

6

Test and Measurement in Sports

Fastrack Revision

▶ SAI Khelo India Fitness Test

- ▶ The Fitness Programme for children focuses on developing motor skills, knowledge of physical education and sports skills, which is implemented and evaluated in a progressive and developmentally appropriate manner.
- ▶ The purpose of **SAI Khelo India Test** is to enable the children to demonstrate individually and in groups (with others), the physical skills, practices and values to enjoy an active healthy lifespan.
- ▶ The following Khelo India battery of Fitness Assessment Tests has been finalised by the Expert Committee of Physical Fitness Assessment:

▶ Battery of Tests for Age Group 5-8 Years | Class 1 To 3

- ▶ The following are the abilities of children in class 1-3 which need to be measured and tracked which are important for controlling the body in various situations:
 - Body Composition (BMI)
 - Coordination (Plate Tapping Test)
 - Balance (Flamingo Balance Test)

▶ Body Composition (Body Mass Index or BMI)

- ▶ **Objective:** The test performed is Body Mass Index (BMI), which is calculated from body weight (W) and height (H). $BMI = W / (H \times H)$, where W = body weight in kilograms and H = height in meters. The higher the score usually indicates higher levels of body fat.
- ▶ **Equipment Required:** Flat and clean surface, weighing machine and a stadiometer or measuring tape pasted on a wall.

▶ Procedure

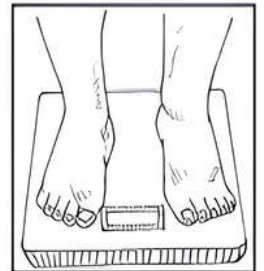
- ▶ **Measuring Height:** This test involves measuring the height of a student on flooring that is not carpeted and against a flat surface such as a wall with no moulding. Make sure that the student stand with feet flat and together, back against the wall, legs straight, arms are at sides, and shoulders are levelled. Also, make sure the participant is looking straight ahead and that the line of sight is parallel with the floor. Remove the student's shoes, bulky clothing, hair ornaments, and unbraided hair that interferes with the measurement. 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.

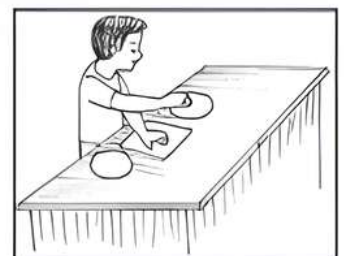
- ▶ **Scoring:** Height will be recorded in (cm) and (mm). Accurately, record the height to the nearest 0.1 centimeter.
- ▶ **Measuring Weight:** This test involves measuring the weight of a student using a digital scale and placing it on firm flooring (such as tile or wood) rather than carpet. First of all, shoes and heavy clothing, such as sweaters should be removed. Make sure that the student stand with both feet in the center of the scale.
- ▶ **Scoring:** Weight will be recorded in kilogram (kg) and grams (gms). Record the weight to the nearest decimal fraction.
- ▶ Now, BMI can be calculated by using the formula

$$BMI = \frac{\text{Weight (in kg)}}{[\text{Height (in m)}]^2}$$



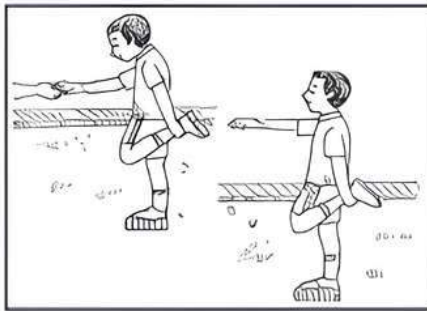
▶ Coordination (Plate Tapping Test)

- ▶ **Objective:** The aim of this test is to measure speed and coordination of limb movement.
- ▶ **Equipment Required:** Table (adjustable height), 2 yellow discs (20cm diameter), rectangle (30 x 20 cm) and stopwatch.
- ▶ **Procedure:** First of all, adjust the table height so that the student is standing comfortably in front of the discs. The two yellow discs are placed with their centers 60cm 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).
- ▶ **Scoring:** The time taken to complete 25 cycles is recorded.



▶ Static Balance (Flamingo Balance Test)

- ▶ **Objective:** The aim of this test is to assess the strength of the leg, pelvic, and trunk muscle as well as static balance.
- ▶ **Equipment Required:** Non slippery even surface, stopwatch and a beam or brick.
- ▶ **Procedure:** The test is performed on a non-slippery even surface by standing on a beam or brick. First of all, the student stands on the beam with his preferred leg. 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 is held close to the buttocks. Try to keep this position for as long as possible. Start the stopwatch as the instructor let go off the student. Pause the stopwatch, each time the student loses balance (either by falling off the beam or letting go off the foot being held). The time starts to run again once the participants have regained 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.
- ▶ **Scoring:** The total number of falls or loss of balance in 60 seconds of balancing is recorded.



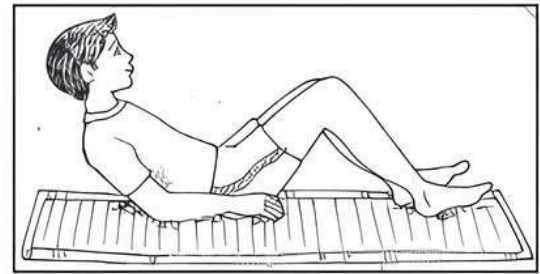
▶ Battery of Tests for Age Group: 9-18+ Years | Class 4 To 12

- ▶ The following components are to be considered in Physical Health and Fitness Profile of children in class 4-12:
 - Body Composition (BMI)
 - Muscular Strength and Endurance
 - Abdominal/Core Strength (Partial Curl-up)
 - Muscular Endurance (Push Ups for Boys, Modified PushUps for Girls)
 - Flexibility (Sit and Reach Test)
 - Cardiovascular Endurance (600 M Run/Walk)
 - Speed (50 m Dash)

▶ Partial Curl-up

- ▶ **Objective:** The partial curl-up test measures abdominal muscular strength and endurance of the abdominals and hip-flexors, which is important in back support and core stability.
- ▶ **Equipment Required:** A flat, clean and cushioned surface with two parallel strips (6 inches apart) and a stopwatch.
- ▶ **Procedure:** First of all, the student lies on a cushioned, flat, clean surface with knees flexed, usually at 90° angle, with hands straight on the sides (palms facing downwards) closer to the ground, parallel to the body. The student raises the trunk in a smooth motion, keeping the arms in position, curling up the desired amount (at least six inches above the ground towards the parallel strip). The trunk is lowered back

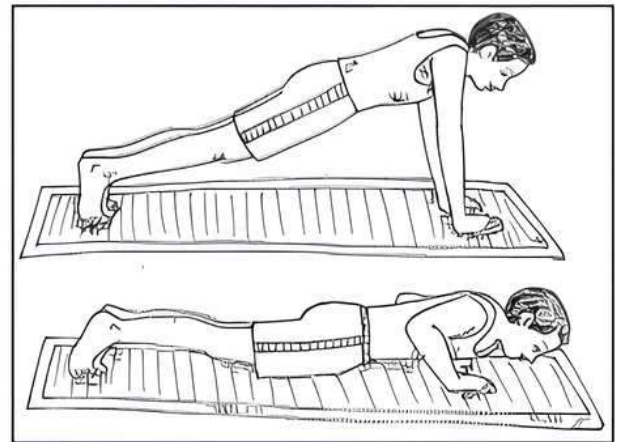
to the floor, so that the shoulder blades or upper back touch the floor.



