

CHAPTER

06

Test and Measurement in Sports

In physical education, there is a need to test. A test is the form of questioning or measuring tool used to assess the status of one's skill, knowledge, attitude and fitness. Each test is used to measure different but related concepts in physical fitness and sports.

Many types of tests may be effectively utilised in physical education. Before conducting a test, the measurements for the test are fixed.

Measurements refer to the process of collecting data based on particular attributes. These measurements are quantitative in nature and can be related to size, height, weight, vital capacity, achievements etc.

Measurement is a specific score given by an expert every time on applying a test. Each score tells about the use of a test once. Every time a test is used, it will have a new measurement.

Hence, measurement a process by which the level of performance, fitness, ability, knowledge, personality and skills are measured with the help of various standard tests.

There are various types of tests such as Johnson Basketball Ability Test, AAPHERD Youth Fitness Test, Kraus-Weber Test, Harvard Step Test, Sit and Reach Test, etc.

Importance of Test and Measurement in Sports

The importance of test and measurement in sports is discussed below

- Selection of Athlete Athlete is selected on the basis of skill testing and evaluation of measurements.

CHAPTER CHECKLIST

- Importance of Test and Measurement in Sports
 - Fitness Test- SAI Khelo India Fitness Test in School
 - Basal Metabolic Rate (BMR)
 - Rikli and Jones-Senior Citizen Fitness Test
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- **Motivation of an Athlete** The measurement and evaluation process creates motivation in athlete.
- **To Predict in Advance the Performance Potentials** Through measurements and evaluation procedure, the future performance can be predicted.
- **To Prepare Norms and Standards** All types of standards involve testing and measurements as an essential tool. Norms are set by testing large number of individuals.
- **To Measure Current Fitness Status** It helps in measuring the present health status of an individual.
- **To Achieve Objectives and Goals** Test and measurement help in achieving objectives and goals by improving performance.

Fitness Test- SAI Khelo India Fitness Test in School

Fitness defines the ability to perform physical activity and encompasses a wide range of abilities. Each activity and sports requires a specific set of skills, and so being fit for an activity or a sport does not necessarily make a person fit for another. Fitness is generally divided into specific fitness categories or components, and each can be tested and trained individually.

Age Group 5-8 Years/ Class 1 To 3

At Primary class 1-3, children should acquire Fundamental Movement Skills (FMS) leaving the learning of specific physical activities to later stages. FMS provide the building blocks for many physical activities, such as playing games, dance, and sport. Locomotor, Manipulative & Body Management abilities are key to success in most sports and physical activities. Following are the abilities of children in class 1-3 which need to be measured and tracked and are important for controlling the body in various situations:

- Body Composition (BMI)
- Coordination (Plate Tapping)
- Balance (Flamingo Balance)

component. The test performed is Body Mass Index (BMI), which is calculated from body Weight (W) and Height (H) such as

$$BMI = W / (H \times H)$$

Where: W = body weight in kilograms and
H = height in meters.

The higher the score usually indicating higher levels of body fat.

Equipments Required

- Flat, Clean surface, Weighing
- Machine, Stadiometer/Measuring Tape pasted on a wall

Procedure

Measuring Height Accurately

- Remove the participant's shoes, bulky clothing, and hair ornaments, and unbraided hair that interferes with the measurement.
- Take the height measurement on flooring that is not carpeted and against a flat surface such as a wall with no molding.
- Have the participant stand with feet flat, together, and back against the wall. Make sure legs are straight, arms are at sides, and shoulders are level.
- Make sure the participant is looking straight ahead and that the line of sight is parallel with the floor.
- Take the measurement while the participant stands with head, shoulders, buttocks, and heels touching the flat surface (wall). Depending on the overall body shape of the participant, all points may not touch the wall.
- Use a flat headpiece to form a right angle with the wall and lower the headpiece until it firmly touches the crown of the head.
- Make sure the measurer's eyes are at the same level as the headpiece.
- Lightly mark where the bottom of the headpiece meets the wall.
- Then, use a metal tape to measure from the base on the floor to the marked measurement on the wall to get the height measurement.
- Accurately record the height to the nearest 0.1 centimeter.

- Have the participant remove shoes and heavy clothing, such as sweaters.
- Have the participant stand with both feet in the center of the scale.
- Record the weight to the nearest decimal fraction e.g. 30.6 kilograms.

Plate Tapping Test

Purpose- It measures speed and coordination of limb movement of children.

Equipments Required

- Table (adjustable height)
- 2 yellow discs (20cm diameter)
- Rectangle (30 x 20 cm)
- Stopwatch

Procedure

- If possible, the table height should be adjusted so that the subject is standing comfortably in front of the discs. The two yellow discs are placed with their centers 60 cm apart on the table. The rectangle is placed equidistant between both discs.
- The non-preferred hand is placed on the rectangle. The subject moves the preferred hand back and forth between the discs over the hand in the middle as quickly as possible.
- This action is repeated for 25 full cycles (50 taps).

Suggestions

- Participants should be encouraged to stand in a balanced posture, feet apart to shoulder width.
- Results are usually better if the participant can maintain constant pace during most of the run.

Flamingo Balance Test

Purpose It measures ability to balance successfully on a single leg. This single leg balance test assesses the strength of the leg, pelvic, and trunk muscle as well as static balance.

Equipments Required

- Non- Slippery even surface
- Stopwatch

Procedure

- Stand on the beam. Keep balance by holding the instructor's hand (if required to start).
- While balancing on the preferred leg, the free leg is flexed at the knee and the foot of this leg held close to the buttocks.
- Start the watch as the instructor lets go of the participant/subject.
- Pause the stopwatch each time the subject loses balance (either by falling off the beam or letting goes of the foot being held).
- Resume over, again timing until they lose balance. Count the number of falls in 60 seconds of balancing.
- If there are more than 15 falls in the first 30 seconds, the test is terminated.

