



Unit -6

Physical Education





Unit – 6



Test and Measurement in Sports



Unit Contents

6.1 Fitness Test – SAI Khelo India Fitness Test in school :

- Age group 5-8 years (Class 1-3) :

1. BMI,
2. Flamingo Balance Test,
3. Plate Tapping Test

- Age group 9-18 years (Class 4-12) :

1. BMI,
2. 50mt Speed test,
3. 600mt Run/Walk,
4. Sit & Reach flexibility test,
5. Strength Test (Abdominal Partial Curl Up, Push-Ups for boys, Modified Push-Ups for girls).

6.2 Measurement of Cardio-Vascular Fitness – Harvard Step Test – Duration of the Exercise in Seconds $\times 100 / 5.5$
 \times Pulse count of 1-1.5 Min after Exercise.

6.3 Basal Metabolic Rate (BMR)

6.4 Rikli and Jones - Senior Citizen Fitness test

1. Chair stand test for lower body strength
2. Arm curl test for upper body strength
3. Chair sit & reach test for lower body flexibility.
4. Back scratch test for upper body flexibility.
5. Eight foot up & go test for agility.
6. Six minutes walk test for aerobic endurance.

Sample Question Papers...!!

33. Make a table of test items listed under fitness test by SAI (Age group 9-18 yrs). Explain the Procedure and Scoring of 50 MTS Run and Partial Curl Up. [1+2+2=5]

Ans. There are several programs that have fitness testing protocols designed for assessing school age children. Children are naturally active, and encouraging this with fitness guidance will create lasting habits. The fitness components measured are:

1.	Body Composition	BMI
2.	Strength	a. Abdominal (Partial Curl-up) b. Muscular Endurance (Push Ups for Boys, Modified Push Ups for Girls)
3.	Flexibility	Sit and Reach Test
4.	Cardiovascular Endurance	600 Meter Run/Walk
5.	Speed	50 mts. Dash

Procedure for 50 mts Dash: 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.

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- (a) Improvement in confidence (c) Increase in depression
(b) Improvement in endurance (d) Better hand-eye coordination

Ans. (c) Increase in depression

Explanation: Primary amenorrhoea refers to the absence of menstruation cycle at puberty.

16. If the menstruation cycle does not begin at puberty, the condition is called _____

- (a) Primary Amenorrhoea (c) Oligomenorrhoea
(b) Secondary Amenorrhoea (d) Dysmenorrhoea

Ans. (a) Primary Amenorrhoea

Explanation: The range of age group for the Senior Citizen Fitness Test is (a) 60-94. This means that the test is appropriate for individuals aged 60 years and above, up to the age of 94.

17. Senior Citizen Fitness Test the range of age group is _____

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

Ans. (a) 60-94

Explanation: Kyphosis is a spinal disorder in which an excessive curve of the spine results in an abnormal rounding of the upper back. The condition is sometimes known as hunchback.

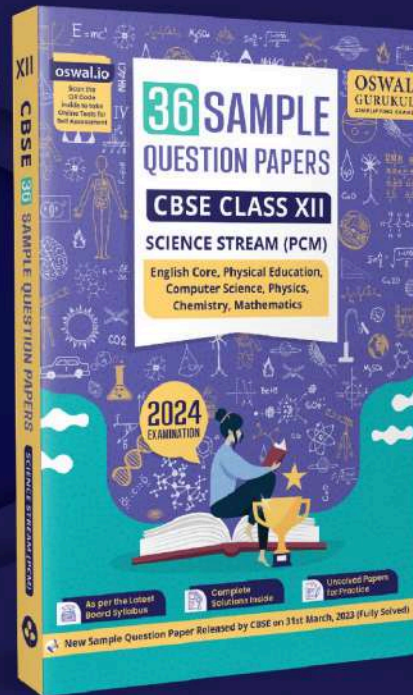
18. Kyphosis is also known as _____

- (a) Hallow Back (b) Hunch Back (c) Curve Back (d) both (a) and (b)

Ans. (b) Hunch Back

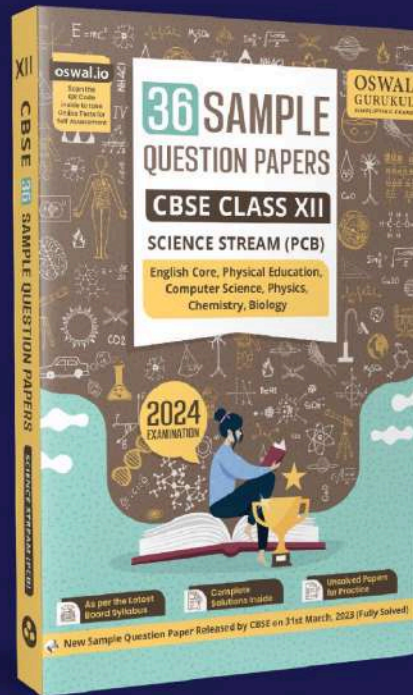
SECTION-B

[4×0.5=2]



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CBSE Sample Paper 2023

Q17. Match the following :

I. Chair stand test.

II. Arm curl test.

III. Back scratch test.

IV. Six minute walk test.

1. Lower Body strength

2. Aerobic Endurance

3. Upper body strength

4. Upper body flexibility

a) I-1, II-3, III-4, IV-2.

b) I-2, II-3, III-1, IV-4

c) I-1, II-3, III-2, IV-4

d) I-2, II-3, III-4, IV-1

CBSE Sample Paper 2023

Q23. Write down the objectives and administration of the flamingo test. **(2M)**

Q35. Make a table of test items listed under fitness test by SAI (Age group 9-18 yrs) along with the objectives of conducting them. Explain the administration of any one of them. **(5M)**

Complete Chapter's Summary

6.1 Fitness Test – SAI Khelo India Fitness Test in school :

Age group 5-8 years (Class 1-3) :

1. BMI,
2. Flamingo Balance Test,
3. Plate Tapping Test

Age group 9-18 years (Class 4-12) :

1. BMI,
2. 50mt Speed test,
3. 600mt Run/Walk,
4. Sit & Reach flexibility test,
5. Strength Test (Abdominal Partial Curl Up, Push-Ups for boys, Modified Push-Ups for girls).

1. Age group 5-8 years (Class 1-3) :

At Primary class 1-3, children should acquire **Fundamental Movement Skills (FMS)** leaving the learning of specific physical activities to later stages.

Locomotor, Manipulative & Body Management abilities are key to success in most sports and physical activities.