- ▶ **Scoring:** Record the maximum number of partial curl ups in a certain time period such as 30 sec or 1 min.

▶ Push Ups for Boys

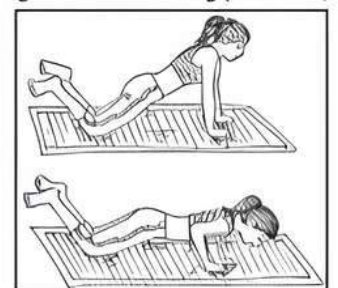
- ▶ **Objective:** The aim of this test is to assess the endurance of student's upper body strength and endurance.
- ▶ **Equipment Required:** Flat clean cushioned surface/ Gym mat.
- ▶ **Procedure:** Begin in a push-up position with the hands and toes touching the floor, the body and legs in a straight line, feet slightly apart, the arms at shoulder width apart, extended and at right angle to the body. While keeping the back and knees straight, the student lowers the body to a predetermined point, to touch some other object, or until there is a 90° angle at the elbows, then returns back to the starting position with the arms extended. This action is repeated, and the test continues until exhaustion, or until they can do no more in rhythm or have reached the target number of push-ups.



- ▶ **Scoring:** Record the number of correctly completed push-ups.

▶ Modified Push Ups for Girls

- ▶ **Objective:** To measure the upper body strength and trunk stability.
- ▶ **Equipment Required:** Flat clean cushioned surface/ Gym mat.
- ▶ **Procedure:** The push-up begins in a kneeling position, with the hands and knees touching the ground. The knees are kept slightly apart, the arms are at shoulder width apart, extended and at right angle to the body. Keeping the back



straight and holding the core tight, the student lowers the body until there is a 90° angle at the elbows, then returns to the starting position with the arms extended. The action is repeated until exhaustion or until the time limit is reached.

- **Scoring:** Record the number of correctly completed push-ups.

▶ Sit and Reach Test

- **Objective:** The sit and reach test is designed to measure the flexibility of the lower back and hamstring muscles.
- **Equipment Required:** Flat clean cushioned surface/ Gym mats, Sit and Reach box with the following dimensions: 12" x 12" (sides) 12" x 10" (front and back) 12" x 21" (top).



- **Procedure:** First of all, shoes should be removed. Then sit down on the floor with legs stretched out straight ahead. The soles of the feet should be kept flat against the Sit and Reach box. Both the knees should be locked and pressed flat to the floor. An assistant may hold the knees down. Palms should be facing downwards. Hands should be on the top of each other or side by side. The student whose flexibility is to be measured, tries to extend his both hands forward along the measuring line on the box as far as he can extend. Ensure that the hands remain at the same level, not one reaching further forward than the other. He should not jerk or bounce to reach at maximum distance. He should hold the full reach position for one-two seconds while the distance is recorded.
- **Scoring:** The score is recorded (difference between initial position and final position) to the nearest cm as the distance reached by the hand.

▶ 600 m Run/Walk

- **Objective:** The aim of this test is to measure cardiovascular endurance.
- **Equipment Required:** Stopwatch, whistle, marker cone, lime powder, measuring tape and 200 m or 400 m with 1.22 mt (minimum 1 mt) width preferably on a flat and even playground with a marking of starting and finishing line.
- **Procedure:** The aim of this test is to complete the 600 meter course in fastest possible time. To start, all participants line up behind the starting line. On the command 'go,' the clock will start, and they will begin running at their own pace. Cheering or calling out the elapsed time is also permitted to encourage the participants to achieve their best time.

- **Scoring:** The total time taken to run 600 m is recorded in min, sec.

▶ 50 m Dash

- **Objective:** The aim of this test is to determine the acceleration and speed.
- **Equipment Required:** Measuring tape or marked track, stopwatch, cone markers, flat and clear surface of at least 60 m.
- **Procedure:** The test involves running a single maximum sprint over 50 meters, with the time recorded. A thorough warm-up should be given, including some practice starts and accelerations. Start from a stationary standing position (hands cannot touch the ground), with one foot in front of the other. The front foot must be behind the starting line. Once the student is ready and motionless, the starter gives the instructions "set" then "go." The tester should provide hints for maximising speed (such as keeping low driving hard with the arms and legs) and the participant should be encouraged do not slow down before crossing the finish line.
- **Scoring:** Time taken to cover 50 m distance is expressed in seconds.

- ▶ **Meaning of Cardiovascular Fitness:** Cardiovascular fitness can be defined as the capacity of the cardiovascular system (heart, lungs and vessels) to supply oxygenated blood to the working muscles and the muscles to use the oxygen delivered by the blood supply as a source of energy for movement. In other words, the definition of cardiovascular fitness is how well and efficiently the blood circulates through the body.

- Elements involved in cardiovascular endurance include heart, lungs, and major blood vessels in the capillary system, and the oxygen nutrient carrying capacity of oxygen.

- ▶ **Harvard Step Test:** Harvard Step Test is a cardiovascular fitness test. It is also called aerobic fitness test. It was developed by Brouha and others in 1943. It is used to measure the cardiovascular fitness or aerobic fitness by checking the recovery rate.

- **Equipments Required:** A gym bench or box of 20 inches high for men and 16 inches for women, a stopwatch and cadence tape.

▶ Procedure

- The athlete stands in front of the bench or box.
- On the command 'Go', the athlete steps up and down on the bench or box at a rate of 30 steps per minute (one second up one second down) for 5 minutes (150 steps).
- Stopwatch is also started simultaneously at the start of the stepping.
- Then, the athlete sits down immediately after completion of the test i.e. after 5 minutes.
- The total number of heart beats are counted between 1 to 1.5 minutes after completion of the last step.



- The heart beats are counted for 30 seconds period. Again the heart beats are noted for 30 seconds after the finishing of the test.
- After that third time the heart beats are noted after 3 minutes of completion of the test for 30 seconds period.
- The same foot must start the step up each time, and an erect posture must be assumed on the bench.

➤ **Calculation of the Score:** The athlete's fitness index score is calculated with the help of following formula:

- Fitness Index score (long-term)

$$= \frac{(100 \times \text{test duration in seconds})}{(2 \times \text{sum of heart beats in recovery periods})}$$

- Fitness Index score (short-term)

$$= \frac{(100 \times \text{test duration in seconds})}{(5.5 \times \text{pulse count between 1 to 1.5 minutes after exercise})}$$

▶ Computing Basal Metabolic Rate (BMR)

➤ Basal metabolic rate is the amount of energy per unit of time that a person needs to keep the body functioning at rest. Some of those processes are breathing, blood circulation, controlling body temperature, cell growth, brain and nerve function, and contraction of muscles. Basal metabolic rate affects the rate that a person burns calories and ultimately whether that individual maintains, gains, or loses weight. The basal metabolic rate accounts for about 60% to 75% of the daily calorie expenditure by individuals.

