The acceleration of coin relative to trolley (i.e. man) is g cosθ downward and perpendicular to inclined plane.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** The contact force is the net force applied by the surface on the body kept on it.

Reason (R): When a body is at rest on a horizontal surface then the contact force on the body by the surface must be equal to the weight of body.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** A horse has to pull a cart harder during the first few steps of his motion.
    Reason (R): The first few steps are always difficult.
    (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
    (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
    (3) (A) is true but (R) is false
    (4) Both (A) and (R) are false

16. **Assertion (A):** Static friction acts between two surfaces in contact only when these surfaces are at rest with respect to ground.
    Reason (R): Static friction opposes the motion of object.
    (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
    (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
    (3) (A) is true but (R) is false
    (4) Both (A) and (R) are false

17. **Assertion (A):** A lighter and a heavier body moving with same momentum and experiencing same retarding force have equal stopping distances.
    Reason (R): For a given force and momentum, stopping time is independent of mass.
    (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
    (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
    (3) (A) is true but (R) is false
    (4) Both (A) and (R) are false

18. **Assertion (A):** A car is moving with acceleration on a straight road. Net force on a milestone with respect to car is zero.
    Reason (R): Pseudo force acts on each body if observation is made with respect to a inertial reference frame.
    (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
    (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
    (3) (A) is true but (R) is false
    (4) Both (A) and (R) are false

19. **Assertion (A):** The apparent weight of a body in an elevator moving with some downward acceleration is less than the actual weight of body.
    Reason (R): The part of the weight is spent in producing downward acceleration, when body is in elevator.
    (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
    (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
    (3) (A) is true but (R) is false
    (4) Both (A) and (R) are false

20. **Assertion (A):** Even though there is no relative motion between two surfaces, frictional force can be non-zero between these two surfaces.
    Reason (R): Static frictional force can be non-zero.
    (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
    (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
    (3) (A) is true but (R) is false
    (4) Both (A) and (R) are false

21. **Assertion (A):** A particle has positive acceleration it means that its speed always increases.
    Reason (R): Acceleration is the rate of change of speed with respect to time.
    (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
    (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
    (3) (A) is true but (R) is false
    (4) Both (A) and (R) are false

22. **Assertion (A):** Trajectory of an object moving under a constant acceleration must be a straight line.
    Reason (R): The shape of trajectory depends only on the acceleration.
    (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
    (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
    (3) (A) is true but (R) is false
    (4) Both (A) and (R) are false

23. **Assertion (A):** A block is hanging from spring. Spring force on block and gravitational force on block are not action and reaction pair.

Reason (R): Action and reaction force acts in opposite direction.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

24. **Assertion (A):** A block is lying at rest on horizontal rough surface. A person moving with acceleration a in forward direction will observe a friction force acting on the block.

Reason (R): When there is relative motion between the two surface then only static friction acts between them.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

25. **Assertion (A):** An insect is climbing up a vertical wall with constant speed then the force applied by the wall on the insect is vertically upwards and equal to its weight.

Reason (R): Friction is a self-adjusting force.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

26. A frame of reference A is moving rectilinearly and uniformly with a velocity $\vec{u}$ with respect to an inertial frame B. A body is moving with velocity $\vec{v}$ and acceleration $\vec{a}$ in an inertial system B.

Assertion (A): When we use Newtons second Law in frame B we write $\sum \vec{F}_{net} = m\vec{a}$. Now when we use the same in frame A we will write exactly same $\vec{F}_{net}$ and $\vec{a}$.

Reason (R): All inertial system are equally suitable for the description of physical phenomenon.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

27. **Assertion (A):** According to the Newton's third law of motion, the magnitude of the action and reaction force in an action reaction pair is same only in an inertial frame of reference.

Reason (R): Newton's laws of motion are applicable only in inertial reference frame.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

**28.** **Assertion (A):** A body is lying at rest on a rough horizontal surface. A person accelerating with acceleration a (where a is positive constant and $\hat{i}$ is a unit vector in horizontal direction) observes the body. With respect to him, the block experiences a kinetic friction.

Reason (R): There is relative motion between the block and surface in person's frame of reference.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

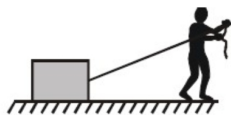(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

29. Assertion (A): A block of mass m is placed on a block of mass M, which is placed on smooth fixed inclined plane. The two block system is released from rest as shown. Whatever be the coefficient of friction between both the blocks, the magnitude of friction force between the both the blocks will be zero (As long as they are on inclined surface).
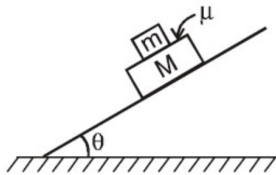
**Reason (R):** In the given situation there is no tendency of relative motion between the blocks.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

30. Assertion (A): A man and a block rest on smooth horizontal surface. The man holds a rope which is connected to block. The man can move on the horizontal surface.

Reason (R): There is no friction between man and horizontal surface

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

31. Assertion (A): In an at wood machine, when the masses are in motion, for a heavy rough pulley, tension on both side of pulley are different.
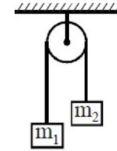
Reason (R): Acceleration of both masses are different.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

32. Assertion (A): The acceleration of a body moving down on a rough inclined plane is greater than the acceleration due to gravity.

Reason (R): The body is able to slide on a inclined plane only when its acceleration is greater than acceleration due to gravity

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

33. Assertion (A): If pseudo force on a body is assumed as action then frictional force may be reaction for this action.

Reason (R): Action-reaction must acts on different bodies.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

34. **Assertion (A):** A body starts moving from a point then after some time a constant force is applied on it then body can never pass from the starting point

    Reason (R): A constant force always produces a constant positive acceleration.

