

Chapter 6 · Test and Measurement in Sports

CBSE Class 12 Physical Education (048) · Unit 6 = 8 marks · Ultimate Revision Sheet

60-SECOND RECALL

Khelo India age groups	5–8 years (3 tests) 9–18 years (6 tests)
Rikli & Jones	Senior citizens fitness test — 6 items
Senior Citizen test items	Chair stand · Arm curl · Chair sit-and-reach · Back scratch · Eight foot up-and-go · Six minute walk
Barrow test	3 items — Standing broad jump, Zig-zag run, Medicine ball put
Harvard Step Test	Measures cardiovascular endurance → Fitness Index
Rockport Test	One mile walk → estimates VO₂ max

1. SAI Khelo India Fitness Test

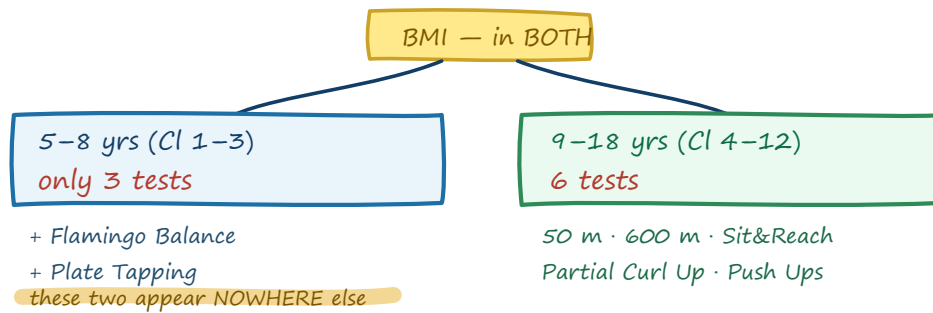
PURPOSE The Khelo India Fitness Test is a national school-level assessment by the **Sports Authority of India** to measure the physical fitness of children, identify talent, and create a fitness database.

AGE GROUP 5–8 YEARS (Class 1–3) — 3 tests

Test	Measures
1. Body Mass Index (BMI)	Body composition
2. Flamingo Balance Test	Balance — stand on one leg on a beam, count falls in 1 minute
3. Plate Tapping Test	Speed of limb movement / coordination — tap two discs alternately 25 times

AGE GROUP 9–18 YEARS (Class 4–12) — 6 tests

Test	Measures
1. Body Mass Index (BMI)	Body composition
2. 50 m Dash / Standing Start	Speed
3. 600 m Run / Walk	Cardiovascular endurance
4. Sit and Reach Test	Flexibility (lower back and hamstring)
5. Partial Curl Up	Abdominal muscular strength and endurance
6. Push Ups (boys) / Modified Push Ups (girls)	Upper body strength and endurance



BMI is the hinge — it is the only item the two age groups share.

TRAP Do not mix the two lists. The 5-8 group has **3** tests and includes **Flamingo Balance** and **Plate Tapping** — neither appears in the 9-18 group. BMI is the only test common to both.

2. Rikli and Jones Senior Citizen Fitness Test

PURPOSE Developed by **Roberta Rikli and Jessie Jones**, this test assesses the functional fitness of older adults (60+) — the physical capacity needed to perform normal everyday activities safely and independently.

THE SIX ITEMS

Test	Procedure	Measures
1. Chair Stand Test	Sit and stand from a chair as many times as possible in 30 seconds , arms crossed on chest	Lower body strength
2. Arm Curl Test	Curl a weight (5 lb women / 8 lb men) as many times as possible in 30 seconds	Upper body strength
3. Chair Sit and Reach Test	Sit at the edge of a chair, one leg extended, reach towards the toes; measure the distance	Lower body flexibility
4. Back Scratch Test	Reach one hand over the shoulder and the other up the back; measure the gap between fingertips	Upper body (shoulder) flexibility
5. Eight Foot Up and Go Test	Stand from a chair, walk 8 feet round a cone and sit back; record the time	Agility and dynamic balance
6. Six Minute Walk Test	Walk as far as possible in 6 minutes on a marked course	Aerobic / cardiovascular endurance

3. Barrow Three-Item General Motor Ability Test

THE THREE ITEMS

Test	Procedure	Measures
1. Standing Broad Jump	Stand behind a line, swing arms and jump forward as far as possible with both feet. Three trials; best is recorded.	Explosive strength of legs
2. Zig-Zag Run	Run a figure-of-eight course around five cones for three complete circuits without touching them. Time is recorded.	Agility

3. Medicine Ball Put

Throw a medicine ball (**6 lb**) forward as far as possible from behind a restraining line. Three trials.