➤ The Harris-Benedict Equation is often used to estimate BMR. It is as follows:

$$\text{For MEN: BMR} = 88.362 + (13.397 \times \text{weight in kg}) + (4.799 \times \text{height in cm}) - (5.677 \times \text{age in years})$$

$$\text{For WOMEN: BMR} = 447.593 + (9.247 \times \text{weight in kg}) + (3.098 \times \text{height in cm}) - (4.330 \times \text{age in years})$$

▶ Rikli and Jones-Senior Citizen Fitness Test

Dr. Roberta Rikli and Dr. Jessie Jones developed various simple and easy-to-use fitness tests for senior citizens in 2001. They are easy to understand and effective to measure aerobic fitness, strength and flexibility using minimal and inexpensive equipments.

Rikli and Jones fitness test includes the following items:

- Chair Stand Test for lower body strength.
- Arm Curl Test for upper body strength.
- Chair Sit and Reach Test for lower body flexibility.
- Back Scratch Test for upper body flexibility.
- Eight Foot up and Go Test for agility.
- Six Minute Walk Test for Aerobic Endurance.

▶ **Chair Stand Test:** The chair stand test is similar to a squat test to measure leg strength.

- **Aim:** This test assesses leg strength and endurance of senior citizens.
- **Equipment Required:** A straight back or folding chair without arm rests (seat of at least 44 cm high), stopwatch.

▶ Procedure

- Place the chair against a wall, or otherwise stabilise it for safety.
- Sit in the middle of the seat, with feet shoulder width apart, flat on the floor. The arms are to be crossed at the wrists and held close to the chest.
- From the sitting position, stand up completely then completely sit down, and repeat this for 30 seconds.
- Count the total number of complete chair stands (up and down equals one stand).
- On completing a full stand from the sitting position when the time is elapsed, the final stand is counted in the total.

➤ **Scoring:** The score is the number of completed chair stands in 30 seconds.

▶ Arm Curl Test

➤ **Aim:** This test measures upper body strength and endurance.

➤ **Equipment Required:** A 5 pound weight for women 8 pound weight for men, a chair without armrests, 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).

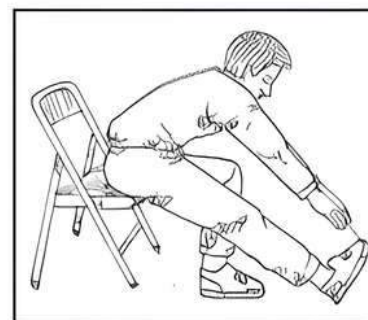


Arm Curl Test

- Sit 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.
- Brace the upper arm against the body so that only the lower arm is moving (tester may assist to hold the upper arm steady).
- Curl the arm up through a full range of motion, gradually turning the palm up.
- Then the arm is lowered through the full range of motion, gradually returning 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.

➤ **Scoring:** The score is the total number of controlled arm curls performed in 30 seconds.

▶ Chair Sit and Reach Test



Chair Sit and Reach Test

- **Aim:** This test measures lower body flexibility.
- **Equipment Required:** Ruler, straight back or folding chair (about 44 cm high).
- **Procedure**
 - Sit on the edge of a 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 on the floor, and ankle bent at 90°.
 - Place one hand on top of the other with tips of the middle fingers at same level. Inhale, and then as while exhaling, 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 is measured between the tip of the fingertips and the toes. If the fingertips 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 (a positive score).
 - Perform two trials.

➤ **Scoring:** The score is recorded to the nearest 1/2 inch or 1 cm as the distance reached, either a negative or positive score.

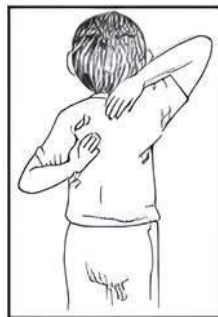
➤ **Back Scratch Test:** The Back Scratch Test, or simply the Scratch Test, measures how close the hands can be brought together behind the back.

➤ **Objective:** The back scratch test provides an indication of the participants upper body and shoulder flexibility.

➤ **Equipment Required:** A ruler or measuring tape.

➤ **Procedure**

- This test is done in the standing position. Place one hand over the same shoulder with the palm touching the back and reach down the back.
- Place the other hand up, the back from the waist with the palm facing outwards. Reach up the back.
- Point the middle fingers of each of hand towards each other. Try and touch the fingers of each hand in the middle of the back.
- Do not bounce the arms towards each other.
- Do not grasp the fingers and pull the hands together.
- Try two warm ups with the arms in opposite positions to determine the preferred side for reaching over the shoulder.

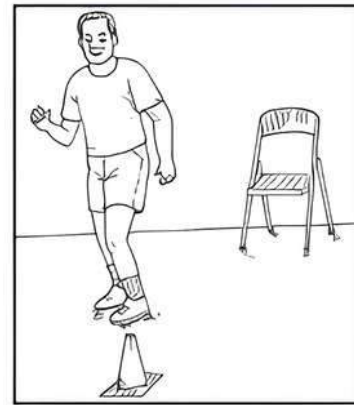


Back Scratch Test

➤ **Measurement:** Use the measuring tape or ruler to measure the distance between the middle fingers. If the fingers do not overlap the score has a negative value. If the fingers overlap the score has a positive value.

➤ **Scoring:** Record the best score out of the trials to the nearest centimetres or 1/2 inch.

➤ **Eight Foot Up and Go Test:** The 'Eight Foot Up and Go' is a coordination and agility test for the elderly.



Eight Foot Up and Go Test

➤ **Aim:** This test helps to evaluate speed, agility and balance of a person while moving.

➤ **Equipment Required:** A chair with a straight back which should be kept along the wall to stop the chair sliding backwards, a conical marker placed so the rear of the marker is 2.44 metres (8 feet) from the front of the chair, a stopwatch.

➤ **Procedure**

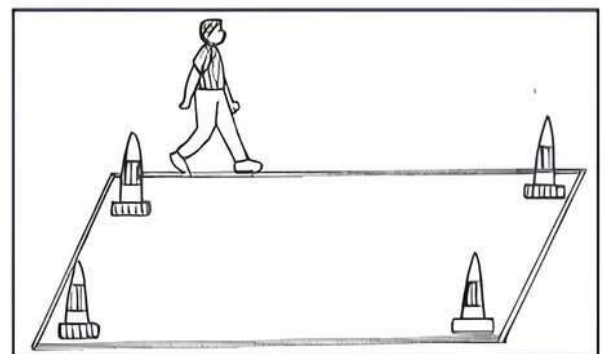
- Sit in the middle of the chair with hands on thighs. One foot can be placed slightly in front of the other but both must be flat on the floor.
- Lean slightly forward. On the instruction to begin, stand up as quickly as possible.
- Walk around the marker, return to the chair and sit down.