Suggestion

Participants should be encouraged to eyes focused on stationary object straight ahead.



Flamingo

Age Group 9-18+ Years/ Class 4 To 12

For Class 4 to 12, it is important for students to have an overall physical fitness. The following components are to be considered in Physical Health and Fitness Profile

- Body Composition (BMI)
- Speed (50 mt speed test)
- Cardiovascular Endurance (600 mt Run/Walk)
- Flexibility (Sit and Reach Test)
- Strength (Abdominal Partial Curl-up, Push Ups for Boys, Modified Push Ups for Girls)

Note The procedure of Body Composition (BMI) for age group

50 mt Speed Test (50 Yard Dash)

- **Purpose** The purpose of this test is to determine acceleration and speed of an athlete.
- **Equipments Required** Marked track or measuring tape, stopwatch and cones.
- **Procedure** The student is asked to run 50 m from the starting line. Student is required to stand behind the starting line.
The coach or teacher commands 'get set', then 'go' alongwith the downward sweep of his hand as a signal to the timer.
Before starting this test, a student must be given a thorough warm up, including practice starts and acceleration.
- **Scoring** Two trials are given to a student and best time of the two is recorded in seconds nearest to one-tenths of a second.



50 m Speed Test

600 m Run/Walk

- **Purpose** To measure cardiovascular fitness or endurance by running/walking to the longest distance.
- **Equipments Required** 600 m track, marked cones and stopwatch.
- **Procedure** The student is asked to run or walk for 600 meters. Students stand behind the starting line and on the command 'go', they start running or walking at their own pace.
This can be performed in an open field or on the track of an athletic field, as shown in the diagram below, by marking the distances appropriately.
- **Scoring** The time is recorded in minutes and seconds.



Sit and Reach Flexibility Test

The sit and reach test is a common measure of flexibility, and specifically measures the flexibility of the lower back and hamstring muscles.

This test was first described by Wells and Dillon (1952) and now is widely used as a general test of flexibility.

- **Purpose** To measure the flexibility of the lower back and hamstring muscles.
- **Equipments Required** Sit and Reach box or flexometer.
- **Procedure** This test involves sitting on the floor with legs stretched out straight ahead. Shoes and socks should be removed.
The soles of the feet should be placed flat against the box. Both knees should be locked and pressed flat to the floor. An assistant may hold the knees down. With the palms facing downwards, and the hands on the top of each other or side by side, the student should reach forward along the measuring line as far as possible. He should hold the full reach position for one-two seconds, while the distance is recorded.
- **Scoring** The score is recorded to the nearest centimeter or an inch based on the distance reached by the finger tips of both hands.



Sit and Reach Test

Abdominal Partial Curl Up

- **Purpose** To test the strength and endurance of abdominal muscles.
- **Equipments Required** A flat clean cushioned surface, recording sheet and pen.
- **Procedure** The complete test procedure is explained to the student. After that the student lies in supine pose on cushioned surface.

The knees should be flexed and feet should be 12 inches from the buttocks. Both the feet should be

Then, the student curls up with a slow controlled movement, until his/her shoulders come off the cushioned surface or mat two inches, then back down again.

One complete curl up is completed every 3 seconds and should be continued till exhaustion, *i.e.* the student is unable to maintain the rhythm.

The curl ups should be continuous *i.e.* there should not be any pause in the up or down position.

- **Scoring** Record the total number of partial curl ups. Curl up should not be counted if the shoulders are not raised up by 2 inches.



Partial Curl Up

Push Ups (Boys)

- **Purpose** To test or measure the upper body strength and endurance.
- **Equipments Required** A floor mat and a paper to record basic information such as age, gender and total number of push ups performed.
- **Procedure** The student is required to take position after proper warming up. In a push up position, hands and toes should touch the mat/floor. Hands should be shoulder width apart. The upper body and legs should be in a straight line. Elbow should be fully extended keeping the back and knees straight.

Now, the student should lower the upper body, so that elbows may bend to 90 degrees or chest may touch the mat/floor, then return back to the starting position with the arms extended. This is counted as one repetition.

The student is required to complete as many repetitions as possible without breaking rhythm.

- **Scoring** Count the total number of push ups.



Push Ups

Modified Push Ups (Girls)

- **Purpose** To measure the upper body strength and endurance.
- **Equipments Required** A mat and paper to record the basic information like age, gender and push ups performed.
- **Procedure** The student is asked to take starting position, for modified push ups. Hands and knees should touch the mat/floor. Both hands should be shoulder width apart and elbows fully extended. The body from the knees, to the hips and to the shoulders should be in a straight line. While keeping this position, the subject should lower her upper body, so that elbows may bend to 90 degrees. Then, the student returns back to the starting position. This is one repetition. The student is required to complete as many repetitions as possible without breaking rhythm.
- **Scoring** Count the total number of modified push ups for record.



Modified Push Ups

Basal Metabolic Rate (BMR)

Basal Metabolic Rate (BMR) is the number of calories our body needs to accomplish its most basic (basal) life-sustaining functions such as breathing, circulation, nutrient processing and cell production. Around 60-75% of our daily calories are burned during these processes. It is the rate of one's metabolism when waking up in the morning after fasting during sleep.

The BMR is enough energy for the brain and central nervous system, heart, kidneys, liver, lungs, muscles, sex organs, and skin to function properly.

People who are overweight or obese do not necessarily have a slow BMR. In fact, their BMR is usually faster to accommodate for extra fat and for their body to work harder to perform normal body functions.

Building lean muscle mass can increase BMR, but there is a limit for both men and women as to how much lean muscle mass can be built. Some supplements may increase BMR, but also only to a limit, and they may have serious side effects.