Abilities of children in class 1-3 which need to be measured and tracked are

1. **Body Composition (BMI)**
2. **Coordination (Plate Tapping)**
3. **Balance (Flamingo Balance)**



1. Body Mass Index (BMI) :

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

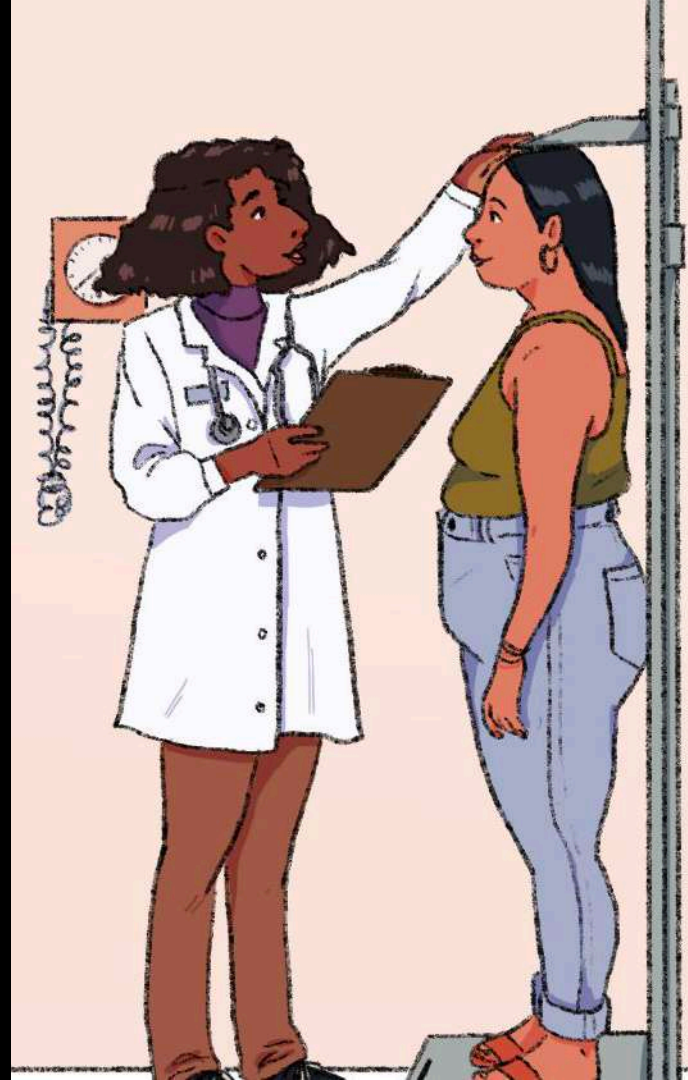
BMI = W / (H x H), where

W = body weight in kilograms and

H = height in meters. The higher the score usually indicating higher levels of body fat.

Body Composition :

It refers primarily to the **distribution of muscle and fat in the body**. Body size such as height, lengths and girths are also grouped under this component.



Under weight	Normal weight	Over weight	Obese (Class I)	Obese (Class II)	Obese (Class III)
					
<18.5	18.5 – 24.9	25.0 – 29.9	30.0 – 34.9	35.0 – 39.9	>40.0

2. Plate Tapping Test :

What does it measure :

Tests **speed and coordination** of limb movement.

Infrastructure/Equipment Required :

Table (adjustable height), 2 yellow discs (20cm diameter), rectangle (30 x 20 cm), stopwatch



How to Perform :

1. If possible, the table height should be adjusted so that the subject is standing comfortably in front of the discs.
2. The **two yellow discs** are placed with their centres 60 cm apart on the table.



3. The **rectangle** is placed equidistant between both discs. The nonpreferred hand is placed on the rectangle.
4. The subject moves the preferred hand back and forth between the discs over the hand in the middle as quickly as possible.
5. This action is repeated for 25 full cycles (50 taps).



Scoring : The time taken to complete 25 cycles is recorded



3. Flamingo Balance Test :

What does it measure :

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.

Infrastructure/Equipment Required:

Non Slippery even surface,
Stopwatch, can be done on just standing on beam.



How to Perform :

1. Stand on the **beam**. Keep balance by holding the instructor's hand (if required to start).
2. 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



Scoring :

The total number of falls or loss of balance in **60 seconds** of balancing is recorded.

If there are more than 15 falls in the first 30 seconds, the **test is terminated.**



Age group 9-18 years (Class 4-12) :

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:

1. BMI,
2. 50mt Speed test,
3. 600mt Run/Walk,
4. Sit & Reach flexibility test,
5. Strength Test (Abdominal Partial Curl Up, Push-Ups for boys, Modified Push-Ups for girls).



2. 50 m Speed Test :

Procedure :

1. Sprint over 50 meters, with the time recorded, **start from a stationary standing position.**
2. Once the subject is ready, the starter give the instructions “set” then “go” participant should be encouraged to not slow down before crossing the finish line.



Scoring :

**Time take to cover
50 m distance is
expressed in
seconds.**



3. 600 m walk/Run :

Procedure :

1. The subject takes a standing start from the starting line. The subject **may walk** in between.
2. Objective is to cover the distance in the **shortest time** when he crosses the finish line he is informed of his time.



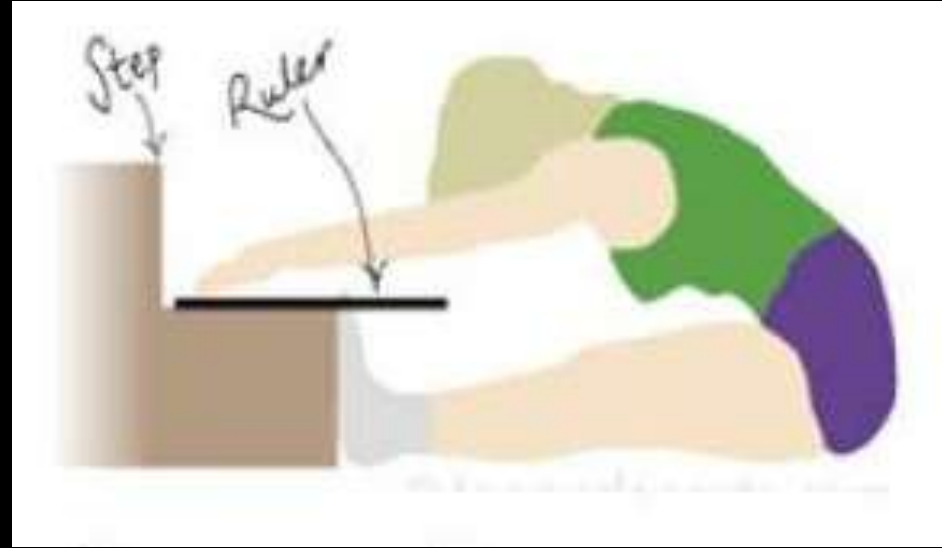
4. Sit and Reach Flexibility test :

Procedure :

1. This test involves sitting on the floor with **legs stretched out straight ahead**.

2. The soles of the feet are placed flat against the box. Both knees should be locked and pressed flat to the floor.

3. The tester may assist by holding them down with the palms facing downwards, and the **hands on top of each other** or side by side.