➤ **Measurement:** On the instruction to begin, start the stopwatch. Stop the timing when the participant returns to the chair and sits down. Two trials are given per participant.

➤ **Scoring:** The best trial is recorded to the nearest 1/10th second.

➤ **Six Minute Walk Test**

➤ **Aim:** This test measures aerobic endurance of the senior citizens.



Six Minute Walk Test

➤ **Equipment Required:** Measuring tape to mark out the track distances, stopwatch, chairs positioned for resting.

➤ **Procedure**

- The walking course is laid out in a 50 yard rectangular area (dimensions 45 x 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 ground as possible.



- The individuals set their own pace, and are able to stop for a rest if they desire.

➤ **Scoring:** The total distance covered in six minutes is recorded to the nearest metre.

▶ **Johnson-Metheny Test of Motor Education**

➤ **Aim:** Johnson-Metheny Test battery is revised version of Johnson Educability Test which was designed in 1932. The purpose of the Johnson battery was to measure neuromuscular skill capacity which have ten items. In 1938, Metheny studied the test and eliminated six items. The test battery consists of four motor stunts are given below:

1. Front Roll
2. Back Roll
3. Jumping Half-Turns
4. Jumping Full-Turns

Four stunts are to be performed by the boys and three stunts for girls.

➤ **Test Area:** Mat area length is 15 feet and it is 2 feet wide. The 15 feet length divided into ten sections for 18" each. The width of transverse line is ¾" and 3" alternatively. Centre of lines remains 18" apart. Another ¾" wide line is marked lengthwise in the middle of the mat area.

▶ **Front Roll**

➤ **Procedure:** Ignoring the long middle dividing line, the subject is asked to start outside the marked area and perform two front rolls, one up to 7.5' i.e. 3" wide centre line and the second in the other half of 7.5'. The subject is to perform the rolls without touching the limits or over reaching the zones mentioned above.

➤ **Scoring:** Each correct roll gets 5 points, hence maximum of 10 points. Two points are deducted for over reaching side line, right or left for each roll; one

point is deducted for over reaching the end limit on each roll and full five points are deducted when the subject fails to perform a true front roll.

▶ **Back Roll**

➤ **Procedure:** The test is similar to front roll both in performing and scoring. The subject is to start outside the marked chart area and is to perform two back rolls in the 2 feet lane area, one up to first half and the second back roll in the second half.

▶ **Jumping Half Turns**

➤ **Procedure:** The subject is asked to start with feet on first 3" line, jump with both feet to second 3" wide line, executing a half turn either right or left; jump to third 3" line executing half turn in opposite direction to first half-turn and then to 4th and 5th 3" wide lines executing half turns, right or left alternatively.

➤ **Scoring:** Perfect execution of four jumps is worth ten points. Only 2 points are deducted for each wrong jump when the subject either does not land with both feet on the 3" line or turns the wrong way or both.

▶ **Jumping Full Turns**

➤ **Procedure:** The subject is asked to start with the feet outside the marked area at about the centre of the lane. He/She is required to jump with feet together to second rectangular space, executing a full turn with the body either right or left; continue jumping to alternate rectangular spaces across the marked mat executing full turns, rotating body in the same direction, landing on both feet every time.

➤ **Scoring:** Perfect execution of five jumps is worth ten points. Two points are deducted, if the subject fails to keep balance on landing on both feet; turns too far or oversteps the squares.

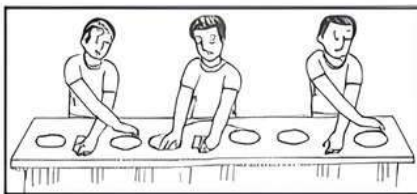


Practice Exercise



Multiple Choice Questions

Q 1. Name the test shown in the picture:



- Flamingo Balance Test
- Sit and Reach
- Plate Tapping Test
- 600 mt Run/Walk

Q 2. Calculate the BMI of a girl and identify the category if her weight is 68 kg and height is 161 cm:

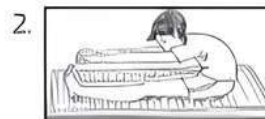
(CBSE SQP 2021 Term-1)

- Underweight
- Normal weight
- Overweight
- Obesity class

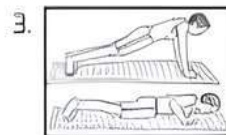
Q 3. Match the following:



(i) Lower body flexibility



(ii) Upper body strength



(iii) Abdominal strength and endurance



(iv) Speed

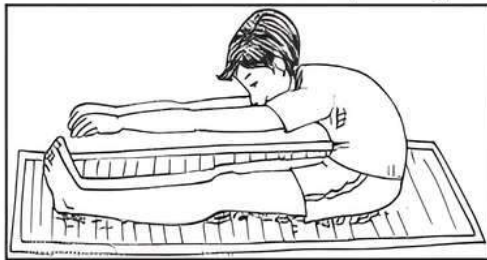
(CBSE 2021 Term-1)

- | | 1 | 2 | 3 | 4 |
|----|-------|------|------|------|
| a. | (iii) | (ii) | (i) | (iv) |
| b. | (iii) | (i) | (iv) | (ii) |
| c. | (iii) | (i) | (ii) | (iv) |
| d. | (iii) | (iv) | (i) | (ii) |



Q 4. Name the component which is measured by this test.

(CBSE SQP 2021 Term-1)



- a. Endurance
- b. Speed
- c. Flexibility
- d. Coordinative ability

Q 5. What is the height of the box used by boys in Harvard step test?

(CBSE SQP 2020-21)

- a. 16 inch
- b. 18 inch
- c. 20 inch
- d. 22 inch

Q 6. Which test is used to test the functional ability amongst senior citizens?

(CBSE SQP 2021 Term-1)

- a. Rockport one mile test
- b. Harvard step test
- c. Rikli and Jones test
- d. SAI Khelo India Fitness test

Q 7. Match the following:

(CBSE 2023)

L1st-I	L1st-II
A. Plate Tapping Test	(i) Upper body strength endurance of boys
B. Push-up	(ii) Speed and coordination of limb movement
C. Partial Curl up	(iii) Upper body strength endurance of girls
D. Modified push up	(iv) Abdominal strength

Choose the correct option from the following:

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

Q 8. Match the following:

(CBSE SQP 2022-23)

List-I	List-II
A. Chair stand test	(i) Lower body strength
B. Arm curl test	(ii) Aerobic endurance
C. Back scratch test	(iii) Upper body strength
D. Six minute walk test	(iv) Upper body flexibility

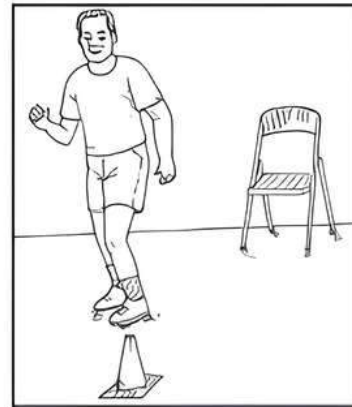
- | | | | |
|---------|-------|------|------|
| A | B | C | D |
| a. (i) | (iii) | (iv) | (ii) |
| b. (ii) | (iii) | (i) | (iv) |
| c. (i) | (iii) | (ii) | (iv) |
| d. (ii) | (iii) | (iv) | (i) |

Q 9. What is the test duration for the Arm curl test?