Computing Basal Metabolic Rate (BMR)

One popular way to estimate BMR is through the Harris-Benedict formula, which takes into account weight, height, age and gender such as

For Women

$$\text{BMR} = 655 + (9.6 \times \text{weight in kg}) + (1.8 \times \text{height in cm}) - (4.7 \times \text{age in years})$$

For Men

$$\text{BMR} = 66 + (13.7 \times \text{weight in kg}) + (5 \times \text{height in cm}) - (6.8 \times \text{age in years})$$

Rikli and Jones—Senior Citizen Fitness Test

This test is also known as Fullerton Functional Test of Senior Citizens. Rikli and Jones prepared various tests to test the functional fitness for senior citizens in 2001. Senior citizens can't do exhaustive workouts, however fitness is very important even in old age. Therefore, the tests are designed to check the function

These tests are safe, enjoyable and meet scientific standards of reliability and validity. They measure aerobic fitness, strength, flexibility using minimal and inexpensive equipments.

The Senior Citizens Fitness Test is comprised of the following test

Chair Stand Test for Lower Body Strength

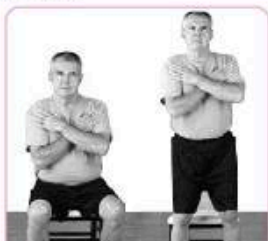
The Chair Stand Test is similar to a squat test to measure leg strength. This test is a part of the Senior Fitness Test Protocol and is designed to test the functional fitness of seniors.

- **Purpose** This test assesses to measure the lower body strength particularly leg strength and endurance of senior citizens.
- **Equipments Required** A straight or folding chair without arm rests (seat 17 inches/ 44 cm high) and stopwatch.
- **Procedure** Place the chair against a wall or stabilise it for safety. The subject/participant sits in the middle of the seat with feet having shoulder width apart and flat on the floor. The arms are to be crossed at the wrists and held close to the chest. From the sitting position, the subject/ participant stands completely up, then completely back down at the start of the signal.

This is repeated for 30 seconds. Count the total number of complete chair stands (up and down equals one stand) within a fixed time limit.

In case the participant has completed a full stand from the sitting position when the time is finished, the final stand is counted in the total.

- **Scoring** The total number of completed chair stands in 30 seconds time.



The recommended ranges for this test based on age group are

Men's Results

Age	Below Average	Average	Above Average
60-64	< 14	14 to 19	> 19
65-69	< 12	12 to 18	> 18
70-74	< 12	12 to 17	> 17
75-79	< 11	11 to 17	> 17
80-84	< 10	10 to 15	> 15
85-89	< 8	8 to 14	> 14
90-94	< 7	7 to 12	> 12

Women's Results

Age	Below Average	Average	Above Average
60-64	< 12	12 to 17	> 17
65-69	< 11	11 to 16	> 16
70-74	< 10	10 to 15	> 15
75-79	< 10	10 to 15	> 15
80-84	< 9	9 to 14	> 14
85-89	< 8	8 to 13	> 13
90-94	< 4	4 to 11	> 11

Arm Curl Test for Upper Body Strength

The Arm Curl Test is a test to measure the upper body strength of senior citizens or old people. This test also measures the functional fitness of the senior citizens. Upper body strength is required to perform household activities.

- **Purpose** This test measures upper body strength and endurance.



- **Equipments Required** 5 pound weight for women, 8 pound weight for men, a chair without arm rests and a stopwatch.
- **Procedure** The aim of this test is to do as many arm curls as possible in 30 seconds. This test is conducted on the dominant arm side (or stronger side).

The subject/participant sits on the chair holding the weight in the hand using a suitcase grip (palm facing towards the body) with the arm in a vertically down position beside the chair.

The upper arm is held close to the body so that only the lower arm is moving. Curl the arm up and down slowly while holding the weight.

The arm must be fully bent and then fully straightened at the elbow. Repeat this action as many times as possible within 30 seconds.

- **Scoring** The score is the total number of completed arm curls performed in 30 seconds.

The table below shows the recommended ranges for this test based on age group

Men's Results

Age	Below Average	Average	Above Average
60-64	< 16	16 to 22	> 22
65-69	< 15	15 to 21	> 21
70-74	< 14	14 to 21	> 21
75-79	< 13	13 to 19	> 19
80-84	< 13	13 to 19	> 19
85-89	< 11	11 to 17	> 17
90-94	< 10	10 to 14	> 14

Women's Results

Age	Below Average	Average	Above Average
60-64	< 13	13 to 19	> 19
65-69	< 12	12 to 18	> 18
70-74	< 12	12 to 17	> 17
75-79	< 11	11 to 17	> 17
80-84	< 10	10 to 16	> 16
85-89	< 10	10 to 15	> 15
90-94	< 8	8 to 13	> 13

Chair Sit and Reach Test for Lower Body Flexibility

This kind of flexibility is needed to do household chores, getting in-out of the car, bending for tying shoe laces etc.

- **Purpose** This test measures lower body flexibility.
- **Equipments Required** Ruler, a chair with straight back or folding chair (17 inch/ 44 cm high).
- **Procedure** The participant sits on the edge of the chair placed against a wall for safety. One foot must remain flat on the floor.

The other leg is extended forward with the knee straight, heel touching the floor, with ankle bent at 90°. Place one hand on top of the other.

Then, the participant should inhale followed by exhaling and reach forward towards the toes by bending at the hip. Keep the back straight and head up.

Avoid bouncing or quick movements and never stretch to the point of pain. Keep the knee straight and hold the reach for 2 seconds.

The distance to be measured is between the finger tips and the toes. If the finger tips touch the toes, then the score is zero. If they do not touch, measure the distance between the fingers and the toes (a negative score); if they overlap, measure by how much distance (a positive score). Perform two trials and record the better score.