Scoring : The score is recorded to the nearest centimeter or half inch as the distance reached by the hand.

	Score
If hands overlap :	(+)ve
Touch :	0
Don't overlap :	(-)ve

5. Strength Test - A. Abdominal Partial Curl up :

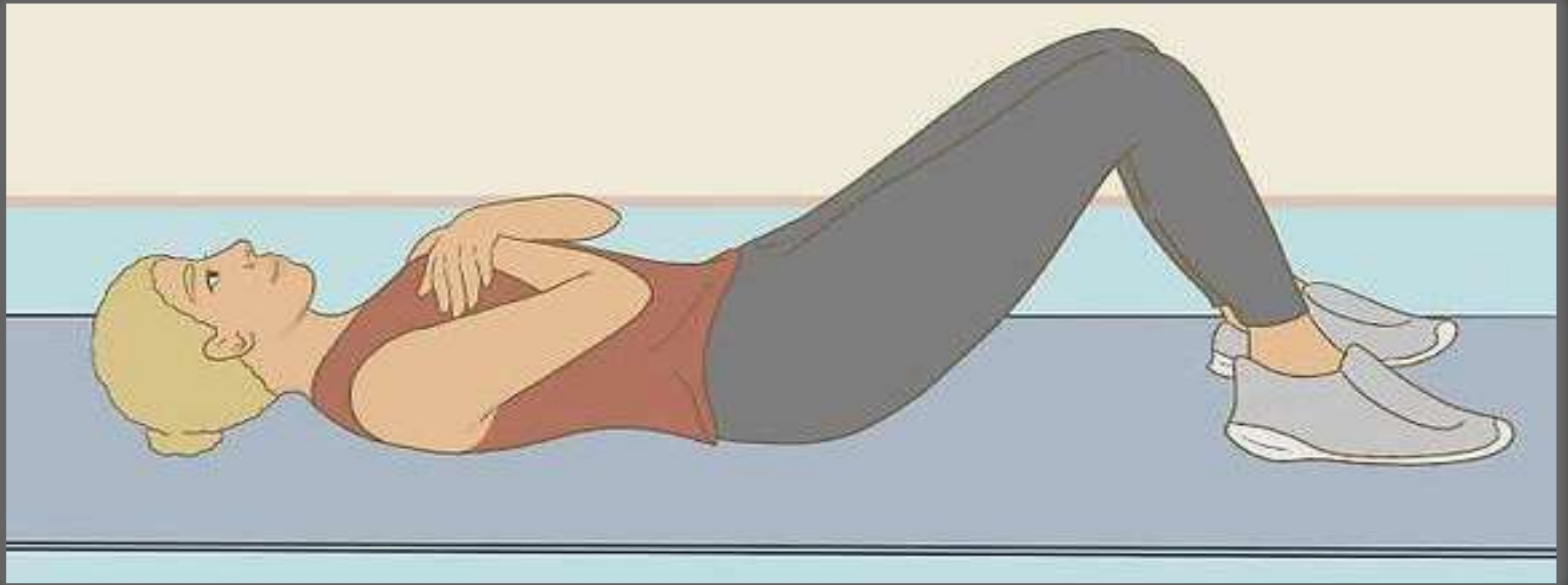
Procedure :

1. The starting position is lying on the back with the knees flexed and feet 12 inches from the buttocks.

2. The feet cannot be held or rest against on object. The arms are extended and are rested on the thighs. The head is in a neutral position.



Scoring : Record the total number of curl-ups, only, correctly performed curl ups should be counted.



5. Strength Test - B. Push up: For Boys



5. Strength Test – C. Push up [Modified] : For Girls



1. 50 m standing start	Measure the acceleration speed of the athlete	speed Measuring tape, stop watch, cone, flat and clear surface
2. 600 m Run/walk	Measure the aerobic fitness of the athlete	Running track, marking coenes, recording sheets, stop watch
3. SIT and Reach	Measure the flexibility of the athlete	Sit and Reach Box, measuring tape
4. Partial Cur/up	Measure the abdominal strength of the athlete	Stop watch, recording sheet, non slipping surface
5. Push up (Boys)	Measure the upper body muscles strength	Stop watch, non slipping surface, recording sheet
6. Modified push up (Girls)	Measure the upper body muscles strength	Stop watch, non slipping surface, recording sheet

6.2 Measurement of cardio vascular fitness: Harvard step test Rock prot test (one mile)

Cardio-vascular fitness is the ability of the **heart and lungs** to supply oxygen-rich blood to the working muscle tissues and the ability of the muscles to use oxygen to produce energy for movements.



Harvard Step Test :

It is a cardiovascular fitness test. It is also called **aerobic fitness test**.

It used to measure the cardiovascular fitness or aerobic fitness by checking the recovery rate.



Harvard Step Test : The harvard step test is a test of aerobic fitness, developed by **Brouha et al. (1943)**.

Objective : The objective of this test to monitor the development of the athlete's cardiovascular system.

Required Resources :-

- Gym bench (45 cm high)
- Stopwatch
- Assistant

How to Conduct the test :

This test requires the athlete to step up and down off a 45 cm high gym bench for 5 minutes at a rate 30 steps/minute.

1. The athlete warm up for 10 minutes
2. The assistant gives the command “Go” and starts the stopwatch.
3. The athlete steps up-up and down-down onto a standard gym bench once every two seconds for five minutes (150 steps)

4. The assistant stops the test after 5 minutes.
5. The assistant measures the athlete's heart beat rate (bpm) one minute after finishing the test pulse 1
6. The assistant measures the athlete's rate (bpm) two minutes after finishing the test - Pulse-2
7. The assistant measure the athlete's heart rate (bpm) three minutes after finishing the test pulse 3.