(CBSE SQP 2021 Term-1)

- a. 1 min
- b. 2 min
- c. 30 sec
- d. Number of repetitions

Q 10. What will be the distance between the chair and marker cone, to measure agility and co-ordination of senior citizens shown in the figure: (CBSE 2021 Term-1)

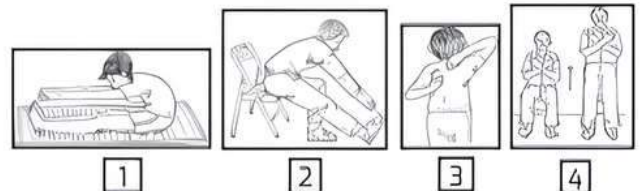


- a. 8 feet
- b. 12 feet
- c. 16 feet
- d. 18 feet

Q 11. In a residential area, a camp was organised to check the functional fitness level of the senior citizens. During testing, it was found that there was a less range of motion in the joints of upper extremities in most of the elderly people.

Which test is administrated to check this functional fitness component?

(CBSE 2021 Term-1)



- a. 1
- b. 2
- c. 3
- d. 4

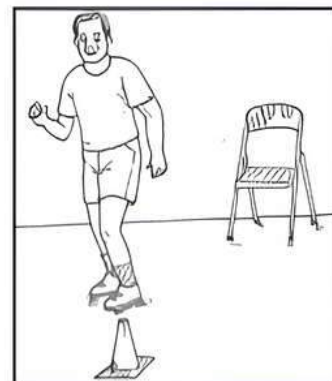
Q 12. Senior Citizen Fitness Test the range of age group is

..... (CBSE SQP 2023-24)

- a. 60-94
- b. 55-79
- c. 65-95
- d. 50-90

Q 13. 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 and spent time with his grand children. Now a days, he is experiencing difficulty in doing certain chores which involve physical movement.

(CBSE SQP 2021 Term-1)



The test shown in the picture is performed to assess which component?

- a. Agility
- b. Endurance
- c. Speed
- d. Strength

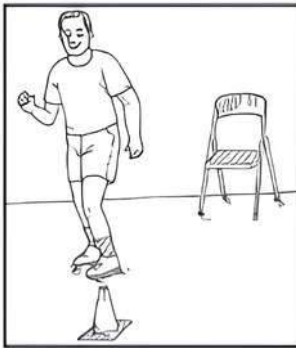
Answers

1. (d) 2. (a) 3. (a)

Case Study 2

Read the following passage and answer the following questions.

Mr. Balachandran, 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.



- Q 1. Which of the following tests would you recommend to check Mr. Balachandran's fitness?**
 a. Harvard step test b. Rikli and Jones test
 c. AAHPER test d. Rockport test
- Q 2. How many series of tests are there in the prescribed fitness test for Mr. Balachandran?**
 a. 6 b. 8
 c. 3 d. 4
- Q 3. The 8 foot up and Go test, as shown in the picture is performed to assess:**
 a. strength b. endurance
 c. flexibility d. agility

Answers

1. (b) 2. (a) 3. (d)

Very Short Answer Type Questions

- Q 1. Name any two SAI Khelo India Fitness test for age group 5-8 years.**
Ans. Flamingo test and plate tapping test.
- Q 2. What do you mean by BMI?**
Ans. BMI is a value derived from the mass (weight) and height of a person. It is used to categorise a person as underweight, normal weight, overweight or obese.
- Q 3. What is the purpose of the Flamingo Balance Test?**
Ans. The purpose of Flamingo Balance Test is to assess the strength of the leg, pelvic and trunk muscles as well as static balance.
- Q 4. How is the scoring done for the SIT and Reach Test?**
Ans. The score is recorded (distance between the initial position and final position) to the nearest centimetre, as the distance reached by the hand.

- Q 5. What test would you suggest to measure upper body strength for aged population?** (CBSE 2016)
Ans. The Arm Curl Test is used to measure upper body strength for aged population.

- Q 6. What motor quality does a senior citizen lack, who finds difficulty in tying the shoe laces while sitting on a chair?** (CBSE 2017)
Ans. The given senior citizen lacks lower body flexibility.



TIP

The task of tying the shoe laces while sitting on a chair is similar to the procedure followed in chair sit and reach test.

- Q 7. Your grandmother feels that she has reduced her upper body flexibility and therefore she wants to test herself. Which test would you suggest to her?** (CBSE 2015, 17)
Ans. I would suggest her Back Scratch Test to improve her upper body flexibility under the Rikli and Jones-senior citizen fitness test.

COMMON ERROR

Many students confuse between various physical fitness tests prepared by Rikli and Jones for senior citizens.

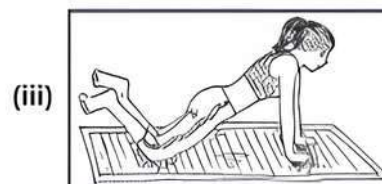
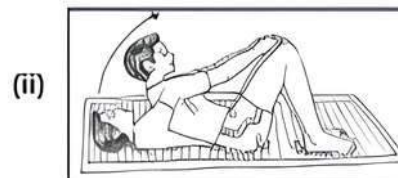
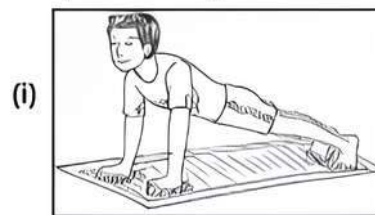
- Q 8. Explain the procedure for eight Foot up and Go test?** (CBSE 2016)

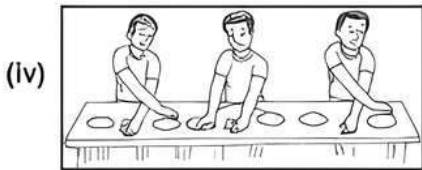
- Ans.** The procedure for eight Foot up and Go test is as follows:
 Keep a chair next to the wall and place the cone marker 8 feet away in front of the chair. The participant starts by fully seated, hand resting on knees and feet flat on the ground. On the command 'Go', stopwatch is started and the participant stands and walks as quickly as possible around the cone marker, return to the chair and sit down. Two trials are given per participant.



Short Answer Type-I Questions

- Q 1. Identify the below given tests and write the names:**





(iv)

.....

- Ans. (i) Push ups (ii) Partial curl up
 (iii) Modified push ups (iv) Plate Tapping test

Q 2. Explain the procedure for carrying out the Plate Tapping Test in point form.