Chair Sit and Reach Test

- **Scoring** The score is recorded to the nearest 1/2 inch or 1 cm as the distance reached either as a negative or positive score. Record which leg was used for measurement.

Below is a table showing the recommended ranges (in inches) for this test based on age

Men's Results

Age	Below Average	Average	Above Average
60-64	< -2.5	-2.5 to 4.0	> 4.0

80-84	< -5.5	-5.5 to 1.5	> 1.5
85-89	< -5.5	-5.5 to 0.5	> 0.5
90-94	< -6.5	-6.5 to -0.5	> -0.5

Women's Results

Age	Below Average	Average	Above Average
60-64	< -0.5	-0.50 to 5.0	> 5.0
65-69	< -0.5	-0.50 to 4.5	> 4.5
70-74	< -1.0	-1.0 to 4.0	> 4.0
75-79	< -1.5	-1.5 to 3.5	> 3.5
80-84	< -2.0	-2.0 to 3.0	> 3.0
85-89	< -2.5	-2.5 to 2.5	> 2.5
90-94	< -4.5	-4.5 to 1.0	> 1.0

Back Scratch Test for Upper Body Flexibility

This is a simple flexibility test to determine if the hands can be brought together behind the back, particularly the shoulders, to check the stretchability of the shoulders.

The upper body shoulder flexibility helps in performing various tasks such as putting on overhead garments, reaching for something overhead, etc.

This test is part of the fitness programme as an alternative to the Back Saver Sit and Reach Test.

- **Purpose** This test measures upper arm and shoulder girdle flexibility.
- **Equipment Required** Ruler
- **Procedure** This test is done in the standing position. Place one hand behind the head and back over the shoulder and reach as far as possible down the middle of your back, your palm should touch your body and the fingers should be directed downwards.



possible, attempting to touch the fingers of the other hand. The tester or assistant may be required to direct the subject so that the fingers are aligned.

See if the participant can touch his fingers. Test the left and right shoulders.

Measure the distance between the tips of fingers. If the finger tips touches, then the score is zero. If they do not touch, measure the distance between the finger tips and it will be a negative score. If they overlap, measure the distance which will be a positive score.

- **Scoring** Two trials are given to the participant and the best score is recorded to the nearest 1/2 inch for this test.

Men's Results

Age	Below Average	Average	Above Average
60-64	> 6.5	6.5 to 0	< 0
65-69	> 7.5	7.5 to 1.0	< 1.0
70-74	> 8.0	8.0 to -1.0	< -1.0
75-79	> 9.0	9.0 to -2.0	< -2.0
80-84	> 9.5	9.5 to -2.0	< -2.0
85-89	> 10.0	10.0 to -3.0	< -3.0
90-94	> 10.5	10.5 to -4.0	< -4.0

Women's Results

Age	Below Average	Average	Above Average
60-64	> 3.0	3.0 to 1.5	< 1.5
65-69	> 3.5	3.5 to 1.5	< 1.5
70-74	> 4.0	4.0 to 1.0	< 1.0
75-79	> 5.0	5.0 to 0.5	< 0.5
80-84	> 5.5	5.5 to 0	< 0
85-89	> 7.0	7.0 to -1.0	< -1.0
90-94	> 8.0	8.0 to -1.0	< -1.0

Eight Foot Up and Go Test for Agility

The Eight Foot Up and Go Test is a coordination and agility test for the elderly people which is part of the Senior Fitness Test Protocol.

This kind of agility is required to balance the body during quick movements such as getting up to answer a

- **Equipments Required** Stopwatch, straight back or folding chair (seat 17 inches/44 cm high), cone marker, measuring tape, area without any obstacles.
- **Procedure** Place the chair next to a wall for safety and the cone marker 8 feet away in front of the chair. Clear the path between the chair and the marker. The participant sits on chair, hands resting on the knees and feet flat on the ground.

On the command 'Go', the stopwatch is started and the subject stands and walks (no running) as quickly as possible towards the cone, turns around and return to the chair to sit down.



Eight Foot Up and Go Test

- **Scoring** Take the best time of two trials to the nearest 1/10th second.

Below is a table showing the recommended ranges in seconds for this test based on age group.

Men's Results

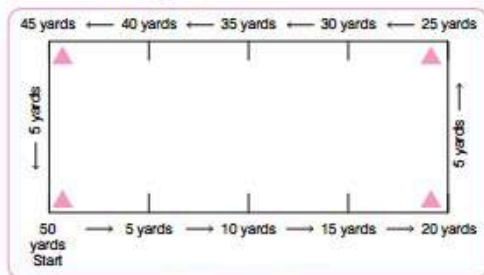
Age	Below Average	Average	Above Average
60-64	> 5.6	5.6 to 3.8	< 3.8
65-69	> 5.7	5.7 to 4.3	< 4.3
70-74	> 6.0	6.0 to 4.2	< 4.2
75-79	> 7.2	7.2 to 4.6	< 4.6
80-84	> 7.6	7.6 to 5.2	< 5.2
85-89	> 8.9	8.9 to 5.3	< 5.3
90-94	> 10.0	10.0 to 6.2	< 6.2

Women's Results

Age	Below Average	Average	Above Average
60-64	> 6.0	6.0 to 4.4	< 4.4
65-69	> 6.4	6.4 to 4.8	< 4.8
70-74	> 7.1	7.1 to 4.9	< 4.9
75-79	> 7.4	7.4 to 5.2	< 5.2
80-84	> 7.7	7.7 to 5.7	< 5.7
85-89	> 8.9	8.9 to 5.3	< 5.3
90-94	> 10.0	10.0 to 6.2	< 6.2

Six Minute Walk Test for Aerobic Endurance

The Six Minute Walk Test is a part of the Senior Fitness Test Protocol and is designed to test the functional fitness of seniors. Endurance is required to walk for long distances, climbing stairs etc.