Computation of Fitness Index =

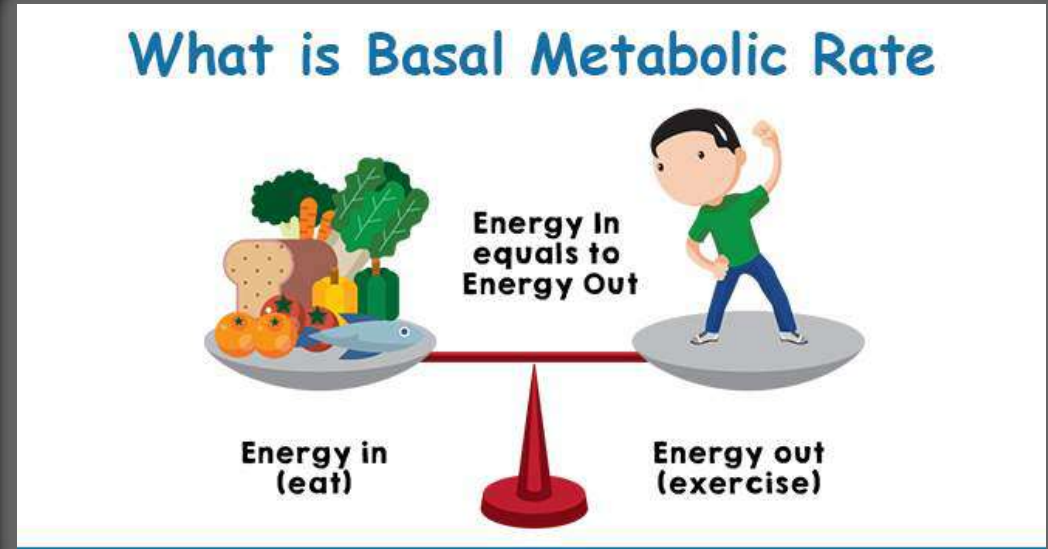
Duration of the Exercise in Second $\times 100 / 5.5 \times$
Pulse count between 1 to 1.5 Min after Exercise

6.3 Basal Metabolic Rate (BMR) :

The acronym BMR stands for Basal Metabolic Rate. It is the number of calories our body burns during **complete rest**.

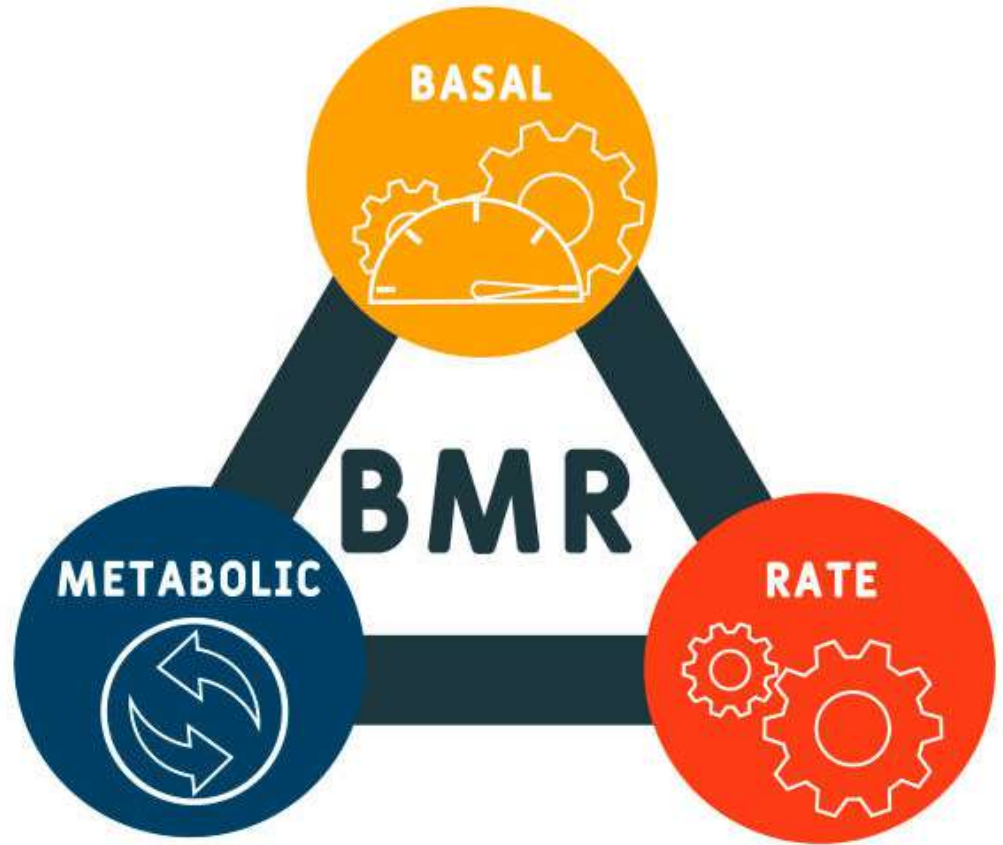
We can get an insight into your **energy level** if you know the BMR levels.

Our body needs some energy even during sleep for **performing some basic functions** like breathing, circulating blood, and repairing cells.



Our body burns more calories by movement and exercise.

So, by monitoring our consumption, it will be better to prevent unwanted weight gains or severe weight loss.



What is the Metabolic Age?

BMR stands for a basal metabolic rate that **changes as our age progresses**. The peak time for BMR is during teenage and slows down gradually henceforth.

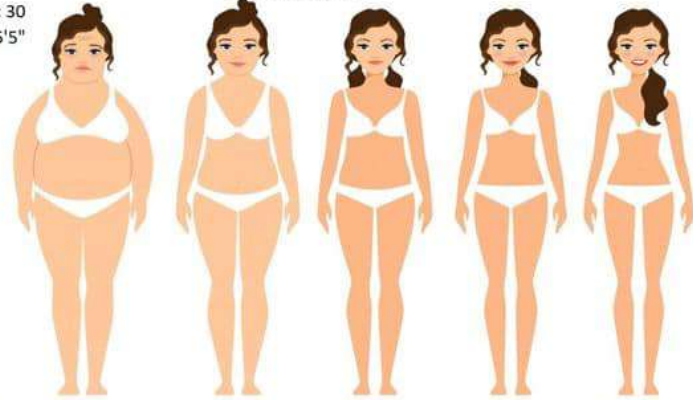
As we grow older, consuming fewer calories helps us to keep a better BMR.

If your metabolic age is higher, then it is time to exercise to burn off those fats accumulated in your body.