Ans. The procedure for carrying out the Plate Tapping test is as follows:

- (i) First of all adjust the table height so that the student is standing comfortably in front of the discs.
- (ii) The two yellow discs are placed with their centers 60cm apart on the table.
- (iii) The rectangle is placed equidistant between both discs.
- (iv) The non-preferred hand is placed on the rectangle and the subject moves the preferred hand back and forth between the discs over the hand in the middle as quickly as possible.
- (v) This action is repeated for 25 full cycles (50 taps).

Q 3. Give the names of the test included in SAI Khelo India Fitness Test in school.

Ans. SAI Khelo India Fitness Test in school is made for two age groups:

- (i) Battery of Tests for Age Group 5-8 Years (Class 1 to 3) : It consists of
 - (a) BMI test for Body Composition
 - (b) Plate Tapping Test
 - (c) Flamingo Balance Test
- (ii) Battery of Tests for Age Group: 9-18+ Years (Class 4 to 12): It consists of
 - (a) BMI test for Body Composition
 - (b) 50 m Dash
 - (c) 600 M Run/Walk
 - (d) Flexibility (Sit and Reach Test)
 - (e) Abdominal/Core Strength (Partial Curl-up)
 - (f) Muscular Strength (Push ups for Boys, Modified Push ups for Girls)

Q 4. Explain the procedure and scoring of 600 M Run/Walk. (CBSE SQP 2023-24)

Ans. **Procedure:** The aim of this test is to complete the 600 meter course in fastest possible time. To start, all participants line up behind the starting line. On the command 'go,' the clock will start, and they will begin running at their own pace. Cheering or calling out the elapsed time is also permitted to encourage the participants to achieve their best time.

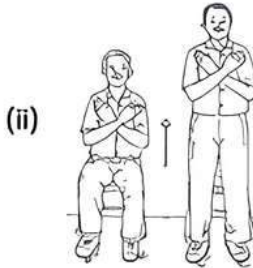
Scoring: The total time taken to run 600 meters is recorded in min, sec.

Q 5. Identify the below given tests and write the names:



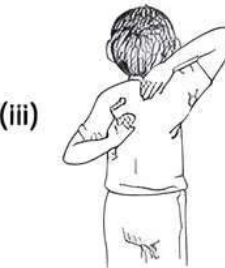
(i)

.....



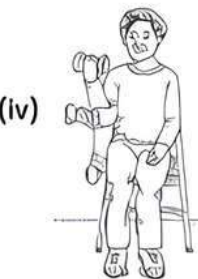
(ii)

.....



(iii)

.....



(iv)

.....

- Ans. (i) Chair sit and Reach test
 (ii) Chair stand test
 (iii) Back scratch test
 (iv) Arm curl test



Short Answer Type-II Questions ↘

Q 1. Write down the objectives and administration of the flamingo test. (CBSE SQP 2022-23)

Ans. **Flamingo Balance Test Objective:** The aim of this test is to assess the strength of the leg, pelvic and trunk muscle as well as static balance.

Administration: (i) First of all, the student stands on the beam with his preferred leg.

- (ii) While balancing on the preferred leg, the free leg is flexed at the knee and the foot of this leg is held close to the buttocks.
- (iii) Try to keep this position for as long as possible.
- (iv) Try to keep this position for as long as possible.
- (v) Start the stopwatch as the instructor let go off the student. Pause the stopwatch, each time the student loses balance (either by falling off the beam or letting go off the foot being held).
- (vi) 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.

Q 2. Explain the administration with scoring of 50M speed test.

Ans. Aim: To measure speed

Equipment Required: A stopwatch, running track or marked area of 50 m on a plane surface (flat and clear surface of at least 70 meters), a starter.

Procedure:

- (i) Start from a stationary standing position (hands cannot touch the ground), with one foot in front of the other.
- (ii) The front foot must be behind the starting line. Once the participant is ready and motionless, the starter gives the instructions "set" then "go".
- (iii) The starter should provide hints for maximising speed (such as keeping low, driving hard with the arms and legs).
- (iv) Stop once the required distance has been transversed.

Scoring: The time taken to cover 50 m distance is expressed in seconds.

Q 3. Describe the method of sit and reach test.

(CBSE SQP 2020-21)

Ans. Procedure:

- (i) Sit on the floor with legs stretched out straight ahead.
- (ii) Feet (shoes off) are placed with the soles flat against the box, shoulder-width apart.
- (iii) Both knees are held flat against the floor by the tester, if required.
- (iv) With hands on top of each other and palms facing down, the participant reaches forward along the measuring line as far as possible.
- (v) After three practice reaches, the fourth reach is held for at least two seconds, while the distance is recorded.
- (vi) Make sure that there are no jerky movements and that the fingertips should remain at the same level.

Q 4. What do you know about Harvard Step Test? Explain its procedure and administration. (CBSE 2017, 19, 20)

Ans. **Harvard Step Test:** Harvard step test is a cardiovascular fitness test. It is also called aerobic fitness test. It was developed by Brouha and others in 1943. It is used to measure the cardiovascular fitness or aerobic fitness by checking the recovery rate.

Procedure:

- (i) The athlete stands in front of the bench or box 20 inches high for men and 16 inches high for women.
- (ii) On the command 'Go', the athlete steps up and down on the bench or box at a rate of 30 steps per minute (one second up one second down) for 5 minutes (150 steps).
- (iii) Stopwatch is also started simultaneously at the start of the stepping.

(iv) Then, the athlete sits down immediately after completion of the test i.e. after 5 minutes.

(v) The total number of heart beats are counted between 1 to 1.5 minutes, 2 to 2.5 minutes and 3 to 3.5 minutes, after completion of the last step.

Calculation of the Score: The athlete's fitness index score is calculated with the help of following formula:

$$\text{Fitness Index Score (long-term)} = \frac{(100 \times \text{test duration in seconds})}{(2 \times \text{sum of heart beats in recovery periods})}$$



TIP

Students must thoroughly prepare the procedure of Harvard step test and also the formula of fitness index score.

Q 5. List down the test items of Rikli and Jones fitness test and explain the procedure of any one.

(CBSE 2020)

Ans. Dr. Roberta Rikli and Dr. Jessie Jones developed various simple and easy-to-use fitness tests for senior citizens in 2001. The Rikli and Jones fitness test includes the following tests:

- (i) Chair stand test
- (ii) Arm curl test
- (iii) Chair sit and Reach test
- (iv) Back scratch test
- (v) Eight foot up and Go test
- (vi) Six minute walk test

Chair Stand Test: This test is part of the Senior Fitness Test Protocol, and is designed to measure the lower body strength, particularly the strength of legs of the elderly.



Chair Stand Test

Equipment Required: A straight back or folding chair without arm rests (seat of at least 44 cm high), stopwatch.

Procedure:

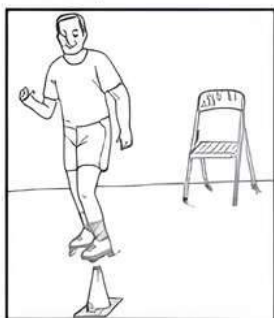
- (i) Place the chair against a wall, or otherwise stabilise it for safety.
- (ii) Sit in the middle of the seat, with feet shoulder width apart, flat on the floor. The arms are to be crossed at the wrists and held close to the chest.
- (iii) From the sitting position, stand up completely, then completely sit down, and repeat this for 30 seconds.