Six Minute Walk Test

- **Purpose** This test measures aerobic fitness or aerobic endurance.
- **Equipments Required** Measuring tape to mark out the track distances, stopwatch and chairs positioned for testing.
- **Procedure** The walking course is laid out in a 50 yard (45.72m) rectangular area (dimension 45 × 5 yards) with cones placed at regular intervals to indicate distance walked.

The aim of this test is to walk as quickly as possible for six minutes to cover as much distance as possible.

Subjects are to set their own pace (a preliminary trial is useful to practise pacing) and are allowed to stop for a rest if they desire.

- **Scoring** Measure the distance walked in 6 minutes to the nearest metre.

Below is a table showing the recommended ranges (in yards) for distance covered during the test.

Men's Results

Age	Below Average	Average	Above Average
60-64	< 610	610 to 735	> 735
65-69	< 560	560 to 700	> 700
70-74	< 545	545 to 680	> 680
75-79	< 470	470 to 640	> 640
80-84	< 445	445 to 605	> 605
85-89	< 380	380 to 570	> 570
90-94	< 305	305 to 500	> 500

Women's Results

Age	Below Average	Average	Above Average
60-64	< 545	545 to 660	> 660
65-69	< 500	500 to 635	> 635
70-74	< 480	480 to 615	> 615
75-79	< 430	430 to 585	> 585
80-84	< 385	385 to 540	> 540
85-89	< 340	340 to 510	> 510
90-94	< 275	275 to 440	> 440

CHAPTER PRACTICE

OBJECTIVE TYPE QUESTIONS

Multiple Choice Questions (MCQs)

- 1 The age group of children and youth is

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- (a) 5-25 yrs (b) 5 - 17 yrs
(c) 5 - 21 yrs (d) 5-15 yrs

Ans (a) 5-25 yrs

- 2 Which of the following is the key to success in most sports and physical activities?

- (a) Locomotor abilities
(b) Manipulative & Body Management abilities
(c) Physical endurance
(d) All of the above

Ans (d) All of the above

- 3 Which of the following is an important test for children with age group 5-8 years?

- (a) Plate Tapping (b) Flamingo Balance
(c) 600 m run/walk (d) Both (a) and (b)

Ans (d) Both (a) and (b)

- 4 Ankit lives with his grandfather who is 65 years old and leads a sedentary lifestyle. Ankit is worried about his health. He would like to test his grandfather's functional fitness. Which test should Ankit administer to check his grandfather's lower body flexibility?

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- (a) Chair stand test
(b) Arm curl test
(c) Back scratch test
(d) Chair sit and reach test

Ans (d) Chair sit and reach test

- 5 Sit and Reach Test is conducted to measure

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- (a) Flexibility (b) Motor Fitness
(c) Endurance (d) Speed

Ans (a) Flexibility

- 6 The purpose of push ups is to measure the

- (a) Lower body strength
(b) Upper body strength and endurance

- 7 If a male senior citizen of 65 years completes two trails in the Eight Foot Up and Go Test in 5.3 and 4.2 seconds respectively, his agility will be classified as

- (a) Below Average (b) Average
(c) Above Average (d) Extremely Poor

Ans (c) Above Average

- 8 The duration of arm curl test is CBSE 2021 Term I

- (a) 30 seconds (b) 15 seconds
(c) 20 seconds (d) 25 seconds

Ans (a) 30 seconds

- 9 Harvard Step Test is also called the Aerobic Fitness Test. It was developed by Brouha and others in 1943. It is used to measure aerobic fitness by checking the recovery rate. Few students were asked to conduct Harvard step test for their classmates and they were asked to note down the complete details of their aerobic capacity. For conducting tests they required a bench separate for boys 20 inches and girls 16 inches with one stop watch to note down the timing and their recovery rate.

How many times is the reading taken for calculating a long term fitness index?

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- (a) 5 (b) 3
(c) 2 (d) 4

Ans (b) 3

- 10 The Six Minute Walk Test for senior citizens is designed to test the

- (a) Functional fitness (b) Mental fitness
(c) Both (a) and (b) (d) None of the above

Ans (a) Functional fitness

- 11 Assertion (A) Push ups help in building muscular strength.

Reason (R) Push ups are isokinetic muscular movements that provide strength to the joints.

In context of above two statements, which one of the following is correct?

Codes

- (c) A is true, but R is false
 (d) A is false, but R is true

Ans. (c) A is true, but R is false

Fill in the Blanks

12 The purpose of 600 m run or walk is to measure _____ by running or walking to the longest distance.

Ans Endurance

13 The Sit and Reach Test was first described by _____ in 1952.

Ans Wells and Dillon

14 The purpose of partial curl up is to test the strength and endurance of _____.

Ans Abdominal muscles

State True or False

15 The senior citizen lacks lower body flexibility.

Ans True

16 Athlete is selected on the basis of skill testing evaluation of measurements.

Ans True

Match the Following

List I (Tests)		List II (Equipments Required)
A. BMI	(i)	Flat, clean surface, Weighing Machine, Stadiometer
B. Plate Tapping Test	(ii)	Table (adjustable height), 2 yellow discs (20cm diameter), Rectangle (30 x 20 cm), Stopwatch
C. Flaming o Balance Test	(iii)	Non- Slippery even surface, Stopwatch,
D. BMR	(iv)	$655 + (9.6 \times \text{weight in kg}) + (1.8 \times \text{height in cm}) - (4.7 \times \text{age in years})$

Codes

- | | | | | |
|-----|-------|------|-------|------|
| | A | B | C | D |
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (iii) | (ii) | (iv) | (i) |
| (c) | (iii) | (iv) | (i) | (ii) |

C VERY SHORT ANSWER TYPE QUESTIONS

18 What is the need of test in sports?

Ans Test in sports is needed to check content knowledge, fitness levels, motor skills as well as attitudes and feelings required for a particular sport.