METABOLIC AGE CALCULATOR

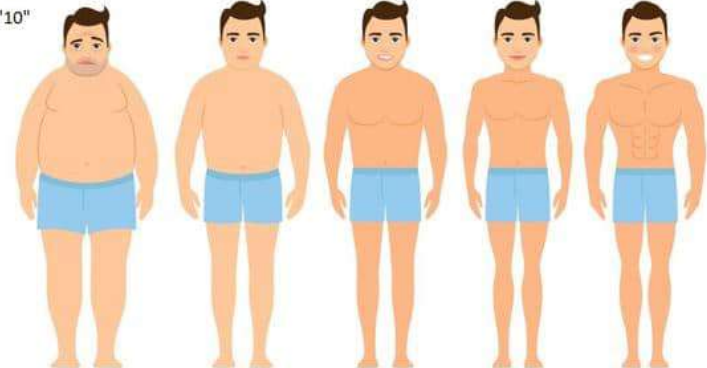
bodybuildingmealplan.com

Actual Age: 30
Height: 5'5"



Weight:	200 lbs	180 lbs	160 lbs	140 lbs	120 lbs
Body Fat:	48%	40%	32%	24%	16%
Metabolic Age:	94	66	45	31	24

Actual Age: 30
Height: 5'10"



Weight:	240 lbs	220 lbs	200 lbs	180 lbs	160 lbs
Body Fat:	40%	32%	24%	16%	8%
Metabolic Age:	109	78	52	32	18

How to calculate BMR?

BMR was introduced to the world by **James Arthur Harris and Francis Gano Benedict**. So, the equation is popularly known as the **Harris-Benedict formula**.

A new equation was formulated in 1990, which is known as the **Mifflin-St. George equation**.

$$P = (10.0 \times m/1 \text{ kg}) + (6.25 \times h/1\text{cm}) - (5.00 \times a/1 \text{ year}) + s$$

P= total energy output during rest(BMR)

M= weight of the person in kgs

H= height of the concerned person

A= age of the incumbent

S= constant which is +5 for males and -161 for females

BMR FORMULAS



MEN

$$\text{BMR} = (10 \times \text{weight [kg]}) + (6.25 \times \text{height [cm]}) - (5 \times \text{age [yrs]}) + 5$$



WOMEN

$$\text{BMR} = (10 \times \text{weight [kg]}) + (6.25 \times \text{height [cm]}) - (5 \times \text{age [yrs]}) - 161$$

6.4 Rikli and Jones - Senior Citizen Test

Rikli and Jones developed the senior citizen fitness test in 2001.

This test has proved to be beneficial for senior citizens.



1. Back Scratch Test :

Purpose :- To assess the **upper body** (shoulder) **flexibility**, which is important in performing various jobs such as combing one's hair, putting on overhead garments and reaching for a seat belt etc.

Equipment Required :-
A ruler.



Fingers should be aligned.
Measure the distance
between the tips of the
fingers.

If the finger **tips touch** then
the score is zero.

If they **do not touch** measure
the distance between the
fingertips (-ve score).

If they **overlap** measure by
how much (+ive score).

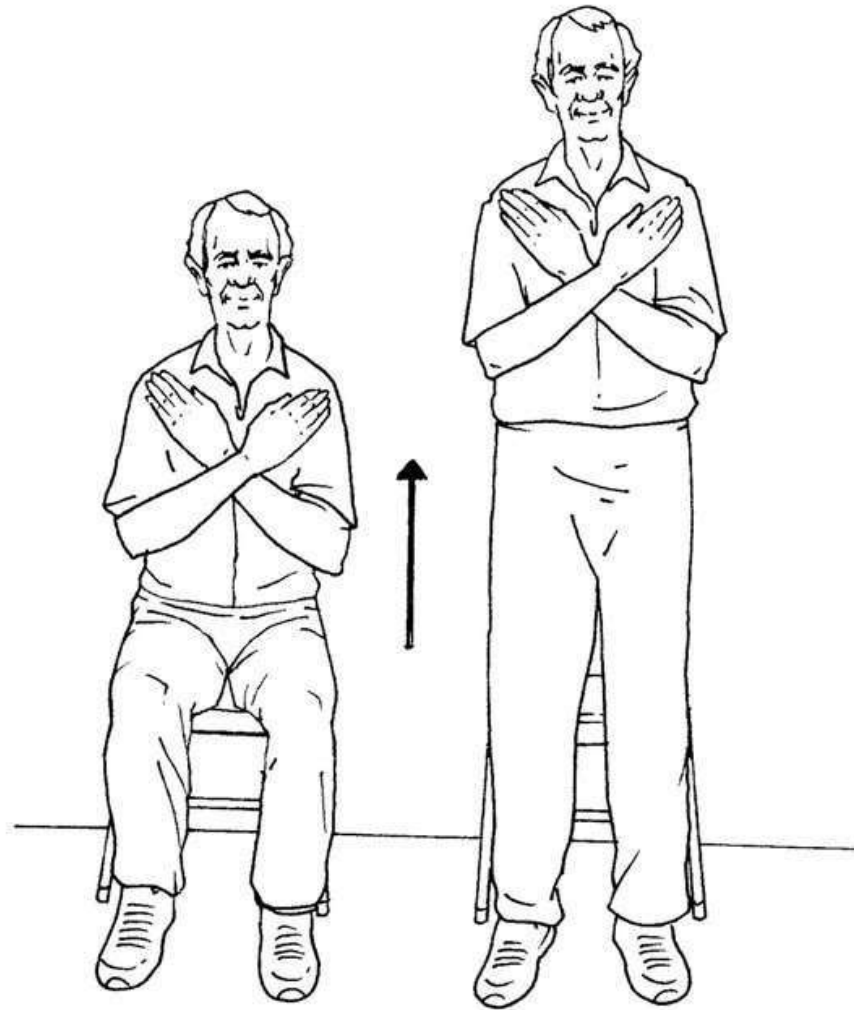


2. Chair Stand Test :

Purpose : The main purpose of this test is to measure the **lower body strength**, particularly **legs strength** which is usually required for various tasks such as climbing stairs, getting in and out of vehicle, bathtub or chair.