- (iv) Count the total number of complete chair stands (up and down equals one stand).

Q 6. Explain the "Eight foot up and Go test" for measuring agility and dynamic balance. (CBSE 2018)

Ans. **Eight foot up and Go test:** The 'Eight foot up and Go' is a coordination and agility test for the elderly, which is part of the Senior Fitness Test Protocol.

Equipment Required: A chair with a straight back which should be kept along the wall to stop the chair sliding backwards, a conical marker placed so the rear of the marker is 2.44 metres (8 feet) from the front of the chair, a stopwatch.



Eight Foot Up and Go Test

Procedure:

- (i) Sit in the middle of the chair with hands on thighs. One foot can be placed slightly in front of the other but both must be flat on the floor.
- (ii) Lean slightly forward. On the instruction to begin, stand up as quickly as possible.
- (iii) Walk around the marker, return to the chair and sit down. Time is noted as he sit down on the chair.
- (iv) Two trials are given per participants.



TIP

Rikli and Jones: Senior citizen fitness tests are very important from the examination point of view.

Q 7. Explain the procedure of six minute walk test.

(CBSE SQP 2020)

Ans. This test measures the aerobic endurance of the senior citizens. The participant is asked to walk for six minutes around the 50 yard rectangular area, with cones placed at regular intervals to indicate distance covered. The aim of this test is to walk as quickly as possible for six minutes to cover as much ground as possible. Measure the total distance covered in six minutes to the nearest metre.



Long Answer Type Questions ↘

Q 1. Name the test used to measure body composition and explain its procedure.

Ans. The Body Mass Index test is used to measure body composition.

The equipments required for this test are: Flat and clean surface, weighing machine and a stadiometer or measuring tape pasted on a wall.

Procedure

(i) **Measuring Height:** This test involves measuring the height of a student on flooring that is not carpeted and against a flat surface such as a wall with no molding. Make sure that the student stand with feet flat and together, back against the wall, legs straight, arms are at sides, and shoulders are levelled. Also, make sure the participant is looking straight ahead and that the line of sight is parallel with the floor. Remove the student's shoes, bulky clothing, hair ornaments, and unbraided hair that interferes with the measurement. 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.

(ii) **Measuring Weight:** This test involves measuring the weight of a student using a digital scale and placing it on firm flooring (such as tile or wood) rather than carpet. First of all, shoes and heavy clothing, such as sweaters should be removed. Make sure that, the student stand with both feet in the center of the scale.

Now, BMI can be calculated by using the formula:

$$\text{BMI} = \text{Weight (kg)} / (\text{height (m)})^2$$

Q 2. Rakshit is working on a project to collect data for assessing physical fitness amongst boys and girls in his residential complex. He plans to administer test for assessing their arm, shoulder and abdominal strength as well as endurance. List the two tests, he should conduct and also explain in detail the procedure of its administration along with scoring system.

Ans. The tests that Rakshit should conduct are:

(i) **Push-ups for Boys:** Its procedure are as follows:

- (a) Keep the hands and toes touching the floor, the body and legs in a straight line, feet slightly apart, and arms at shoulder width apart extended at right angle to the body.
- (b) Keeping the back and knees straight, lower the body until there is a 90° angle at the elbows, then return back to the starting position with the arms extended.
- (c) This action should be repeated, as test continues until exhaustion, or until they can do no more in rhythm or have reached the target number of push-ups.

Scoring: Record the number of correctly completed push-ups.

(ii) **Modified Push-ups for Girls:** Its procedure are as follows:

- (a) The push-up begins in a kneeling position, with the hands and knees touching the ground.

- (b) The knees are slightly apart, the arms are shoulder width apart and extended at right angle to the body.
- (c) The girl lowers the body until there is a 90° angle at the elbows and then returns to the starting position with the arms extended.
- (d) This action is repeated until exhaustion or until the time limit is reached.

Scoring: Record the total number of correctly completed push-ups.

Q 3. Rashmi is working on a project to collect data for assessing physical fitness amongst senior citizens at her residential complex. She plans to administer test for assessing upper body strength and upper body flexibility. List the tests she should conduct and also explain in detail the procedure of its administration along with scoring system.

Ans. Rashmi should conduct arm curl test for upper body strength and back scratch test for upper body flexibility. These tests are given below:

(i) Arm Curl Test: Its procedure are as follows:

- (a) 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 besides the chair.
- (b) The upper arm is held close to the body so that only the lower arm is moving.
- (c) The subject curls the arm up through a full range of motion, gradually turning the palm up (flexion with supination).
- (d) Then the arm is lowered through the full range of motion, gradually returning to the starting position. The arm must be fully bent and then fully straightened at the elbow.
- (e) Repeat this action as many times as possible within 30 sec.

Scoring: The score is the total number of controlled arm curls performed in 30 sec.

(ii) Back Scratch Test: Its procedure are as follows:

- (a) This test is done in the standing position. Place one hand over the same shoulder with the palm touching the back and reach down the back.
- (b) Place the other hand up the back from the waist with the palm facing outwards. Reach up the back.
- (c) Point the middle fingers of each of hand towards each other. Try and touch the fingers of each hand in the middle of the back.
- (d) Do not bounce the arms towards each other.

- (e) Do grasp the fingers and pull the hands together.
- (f) Try two warm ups with the arms in opposite positions to determine the preferred side for reaching over the shoulder.

Scoring: Record the best score out of the trials to the nearest centimetres or 1/2 Inch.

Q 4. Make a table of test items listed under fitness test by SAI (Age group 9-18 years) along with the objectives of conducting them. Explain the administration of any one of them. (CBSE SQP 2022-23)

Ans. Test items listed under Fitness Test by SAI for Age Group 9-18 Years are:

	Test	Objective
(i)	Body Mass Index or BMI	Body Mass Index is the measure of body fat, which is calculated from body Weight (W) and Height (H). $BMI = W/(H \times H)$, where W = body weight in kilograms and H = height in meters. The higher the score usually indicates higher levels of body fat.
(ii)	Partial Curl-up	The partial curl-up test measures abdominal muscular strength and endurance of the abdominals and hip-flexors, which is important in back support and core stability.
(iii)	Push Ups for Boys	The objective of this test is to assess the endurance of student's upper body strength and endurance.
(iv)	Modified Push Ups for Girls	To measure the upper body strength and trunk stability.
(v)	Sit and Reach Test	The sit and reach test is designed to measure the flexibility of the lower back and hamstring muscles.
(vi)	600 m Run/Walk	The objective of this test is to measure cardiovascular endurance.
(vii)	50 m Dash	The objective of this test is to determine acceleration and speed.

Administration of Partial Curl-up:

- (i) First of all, the student lies on a cushioned, flat, clean surface with knees flexed, usually at 90° angle, with hands straight on the sides (palms facing downwards) closer to the ground, parallel to the body.
- (ii) The student raises the trunk in a smooth motion, keeping the arms in position, curling up the desired amount (at least six inches above the ground towards the parallel strip).
- (iii) The trunk is lowered back to the floor so that the shoulder blades or upper back touch the floor.