Arm and shoulder explosive strength

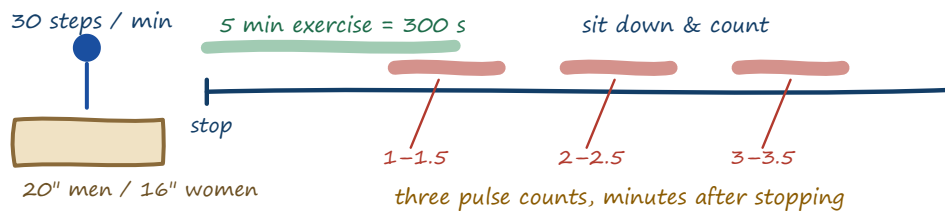
$$\text{General Motor Ability} = 2.2 (\text{Standing Broad Jump}) + 1.6 (\text{Medicine Ball Put}) - 1.0 (\text{Zig-Zag Run})$$

4. Cardiovascular Fitness Tests

HARVARD STEP TEST Procedure: Step up and down a bench (**20 inches** for men, **16** for women) at **30 steps per minute** for **5 minutes**. Then sit and count the pulse three times: **1 to 1.5 min**, **2 to 2.5 min**, and **3 to 3.5 min** after stopping.

$$\text{Fitness Index} = (\text{Duration of exercise in seconds} \times 100) \div (2 \times \text{sum of the three pulse counts})$$

Rating: below 55 poor · 55–64 low average · 65–79 high average · 80–89 good · 90+ excellent



The three counting windows are each 30 seconds, taken while seated.

ROCKPORT ONE MILE WALK TEST Procedure: Walk **one mile (1609 m)** as fast as possible on a flat surface. Record the **time taken** and the **heart rate** immediately at the finish.

Purpose: estimates **VO₂ max** — the maximum volume of oxygen the body can use per minute, the best single measure of aerobic fitness. Suitable for people who cannot run.

WORKED EXAMPLE — Harvard Step Test Exercise duration **300 seconds**. Pulse counts: **60, 50, 45**.

$$\text{Sum of pulses} = 60 + 50 + 45 = 155$$

$$\text{Fitness Index} = (300 \times 100) \div (2 \times 155) = 30,000 \div 310 = 96.7$$

Rating: **Excellent** (above 90)

5. Computing BMI, Waist-Hip Ratio and Bone Density

FORMULAS

$$\text{BMI} = \text{Weight (kg)} \div \text{Height}^2 (\text{metres})$$

$$\text{Waist-Hip Ratio} = \text{Waist circumference} \div \text{Hip circumference}$$

BMI: <18.5 underweight · 18.5–24.9 normal · 25–29.9 overweight · 30+ obese

WHR risk: above **0.90** for men and **0.85** for women indicates abdominal obesity and higher health risk.

6. Computing Basal Metabolic Rate (BMR)

BMR is the number of calories the body needs to maintain basic life-sustaining functions at **complete rest** — the energy your internal organs use even when you do nothing at all. Measured in **kcal**.

FORMULA — THE MIFFLIN-ST JEOR EQUATION

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

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

Everything before the last term is identical. The only difference between the two formulas is the final constant: **+5** for males, **-161** for females. Learn the common part once and just remember the two endings.

Equipment: stadiometer (height), weighing machine (weight), pen and paper.

TRAP CBSE prescribes the **Mifflin-St Jeor** equation, **not** Harris-Benedict. Many guide books print Harris-Benedict — if you write that one, the constants are wrong.

Second trap: **BMR is not BMI**. BMI is a weight-for-height ratio with no units; BMR is an energy requirement in kcal.

Factors affecting BMR: muscle mass, age, gender, genetics, body composition, state of mind, and environmental heat or cold.

WORKED EXAMPLE

A male, 60 kg, 170 cm, 18 years:

$$\text{BMR} = (10 \times 60) + (6.25 \times 170) - (5 \times 18) + 5$$

$$= 600 + 1062.5 - 90 + 5 = 1577.5 \text{ kcal}$$

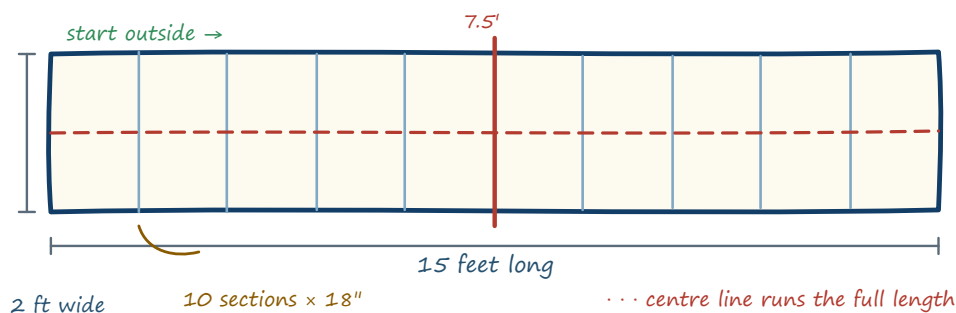
The same person as a female would be $600 + 1062.5 - 90 - 161 = 1411.5 \text{ kcal}$.