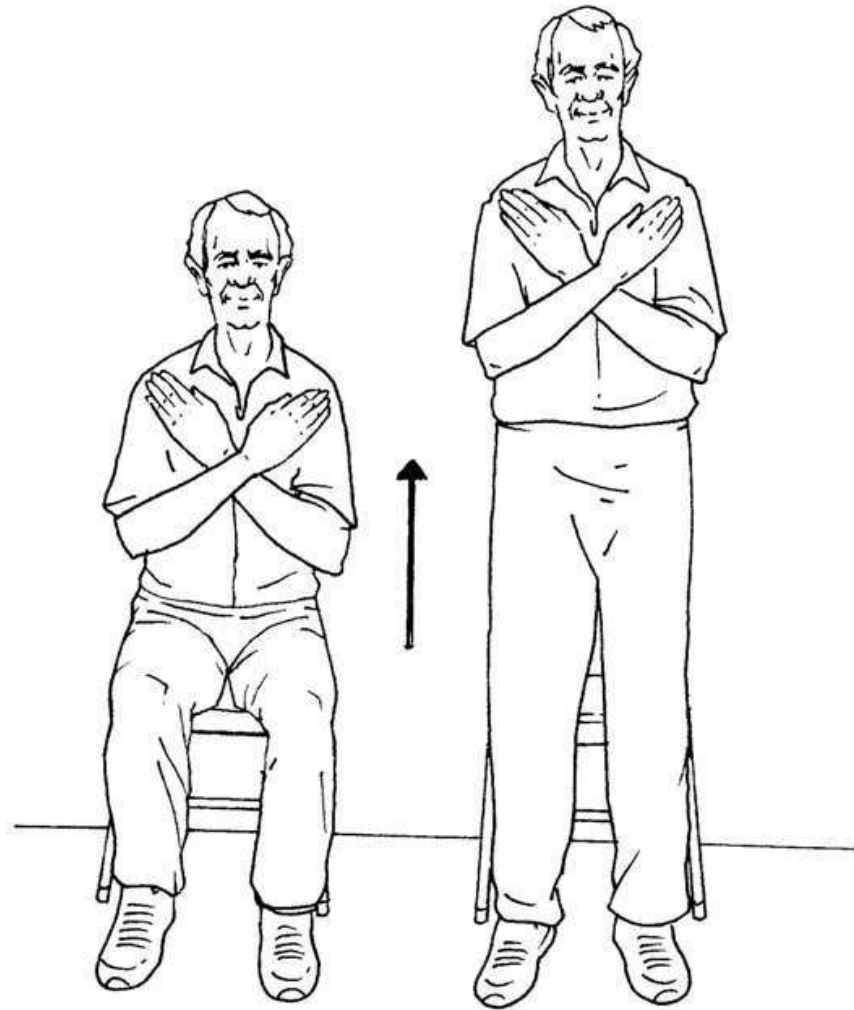
Equipments Required :

A chair with a straight back and a seat of **at least 44 cm** and a stopwatch.



Instructions for Participants :-

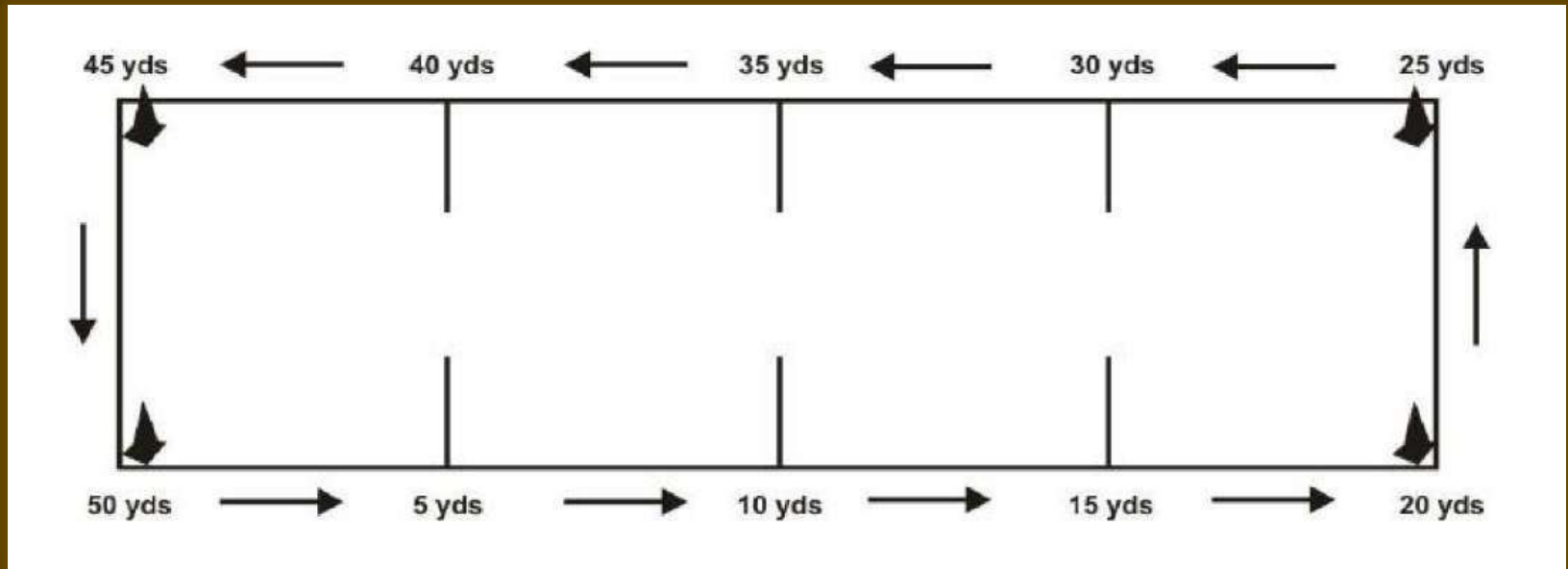
- 1.The participant should sit in the middle of the chair.
- 2.She/He should keep his hands on the opposite shoulder crossed at the wrists.
- 3.The feet should be flat on the floor.
4. Her/His back should be erect.
- 5.Repeat sit up and down for **30 seconds**.



3. 6 Minutes Walk Test :

Purpose : This test measures **aerobic fitness** of senior citizens.

Equipment required : Measuring tap to mark out the track distances, stopwatch, chairs positioned for resting.



Procedure :

- 1.The walking course is laid out in a 50 yard (45.72m) rectangular area (dimensions 45 × 5 yards), with cones placed at regular intervals to indicate distance walked.
- 2.The aim of this test is to walk as quickly as possible for 6 minutes to cover as much distance as possible.
- 3.Subjects are set their own pace (a preliminary trials is useful to practice pacing), and are able to stop for a rest if they desire.

4. Arm Curl test of Rikli & Jones :

Purpose : It is used to Testing upper body strength of senior citizen

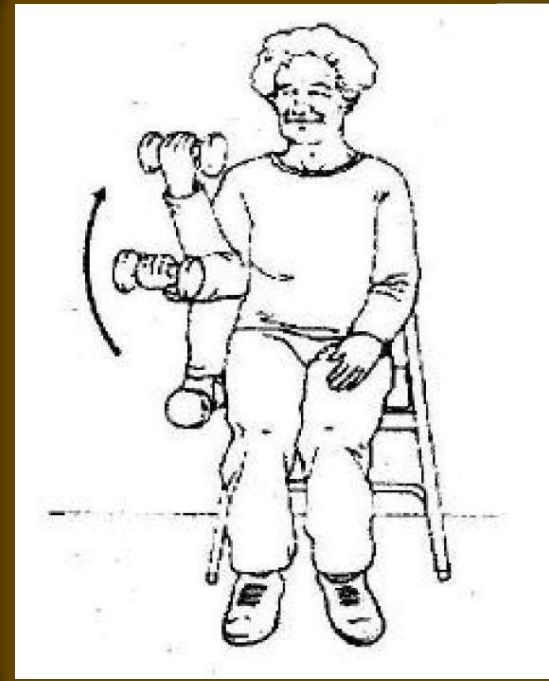
Equipment :

Women will curl a **5 lb.** weight in this test and men will curl a **8 lb** weight for their test.