Q 5. Make a table of test items listed under fitness test by SAI (Age group 9-18 years). Explain the Procedure and Scoring to 50 MTS Run and Partial Curl-Up.

(CBSE SQP 2023-24)

Ans. Age Group: 9-18 + Years | Class 4 to 12

The following components are to be considered in physical health and fitness profile of children in class 4-12:

- (i) Body Composition (BMI)
- (ii) Muscular Strength and Endurance
 - a. Abdominal/Core Strength (Partial Curl-up)
 - b. Muscular Endurance (Push-ups for Boys, Modified Push-ups for Girls)
- (iii) Flexibility (Sit and Reach Test)
- (iv) Cardiovascular Endurance (600 M Run/Walk)
- (v) Speed (50 m Dash)

50 m Run:

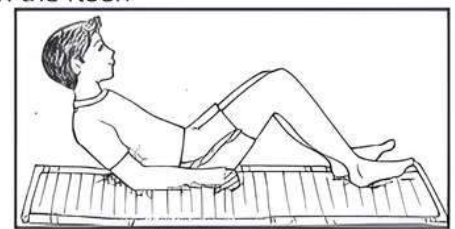
Procedure: The test involves running a single maximum sprint over 50 meters, with the time recorded. A thorough warm-up should be given, including some practice starts and accelerations. Start from a stationary standing position (hands cannot touch the ground), with one foot in front of the other. The front foot must be behind the starting line. Once the student is ready and motionless, the starter gives the instructions 'set' then 'go'. The tester

should provide hints for maximising speed (such as keeping low driving hard with the arms and legs) and the participant should be encouraged to not slow down before crossing the finish line.

Scoring: Time taken to cover 50 m distance is expressed in seconds.

Partial Curl-up:

Procedure: First of all, the student lies on a cushioned, flat, clean surface with knees flexed, usually at 90° angle, with hands straight on the sides (palms facing downwards) closer to the ground, parallel to the body. The student raises the trunk in a smooth motion, keeping the arms in position, curling up the desired amount (at least six inches above the ground towards the parallel strip). The trunk is lowered back to the floor, so that the shoulder blades or upper back touch the floor.



Scoring: Record the maximum number of partial curl ups in a certain time period such as 30 sec or 1 min.



Chapter Test

Multiple Choice Questions

Q 1. Match the following:

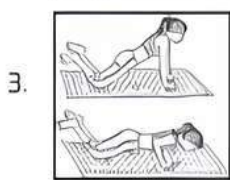
(CBSE SQP 2021 Term-1)



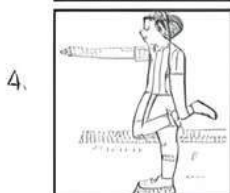
A. Static Balance



B. Lower body flexibility



C. Upper body strength



D. Abdominal strength

A B C D

- a. 3 1 4 2
- b. 4 1 3 2
- c. 3 2 4 1
- d. 4 2 3 1

Q 2. Which SAI khelo India fitness test is used to measure speed and coordination of limb movement?

- a. Partial curl-up
- b. Push-ups
- c. Plate Tapping Test
- d. Flamingo Balance Test

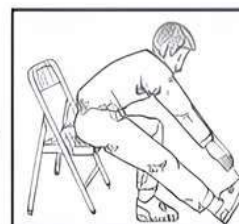
Q 3. 600 m Run/walk aims to measure an athlete's

- a. endurance
- b. speed
- c. abdominal strength
- d. flexibility

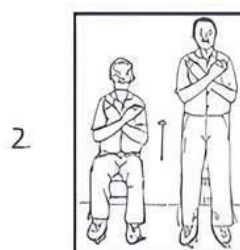
Q 4. Stadiometer is used to measure:

- a. strength
- b. weight
- c. flexibility
- d. height

Q 5. Match the following:



A. Lower Body Strength



B. Upper Body Strength

3.



C. Lower Body Flexibility

4.



D. Upper Body Flexibility

- a. 1-C, 2-B, 3-A, 4-B
 b. 1-D, 2-A, 3-C, 4-B
 c. 1-D, 2-C, 3-A, 4-B
 d. 1-C, 2-A, 3-D, 4-B

Assertion and Reason Type Questions

Directions (Q. Nos. 6-7): There are two statements marked as Assertion (A) and Reason (R). Read the statements and choose the appropriate option from the options given below:

- a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
 b. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
 c. Assertion (A) is true, but Reason (R) is false.
 d. Assertion (A) is false, but Reason (R) is true.
- Q 6.** Assertion (A): 600 m Run/walk is a part of SAI Khelo India fitness test for age group 5-8 years.
 Reason (R): 600 m Run/walk is used to measure cardiovascular endurance.
- Q 7.** Assertion (A): Chair stand test is similar to squat test and used to measure lower body strength.
 Reason (R): A chair with a straight back and a seat of at least 44 cm and stopwatch is required to conduct this test.

Case Study Based Question

Q 8. Read the following passage and answer the following questions.

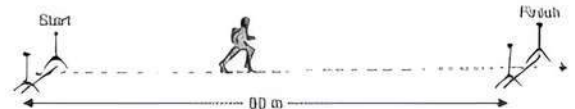
Rakshit is working on a project to collect data for assessing physical fitness amongst boys and girls (age group: 9-18 years) in the residential complex. He plans to administer test for assessing their arm, shoulder and abdominal strength as well as flexibility of hamstring muscles.

- (i) Which of the following test should be conducted for assessing flexibility of hamstring muscles?
 a. 600 m run/walk b. Push-ups
 c. Sit and reach d. Partial Curl-up

(ii) Which of the following test should be conducted for assessing arm, shoulder and abdominal strength of boys and girls?

- a. Push-ups
 b. Modified push-ups
 c. Both a. and b.
 d. Flamingo Balance Test

(iii) Identify the following SAI Khelo India Fitness Test.



- a. Eight foot up and go test
 b. Partial Curl-up
 c. Six minute walk test
 d. 50 m Speed Test

Very Short Answer Type Questions

- Q 9.** Define basal metabolic rate.
Q 10. Which test would you suggest for your grandmother to test lower body flexibility?

Short Answer Type-I Questions

- Q 11.** Write down the Harris-Benedict equations used to calculate BMR.
Q 12. Explain in brief the administration of partial curl-up test.
Q 13. Explain the procedure of eight foot up and go test.

Short Answer Type-II Questions

- Q 14.** Discuss the Back Scratch Test for upper body flexibility.
Q 15. Write the aim and procedure of Arm Curl Test.
Q 16. Write a detail note on Plate Tapping Test.

Long Answer Type Questions

- Q 17.** What are the components of Rikli and Jones Test? Explain the procedure for administering any two test items.
Q 18. Write in detail about the various test items and their administration of the SAI Khelo India Fitness Test in school for age group 9 to 18 years.