19 What is the meaning of the term 'Measurement' in sports?

Ans Measurement is a specific score given by an expert every time on applying a test. It is prerequisite for evaluation. Hence, it helps in tracing progress of individual or group.

20 Write one significance or importance of test and measurement.

Ans One of the significance of test and measurement is that athlete is selected on the basis of skill testing and evaluation of measurements.

21 What is the purpose of Plate Tapping Test?

Ans The purpose of Plate Tapping Test is to measure speed and coordination of limb movement of children.

22 Which equipments are required for Plate Tapping Test?

Ans The following equipments are required for Plate Tapping Test:

- Table (adjustable height)
- 2 yellow discs (20cm diameter)
- Rectangle (30 x 20 cm)
- Stopwatch

23 What is the purpose of the partial curl up?

Ans The purpose of partial curl up test is to measure abdominal strength and endurance, which is important in back support and core stability.

24 Which motor quality does a senior citizen lack who finds difficulty in tying the shoe laces while sitting on a chair?

Ans The senior citizen lacks lower body flexibility as he is not able to bend himself while sitting on the chair.

25 Which test would you suggest for your grandmother to test lower body flexibility?

26 Your grandmother feels she has reduced her upper body flexibility and therefore she wants to test herself. Which test would you suggest her? All India 2017; Delhi 2015

Ans I would suggest my grandmother to take the Back Scratch Test for upper body flexibility under the Rikli and Jones—Senior Citizen Fitness Tests.

C SHORT ANSWER TYPE QUESTIONS

27 State the procedure of measuring weight in BMI.

Ans The procedure of measuring weight in BMI is given below

- Use a digital scale. Avoid using bathroom scales that are spring loaded. Place the scale on firm flooring such as tile or wood rather than carpet.
- Have the participant remove shoes and heavy clothing, such as sweaters.
- Have the participant stand with both feet in the center of the scale.
- Record the weight to the nearest decimal fraction e.g. 30.6 kilograms.

28 Explain the purpose and procedure of Plate Tapping Test.

Ans Purpose of Plate Tapping Test is to measure speed and coordination of limb movement of children.

Procedure

- If possible, the table height should be adjusted so that the subject is standing comfortably in front of the discs. The two yellow discs are placed with their centers 60 cm apart on the table. The rectangle is placed equidistant between both discs.
- The non-preferred hand is placed on the rectangle. The subject moves the preferred hand back and forth between the discs over the hand in the middle as quickly as possible.
- This action is repeated for 25 full cycles (50 taps).

29 Explain the purpose and procedure of any two batteries for the Motor Fitness Test.

CBSE 2020

Ans Purpose and procedure of two batteries for the Motor Fitness is given below

(i) **50 m Speed Test**

- **Purpose** To measure speed.

(ii) **60 m Run/Walk**

- **Purpose** To measure endurance.
- **Procedure** The youth is asked to run or walk for 600 metres and the time is recorded in minutes and seconds. This can be performed in an open field or on the track, by marking the distances appropriately.

30 Explain the procedure for 'Sit and Reach Test'.

Ans The procedure for sit and reach test is as follows

- This test involves sitting on the floor with legs stretched out straight ahead. Shoes and socks should be removed.
- The soles of the feet should be placed flat against the box. Both knees should be locked and pressed flat to the floor. An assistant may hold the knees down.
- With the palms facing downwards, and the hands on the top of each other or side by side, the student should reach forward along the measuring line as far as possible.
- He should hold the full reach position for one-two seconds, while the distance is recorded.
- The score is recorded to the nearest centimeter or an inch based on the distance reached by the finger tips of both hands.

31 What is the usefulness of Back Scratch Test for senior citizens?

Ans The usefulness of the Back Scratch Test for senior citizens is to assess the upper body flexibility, particularly the shoulders.

This is a simple flexibility test to determine if the hands can be brought together behind the back, particularly the shoulders.

This test is a part of the fitness programme as an alternative to the Back Saver Sit and Reach Test. The test shows if the upper arm and shoulder girdle are flexible or not. This kind of flexibility is needed to do various work such as putting an overhead garment, reaching for something overhead etc.

32 Explain the "Eight Foot Up and Go" Test for measuring agility and dynamic balance. CBSE 2018

Or Explain the procedure for Eight Foot Up

The purpose of this test is to measure speed, agility and balance while moving.

Procedure is as follows

- Place the chair next to the wall for safety and the cone marker 8 feet away in front of the chair. Clear the path between the chair and the marker.
- The participant should start fully seated, hands resting on the knees and feet flat on the ground.
- On the command 'Go', the stopwatch is started and the subject stands and walks (no running is allowed) as quickly as possible towards cone, turns around and returns to the chair to sit down.
- The score is the best time of two trials to the nearest 1/10th seconds.

33 Describe the purpose and procedure of Six Minute Walk Test for aerobic endurance.

Ans The purpose of this test is to measure the aerobic fitness and endurance of senior citizens.

Procedure is as follows

- The walking course is laid out in a 50 yard (45.72 m) rectangular area (dimension 45 × 5 yards) with cones placed at regular intervals to indicate distance walked.
- The aim of this test is to walk as quickly as possible for six minutes to cover as much distance as possible.
- Subjects are to set their own pace (a preliminary trial is useful to practise pacing) and are allowed to stop for a rest if they desire.

34 Mention the names of the tests designed by Rikli and Jones for senior citizen fitness and state for what each test is used?