Procedure :

1. Test assistant will tell to begin and will time for **30 seconds**, using the stopwatch or a watch with a second hand.
2. Do as many curls as can in the allotted **30-second time period**, moving in a controlled manner.
3. Do a full curl, squeezing lower arm against upper arm at the top of each curl and returning to a straight arm each time. Keep upper arm still.
4. Do **not swing** the weight.



5. Eight Foot up and Go Test :

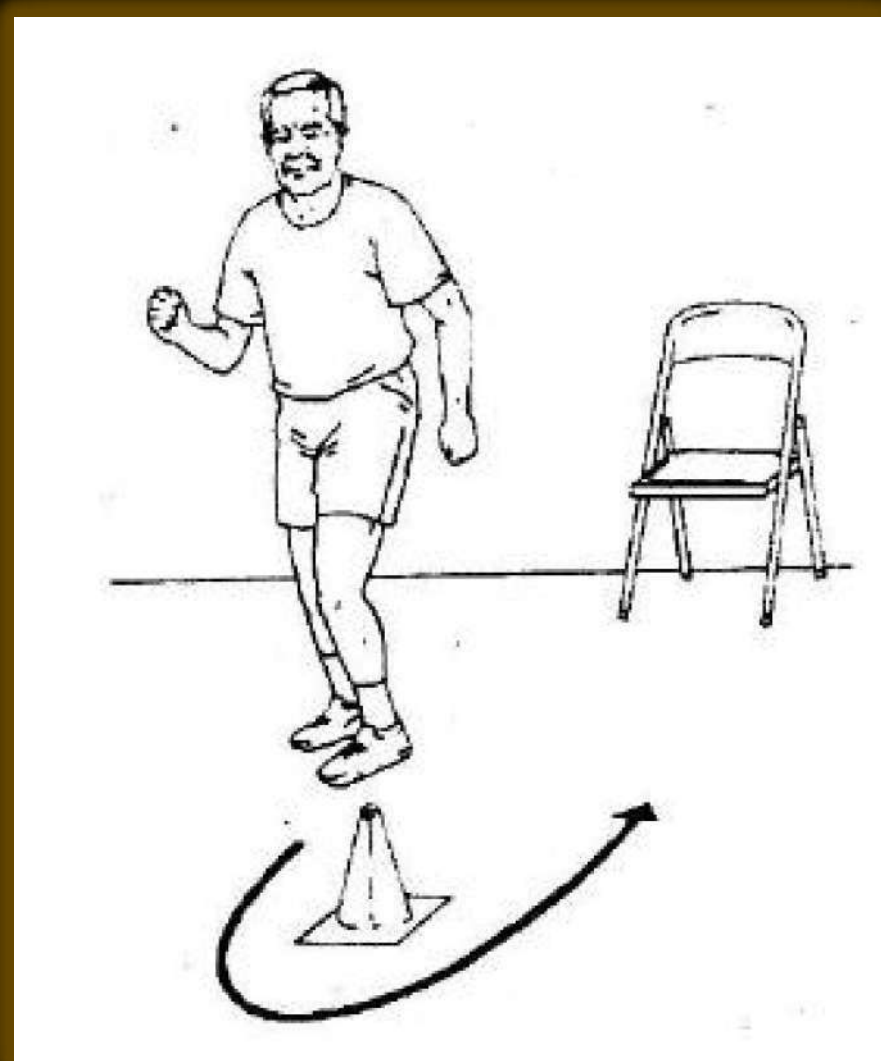
Purpose :

To assess **speed, agility and balance** while moving.

These are important in performing various jobs which require quick maneuvering, such as getting of a bus in time and to answer the phone etc.

Equipments Required :

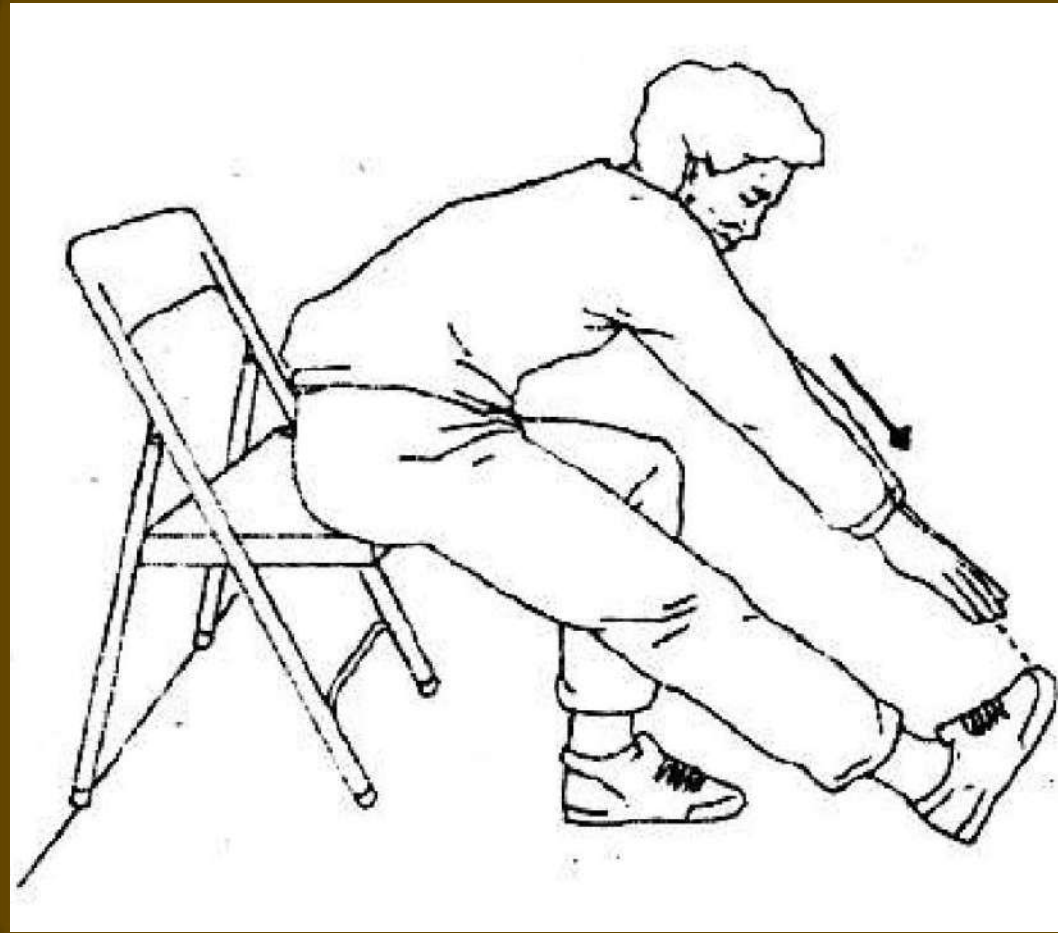
A chair with straight back (about 44 cm high) a stopwatch, cone marker, measuring tape and an area without any hindrances.