7. Johnsen-Metheny Test of Motor Educability

Motor educability = how quickly and easily a person can learn a new motor skill. The battery measures **neuromuscular skill capacity**.

THE DATES AND NUMBERS THAT GET ASKED

1932	Johnson designed the original Educability Test — 10 items
1938	Metheny revised it and eliminated 6 items , leaving 4
Boys / Girls	4 stunts for boys, 3 stunts for girls
Mat area	15 feet long × 2 feet wide , length divided into 10 sections of 18" each
Max score	10 points per stunt



The test area. Each half is 7.5' — one roll goes in each half.

THE FOUR STUNTS — AND HOW EACH IS SCORED

Stunt	Performance	Scoring
1. Front Roll	Start outside the marked area, perform two front rolls — one in each 7.5' half — without touching the limits	5 points per correct roll = 10 max. -2 for over-reaching a side line; -1 for over-reaching the end limit; -5 if it is not a true front roll
2. Back Roll	Two back rolls in the 2-foot lane, one in each half. Same method as the front roll	Same as front roll — 10 max
3. Jumping Half-Turns	Start with feet on the first 3" line, jump with both feet to each successive line executing a half turn in alternate directions	4 perfect jumps = 10 points. -2 per wrong jump (not landing on the line with both feet, or turning the wrong way)
4. Jumping Full-Turns	Start outside the area at the centre of the lane, jump feet-together into alternate rectangles executing full turns in the same direction , landing on both feet each time	5 perfect jumps = 10 points. -2 for losing balance on landing, turning too far, or overstepping the square

TRAP Note the asymmetry examiners love: **Half-Turns = 4 jumps for 10 points** but **Full-Turns = 5 jumps for 10 points**. Also, Half-Turns alternate direction; Full-Turns rotate the same way every time.

8. Question Triggers which test measures what?

If the question asks for a test of...	Answer
Balance in a 6-year-old	Flamingo Balance Test
Limb speed / coordination in a 7-year-old	Plate Tapping Test
Speed in a 14-year-old	50 m Dash
Cardiovascular endurance in a 15-year-old	600 m Run/Walk
Flexibility in a school student	Sit and Reach Test
Abdominal strength	Partial Curl Up
Upper body strength (school)	Push Ups / Modified Push Ups
Lower body strength in an elderly person	Chair Stand Test
Shoulder flexibility in an elderly person	Back Scratch Test
Agility and dynamic balance in the elderly	Eight Foot Up and Go
Aerobic endurance in the elderly	Six Minute Walk Test
Explosive leg strength	Standing Broad Jump
Agility (Barrow)	Zig-Zag Run

Cardiovascular efficiency using a bench	Harvard Step Test
VO ₂ max without running	Rockport One Mile Walk
How fast someone learns a new motor skill	Johnsen–Metheny Test of Motor Educability
Calories needed at complete rest	BMR (Mifflin–St Jeor equation)

MOST-ASKED BOARD QUESTIONS

1. **[5M]** Explain the Rikli and Jones Senior Citizen Fitness Test items and what each measures.
2. **[5M]** Explain the SAI Khelo India Fitness Test for the 9–18 age group.
3. **[3M]** Explain the Barrow three-item general motor ability test.
4. **[3M]** Explain the procedure of the Harvard Step Test and calculate the fitness index.
5. **[1M]** Which test measures VO₂ max? → **Rockport One Mile Walk Test**
6. **[1M]** How many items in the Khelo India test for ages 5–8? → **Three**
7. **[3M]** How can BMR be assessed? Write the Mifflin–St Jeor equation for males and females.
8. **[5M]** Explain the four stunts of the Johnsen–Metheny Test of Motor Educability and their scoring.
9. **[1M]** Who reduced the Johnson Educability Test from ten items to four, and in which year? → **Metheny, 1938**
10. **[1M]** Which parameter is **not** needed to assess BMR — weight, height, age or name? → **Name**

THE HABIT THAT SCORES — For every test write **name** → **procedure in one line** → **what it measures**. The “what it measures” part is the mark most often dropped, and it is the easiest to remember because it is always one fitness component.