Ans The tests designed by Rikli and Jones for senior citizen fitness are

- (i) Chair Stand Test for lower body strength.
- (ii) Arm Curl Test for upper body strength and endurance.
- (iii) Chair Sit and Reach Test for lower body flexibility.
- (iv) Back Scratch Test for upper body flexibility.

35 Compare the basis on which different type of sports injuries are classified.

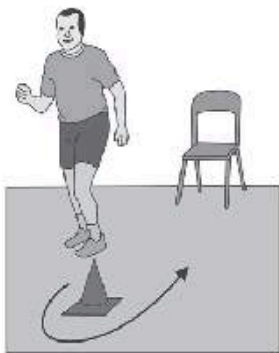
Ans. Sports injuries are classified on the basis of the following :

- (a) **On Basis of Duration** They are classified on the basis of duration for the tissues to be injured into the following :
 - **Acute Injuries** These occur due to sudden trauma to the tissue.
 - **Overuse Injuries** These occur due to repetitive loading of a particular tissue or tissues over a period of time.
- (b) **Tissue Type Affected** These are of three types:
 - **Soft Tissue Injury** This is based on muscles, ligaments, tendons and skin.
 - **Hard Tissue Injury** This is based on bones, joints, particular cartilages, etc.
 - **Special Tissue Injury** This is based on peripheral nerves, eyes, nose, sinuses, teeth, blood vessels, etc.
- (c) **Severity of Injury** These are classified into mild (last for 1-7 days), moderate (last for 8-20 days), and severe injuries (last for 21 days or more).

36 Identify the test and give names



- 37** Mr. Lakshman, aged 65 years worked as a civil engineer in a construction company. He had to walk and climb a lot as part of his job. After retirement, he settled with his son spending time with his grandchildren. Now a days he is experiencing difficulty in doing certain chores which involves physical movement.



- (i) Which of the following tests would you recommend to check Mr. Lakshman's fitness?
- Harvard step test
 - Rikli and Jones test
 - AAHPER test
 - Rock port test
- (ii) How many series of tests are there in the prescribed fitness test for Mr. Lakshman?
- 8
 - 6
 - 5
 - 4
- (iii) Chair sit and reach test is done to check
- agility
 - speed
 - flexibility
 - strength

- Ans** (i) (b) Rikli and Jones test
(ii) (b) 6
(iii) (c) flexibility

- 38** Rajesh went to an old age home on the occasion of his birthday. At that time all the inmates in the home were assembled in one place. When he enquired, they replied that they have a physical fitness test.

(i) Give any one standard physical fitness

- (ii) Chair stand test is used for measuring the
- lower body strength
 - upper body test
 - aerobic fitness
 - anaerobic fitness
- (iii) The weight of dumbbells in Arm Curl test for men is
- 5 pounds
 - 4 pounds
 - 8 pounds
 - 10 pounds
- Ans** (i) (d) Eight foot up and go test
(ii) (a) lower body strength
(iii) (c) 8 pounds

- 39** Sports Minister, Mr. Kiren Rijuju has launched many sports schemes in India. Among these, one of the best schemes is Khelo India. Mr. Kannan, father of Kartik approached the PE teacher and enquired about the fitness levels of the students. PE teacher replied that Khelo India consisted of physical fitness tests for school children and they were analysing students' fitness through these tests.

- (i) To measure lower body flexibility fitness, which one of the following is best?
- Sit and Reach Test
 - Barrow Fitness Test
 - General Fitness Test
 - None of the above
- (ii) Rikli and Jones test is conducted on
- Children
 - Adults
 - Adolescent
 - Senior Citizens
- (iii) Which method should he follow to improve the jump?
- Flexibility
 - Explosive power
 - Push ups
 - Shuttle run

- Ans** (i) (a) Sit and Reach Test (ii) (d) Senior Citizens
(iii) (b) Explosive power

LONG ANSWER TYPE QUESTIONS

- 40** Why tests and measurements are important in sports? Explain in detail.

- Ans** The importance of tests and measurements is discussed below

- (i) Selection of Athlete Athlete is selected on the basis of skill testing and evaluation of measurement

- (iii) **To Study the Development of Athlete**
Development of athlete in respect to their neuro-muscular, social, interpretive, emotional development, etc
- (iv) **Individually Focused Training Programme**
Individually focussed Training programme is based upon individual's weakness and strength.
- (v) **Motivation of an Athlete**
The measurement and evaluation process creates motivation in athletes.
- (vi) **To Predict in Advance the Performance Potentials Through measurement and evaluation procedure,**
the future performance can be predicted.

41 Explain the procedure of measuring height accurately in Body Mass Index (BMI).

Ans The procedure of measuring height accurately in BMI is given below

Procedure of Measuring Height Accurately

- Remove the participant's shoes, bulky clothing, and hair ornaments, and unbraided hair that interferes with the measurement.
- Take the height measurement on flooring that is not carpeted and against a flat surface such as a wall with no molding.
- Have the participant stand with feet flat, together, and back against the wall. Make sure legs are straight, arms are at sides, and shoulders are level.
- Make sure the participant is looking straight ahead and that the line of sight is parallel with the floor.
- Take the measurement while the participant stands with head, shoulders, buttocks, and heels touching the flat surface (wall). Depending on the overall body shape of the participant, all points may not touch the wall.
- Use a flat headpiece to form a right angle with the wall and lower the headpiece until it firmly touches the crown of the head.
- Make sure the measurer's eyes are at the same level as the headpiece.
- Lightly mark where the bottom of the headpiece meets the wall.
- Then, use a metal tape to measure from the

42 Explain purpose, equipments required and procedure of Flamingo Balance Test.

Ans Purpose, equipments required and procedure of Flamingo Balance Test are given below

Purpose- Flamingo Balance Test measures ability to balance successfully on a single leg. This single leg balance test assesses the strength of the leg, pelvic and trunk muscle as well as static balance.