6. Chair sit and reach test :

Purpose : To Test **Lower body flexibility**. It also plays a role in balance, posture, in fall prevention, or walking. Lower body flexibility is **important for maintaining an active, independent lifestyle**.

Equipment required :
Ruler, straight back or folding chair, (about 17 inches/ 44 cm high)



MCQs

**Q.1. The 600 metres run/walk
measures**

- 1. Speed and agility**
- 2. Power**
- 3. Endurance.**
- 4. All of the above**

Q.2 In the Chair Sit and Reach Test for Senior Citizens, the distance measured is between the and the

- 1. Wrist, Toes**
- 2. Fingers, heels**
- 3. Tip of the finger tips, toes.**
- 4. None of the above**

Q.3 The Six Minute Walk Test for Senior Citizens measures

- 1. Overall physical fitness**
- 2. Walking fitness**
- 3. Lower body fitness**
- 4. None of the above.**

Q4. The Back Stretch Test for upper body flexibility is done in a Position.

- 1. Standing.**
- 2. Sitting of the floor**
- 3. Sitting in a chair**
- 4. Either 2 or 3**

Previous Year Questions

**1. Sit and reach test is conducted for?
[2020]**

- A. flexibility.**
- B. motor fitness**
- C. endurance**
- D. speed**

CBSE Sample Paper Questions

33. Make a table of test items listed under fitness test by SAI (Age group 9-18 yrs). Explain the Procedure and Scoring of 50 MTS Run and Partial Curl Up. [1+2+2=5]

Ans. There are several programs that have fitness testing protocols designed for assessing school age children. Children are naturally active, and encouraging this with fitness guidance will create lasting habits. The fitness components measured are:

1.	Body Composition	BMI
2.	Strength	a. Abdominal (Partial Curl-up) b. Muscular Endurance (Push Ups for Boys, Modified Push Ups for Girls)
3.	Flexibility	Sit and Reach Test
4.	Cardiovascular Endurance	600 Meter Run/Walk
5.	Speed	50 mts. Dash

Procedure for 50 mts Dash: 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.

17. Senior Citizen Fitness Test the range of age group is_____

(a) 60-94

(b) 55-79

(c) 65-95

(d) 50-90

Ans. (a) 60-94

CBSE Sample Paper 2023

Q17. Match the following :

I. Chair stand test.

II. Arm curl test.

III. Back scratch test.

IV. Six minute walk test.

1. Lower Body strength

2. Aerobic Endurance

3. Upper body strength

4. Upper body flexibility

a) I-1, II-3, III-4, IV-2.

b) I-2, II-3, III-1, IV-4

c) I-1, II-3, III-2, IV-4

d) I-2, II-3, III-4, IV-1

CBSE Sample Paper 2023

Q23. Write down the objectives and administration of the flamingo test. **(2M)**

Q35. Make a table of test items listed under fitness test by SAI (Age group 9-18 yrs) along with the objectives of conducting them. Explain the administration of any one of them. **(5M)**

1. 50 m standing start	Measure the acceleration speed of the athlete	speed Measuring tape, stop watch, cone, flat and clear surface
2. 600 m Run/walk	Measure the aerobic fitness of the athlete	Running track, marking coenes, recording sheets, stop watch
3. SIT and Reach	Measure the flexibility of the athlete	Sit and Reach Box, measuring tape
4. Partial Cur/up	Measure the abdominal strength of the athlete	Stop watch, recording sheet, non slipping surface
5. Push up (Boys)	Measure the upper body muscles strength	Stop watch, non slipping surface, recording sheet
6. Modified push up (Girls)	Measure the upper body muscles strength	Stop watch, non slipping surface, recording sheet

Q3. Which test is developed to test fitness in senior citizens?

- a) Harvard step
- b) Rikli and Jones
- c) AAHPER
- d) Rockport

Q11. Which test is used to test the functional ability amongst senior citizens?

- a) Rockport one mile test
- b) Harvard step test
- c) Rikli and Jones test
- d) Fitness Index score

Q12. What is the test duration for the Arm curl test?

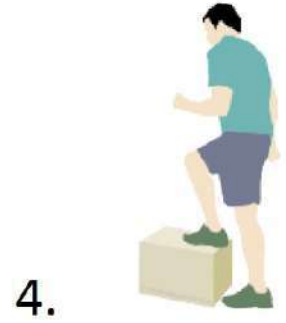
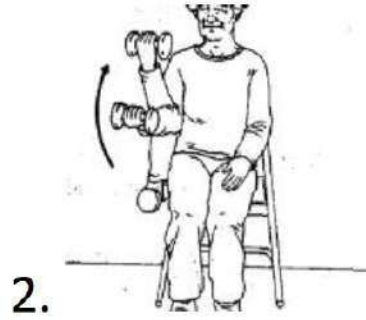
- a) 1min
- b) 2 min
- c) 30sec
- d) Number of repetitions



Procedure of Arm Curl Test :

1. Test assistant will tell to begin and will time for **30 seconds**, using the stopwatch or a watch with a second hand.
2. Do as many curls as can in the allotted 30-second time period, moving in a controlled manner.
3. Do a full curl, squeezing lower arm against upper arm at the top of each curl and returning to a straight arm each time. Keep upper arm still.

Q37. Identify the odd one.



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

Case Study

Q50. 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 grandchildren. Nowadays he is experiencing difficulty in doing certain chores which involve physical movement.

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

- (a) agility (b) endurance (c) flexibility (d) strength



Assertion & Reason

49. Assertion (A) Chair Stands Test is designed to test fitness of the senior citizens.

Reason (R) This test is safe, enjoyable and meet scientific standards of reliability and validity.

Codes

- (a) Both A and R are true and R is the correct explanation of A
- (b) Both A and R are true, but R is not the correct explanation of A
- (c) A is true, but R is false
- (d) A is false, but R is true