    (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

    (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

    (3) (A) is true but (R) is false

    (4) Both (A) and (R) are false

35. **Assertion (A):** Greater is the mass, greater is the force required to change the state of body at rest or in uniform motion.

    Reason (R): The rate of change of momentum is the measure of the force.

    (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

    (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

    (3) (A) is true but (R) is false

    (4) Both (A) and (R) are false

36. **Assertion (A):** Newton third law is that every action has equal and opposite reaction.

    Reason (R): Action is a cause and reaction is an effect that's why they are equal and opposite.

    (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

    (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

    (3) (A) is true but (R) is false

    (4) Both (A) and (R) are false

37. **Assertion (A):** The time taken by a particle to slide down along different smooth chords of a sphere starting from highest point of the sphere is same.

    Reason (R): In above conditions, length of such a chord is proportional to acceleration of the particle along it.

    (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

    (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

    (3) (A) is true but (R) is false

    (4) Both (A) and (R) are false

38. **Assertion (A):** If a particle is moving with uniform velocity, that means no external force is acting on the particle.

    Reason (R): According to Newton's first law, in absence of any force a particle in motion should continue moving with uniform velocity.
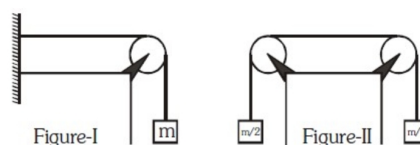
    (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

    (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

    (3) (A) is true but (R) is false

    (4) Both (A) and (R) are false

39. **Assertion (A):** To apply Newton's second law, mass of the system must be constant.

    Reason (R): If force $\vec{F}$ is a acting on a particle of mass m then its acceleration will be given by $\vec{F} = m\vec{a}$ is an inertial frame.

    (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

    (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

    (3) (A) is true but (R) is false

    (4) Both (A) and (R) are false

40. **Assertion (A):** In both cases shown in figures tension in the string will be same.

    Reason (R): Tension in the light strings shown is the force with which its ends are pulled.

    (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

    (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

    (3) (A) is true but (R) is false
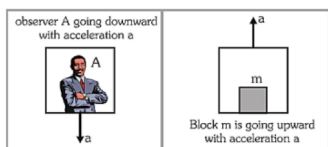
    (4) Both (A) and (R) are false

41. **Assertion (A):** Pseudo force on m as observed by A will be 'ma' in downward direction.

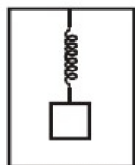**Reason (R):** Pseudo force depends on observer's acceleration.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

42. A block is suspended from an elevator at rest. Initially block is at equilibrium position. Suddenly elevator begins falling freely.

Assertion (A): A few moments after fall has begun the spring begins to contract.

Reason (R): Just after fall of elevator begins resultant force on block in reference frame of elevator is upward.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

43. **Assertion (A):** A man starts walking towards west. Friction force on him acts towards east.

Reason (R): Friction opposes relative motion.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

44. **Assertion (A):** If a particle is found to be in equilibrium in two different frames of reference implies that both frames are inertial.

Reason (R): Newton's second law can be used for motion of a particle in any reference frame.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

45. **Assertion (A):** A rocket moves forward by pushing the surrounding air backward.

Reason (R): There is an equal and opposite reaction to every action.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

46. **Assertion (A):** Magnitude of the contact force on a rough surface is always greater than the magnitude of normal reaction.

Reason (R): Contact force is the resultant of the friction force and normal reaction.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

47. **Assertion (A):** While walking on ice, one should take small steps to avoid slipping.

Reason (R): This is because smaller steps ensure smaller friction.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

48. **Assertion (A):** An air tight cage in which a bird is sitting, is suspended from a spring balance. If the bird starts flying upwards with some acceleration, then the reading of the balance will increase.

Reason (R): The weighing machine measures the actual weight of a body.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

49. **Assertion (A):** A block of weight 10 N is pushed against a vertical wall by a horizontal force of 15 N. The coefficient of friction between the wall and the block is 0.6. Then the magnitude of maximum frictional force is 9 N.

Reason (R): For given system block will remain stationary.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

50. **Assertion (A):** Due to frictional force acting on a body, the body is always retarded by friction.

Reason (R): Friction force opposes the motion of object.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

51. **Assertion (A):** A man standing in a lift which is moving upward, will feel his weight to be greater than when the lift was at rest.

Reason (R): If the acceleration of the lift is 'a' upward, then the man of mass m shall feel his weight to be equal to normal reaction (N) exerted by the lift given by N = m(g - a) (where g is acceleration due to gravity)

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

52. A man of mass 80 kg pushes a box of mass 20 kg horizontally. The man moves the box with a constant acceleration of 2 m/s^2 but his foot does not slip on the ground. There is no friction between the box and the ground, whereas there is sufficient friction between the man's foot and the ground to prevent him from slipping.

Assertion (A): The force applied by the man on the box is equal and opposite to the force applied by the box on the man.

Reason (R): Friction force applied by the ground on the man is 200 N.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

53. **Assertion (A):** When a man climbs the rope friction force acts in downward direction.

Reason (R): Friction force opposes relative motion or tendency of relative motion between two contact surfaces.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

54. **Assertion (A):** The apparent weight of a person standing in a lift, which speed up is always greater than his true weight.

Reason (R): The gravity force due to earth always acts downwards.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	3	3	4	1	2	1	4	2	2	4	1	3	1	3	3	4	4	4	1	1
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	4	4	2	4	4	1	4	4	1	2	2	4	4	4	4	3	1	4	4	4
Que.	41	42	43	44	45	46	47	48	49	50	51	52	53	54						
Ans.	4	1	4	4	4	4	1	3	3	4	4	2	4	4						