Equipments Required

- Non-Slippery even surface
- Stopwatch
- Can be done on just standing on beam

Procedure

- Stand on the beam. Keep balance by holding the instructor's hand (if required to start).
- While balancing on the preferred leg, the free leg is flexed at the knee and the foot of this leg held close to the buttocks.
- Start the watch as the instructor lets go of the participant/subject.
- Pause the stopwatch each time the subject loses balance (either by falling off the beam or letting go of the foot being held).
- Resume over, again timing until they lose balance. Count the number of falls in 60 seconds of balancing.
- If there are more than 15 falls in the first 30 seconds, the test is terminated.

Administrative Suggestion

Participants should be encouraged to eyes focused on stationary object straight ahead.

43 Explain in brief the procedure of partial curl up and push up (Boys).

Ans The procedures of partial curl up and push up (boys) are given below

Partial Curl up

- The complete test procedure is explained to the student. After that, the student lies in supine pose on cushioned surface.
- The knees should be flexed and feet should be 12 inches from the buttocks. Both the feet should be slightly apart.
- Arms should be extended and rested on thighs. Head should be in neutral position. This is the starting position.

- One complete curl up is completed every 3 seconds and should be continued till exhaustion, i.e. the student is unable to maintain the rhythm.

- The curl ups should be continuous i.e. there should not be any pause in the up or down position.

Push up (Boys)

- The student is required to take position after proper warming-up. In a push up position, hands and toes should touch the mat/floor. Hands should be shoulder width apart.
- The upper body and legs should be in a straight line. Elbow should be fully extended keeping the back and knees straight.
- Now, the student should lower the upper body, so that elbows may bend to 90 degrees or chest may touch the mat/floor, then return back to the starting position with the arms extended. This is counted as one repetition.
- The student is required to complete as many repetitions as possible without breaking rhythm.

44 Explain the 'Arm Curl Test' for upper body strength for senior citizens.

Ans The Arm Curl Test is a test of upper body strength. The purpose of this test is to measure upper body strength and endurance.

The subject has to do as many arm curls as possible in 30 seconds. This test is conducted on the dominant arm side (or stronger side).

Procedure is as follows

- The subject sits on the chair holding the weight (8 pounds for men / 5 pounds for women) in the hand using a suitcase grip (palm facing towards the body) with the arm in a vertically down position beside the chair.
- The upper arm is held close to the body so that only the lower arm is moving.
- The subject curls the arm up through a full range of motion, gradually turning the palm up (flexion with supination).
- Then, the arm is lowered through the full range of motion, gradually return to the starting position. The arm must be fully bent and then fully straightened at the elbow.
- Repeat this action as many times as possible within 30 seconds.
- The score is the total number of controlled

45 Explain the procedure of Chair Sit and Reach Test for senior citizens.

Ans The Chair Sit and Reach Test is a part of the Senior Fitness Test Protocol, and is designed to test the functional fitness of seniors. The purpose is to measure lower body flexibility. The equipments required to perform this test are ruler, a chair with straight back or folding chair (seat 17 inch/ 44 cm high).

Procedure is as follows

- The subject sits on the edge of the chair placed against a wall for safety.
- One foot must remain flat on the floor. The other leg is extended forward with the knee straight, heel touching the floor, with ankle bent at 90°.
- Place one hand on top of the other with tips of the middle fingers even, exhale and reach forward towards the toes by bending at the hip. Keep the back straight and head up.
- Avoid bouncing or quick movements and never stretch to the point of pain. Keep the knee straight and hold the reach for 2 seconds.

The distance to be measured is between the finger tips and the toes. If the finger tips touch the toes, then the score is zero.

If they do not touch, measure the distance between the fingers and the toes (a negative score); if they overlap, measure by how much distance (a positive score). Perform two trials and record the better score.

46 Describe the procedure for administering the Rikli and Jones Senior Citizen Fitness Test.

CBSE 2014

Ans The Rikli and Jones Senior Citizen Fitness Test for assessing the functional fitness of older adults describes easy to understand and effective tests to measure aerobic fitness, strength and flexibility using minimal and inexpensive equipments.

These test items involve common activities such as getting up from a chair, walking, lifting, bending and stretching.

The tests were developed to be safe and enjoyable for older adults while meeting scientific standards for reliability and validity.

For name of test and it's use, refer to answer

SELF ASSESSMENT

OBJECTIVE ANSWER TYPE QUESTIONS

- 1 Partial curl up test fall in which of the following category?
(a) Motor Fitness Test (b) Cardiovascular Fitness
(c) Senior Citizen Fitness Test (d) None of these
- 2 Which of the following is formula to calculate Body Mass Index (BMI)?
(a) $H/(W \times H)$ (b) $W/(H \times W)$ (c) $W/(H \times H)$ (d) $H/(W \times W)$
- 3 Plate Tapping test measures and of limb movement of children.
- 4 The purpose of the Sit and Reach test is to measure flexibility. State true or false.

VERY SHORT ANSWER TYPE QUESTIONS

- 5 Name the test used for strength measurement.
- 6 Mention the activities in Rikli and Jones Test.
- 7 What are the advantages of Chair Sit and Reach Test?
- 8 Name a test to measure the flexibility of the upper body.

SHORT ANSWER TYPE QUESTIONS

- 9 State the procedure and suggestion of flamingo balance test
- 10 State about Basal Metabolic Rate (BMR) and its calculation.
- 11 Explain push ups' procedure in brief.

LONG ANSWER TYPE QUESTIONS

- 12 Explain partial curl ups and modified push ups for girls along with its purpose and procedure.
- 13 Discuss about BMI along with its purpose and procedure.