

Collegedunia NCERT Notes

Class 7 Science (Curiosity), 2026-27 Syllabus

Chapter 8: Measurement of Time and Motion

Based on NCERT Curiosity, Grade 7, Chapter 8, 2026-27 revision. These notes cover core concepts and selected activities, rather than every project and exercise.

Suggested revision: allow 45-60 minutes for the chapter and a separate 5-minute final recap. These are flexible planning estimates. Experimental activities need extra time.

Also see: NCERT Curiosity, Grade 7, Chapter 8.

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1 Why we measure time

Time measurement tells us when an event happens and how long it lasts. A fair race needs a common distance and careful timing.

1.1 Events and intervals

An instant identifies a particular moment. An interval is the time between two moments. A school begins at an instant, but a lesson lasts for an interval.

- A starting bell marks an instant.
- A race lasting 16 seconds has a measured interval.
- A timetable gives planned instants of arrival and departure.

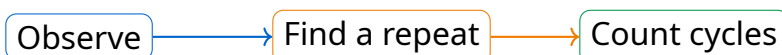
Ask the right question

“What time does the race start?” asks for a clock reading. “How long does the race last?” asks for an interval.

1.2 Repeating events

People noticed recurring natural events before modern watches existed. The day-night cycle, changing Moon phases, and seasons helped people organise their lives.

- A repeated event supplies a reference cycle.
- Counting cycles gives a longer interval.
- A useful reference must repeat predictably.



A school timetable

A timetable gives common starting times. A watch helps everyone follow them. A stopwatch measures the duration of sports events.

1.3 Choosing a time-measuring device

Different tasks need different devices. A calendar suits days and months. A clock suits daily schedules. A stopwatch suits short intervals.

Task	Useful device	Reason
Track a festival date	Calendar	Records days and months
Reach a class on time	Clock or watch	Shows time of day
Compare sprint timings	Stopwatch	Measures a short interval

Read the question first

Choose the device after identifying the interval. A day-long task and a ten-second race need different scales.

2 Timekeeping before modern clocks

Early clocks used shadows, water, sand, or burning candles. Each method connected a visible change with passing time.

2.1 Sundials and changing shadows

A sundial uses the position of a shadow cast by sunlight. The shadow changes as the Sun appears to move across the sky.

- A raised object casts the shadow.
- Marks help relate shadow position to time.
- Sunlight is necessary, so a sundial cannot work at night.

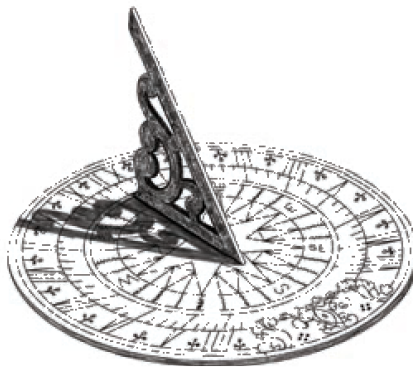


Fig. 8.1: A sundial

Fig. 8.1: A sundial, NCERT Curiosity Class 7.

A useful limitation

A sundial measures local solar time. Its reading needs a correction before comparison with Indian Standard Time.

2.2 Water clocks

In an outflow water clock, water leaves a marked vessel. In a floating-bowl clock, water enters a bowl through a small hole.

- The bowl gradually fills and finally sinks.
- Lifting and floating it again begins another interval.
- Hole size and vessel shape affect the timing.

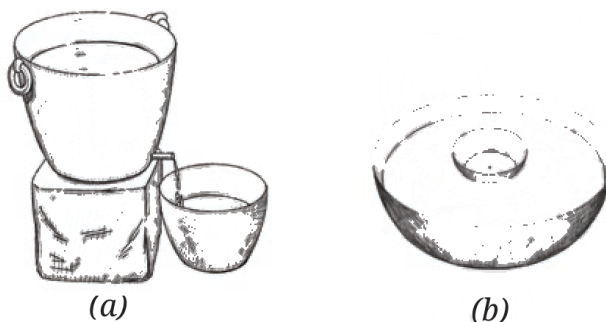


Fig. 8.2: A water clock (a) Water flowing out-type
(b) Floating bowl-type

Fig. 8.2: Two water-clock arrangements, NCERT Curiosity Class 7.

The Ghatika-yantra

Floating-bowl clocks were used in ancient India. A sinking bowl could mark a repeated interval, announced by a gong or drum. A ghati represented 24 minutes. Thus, 60 ghatis made a 24-hour day.

2.3 Sand and candle clocks

An hourglass measures an interval through sand flowing between bulbs. A marked candle uses the amount burned as a time indicator.

- Keep an hourglass in its intended upright position.
- Turn it over to start another interval.
- Candle markings indicate how much time has passed while the candle burns.



Fig. 8.3: An hourglass

Fig. 8.3: An hourglass, NCERT Curiosity Class 7.



Fig. 8.4: A candle clock

Fig. 8.4: A candle clock, NCERT Curiosity Class 7.

Four early clues

Shadow, water, sand, flame: each clock follows a visible change. Remember the change rather than memorising only the device name.

3 Making and checking a water clock

A classroom water clock connects measured minutes with marked water levels. Calibration means comparing its changes with a trusted clock.

3.1 A safe construction plan

Use a transparent plastic bottle with adult help. Sharp tools and cut edges need care. The cap needs a small hole.

1. Ask an adult to cut the bottle and make the hole.
2. Invert the upper half over the lower half.
3. Add coloured water so the level is easy to see.
4. Start a watch as dripping begins.
5. Mark the collected water level after each minute.

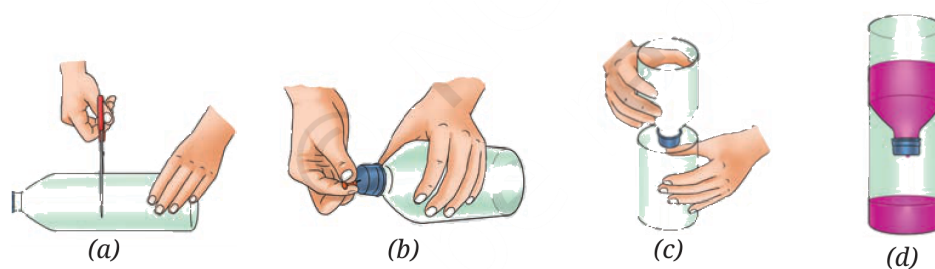


Fig. 8.5: Making a simple water clock

Fig. 8.5: Building a simple water clock, NCERT Curiosity Class 7.

Marks come from observation

Do not assume equal spaces represent equal times. Make each mark when a measured minute has actually passed.

3.2 Using the marked clock again

Return the collected water to the upper part. Use the same starting level and arrangement. Watch the level cross the marks.

- Keep the bottle steady.
- Avoid blocking or widening the hole.
- Repeat the test to see whether readings agree.



Unequal marks can be correct

Water flow can change as the level falls. Equal time intervals need not produce equal changes in water height.

3.3 Recording evidence

Write observations immediately. Keep the starting amount, hole, bottle, and support unchanged when comparing repeated trials.

Trial	What to record	What to compare
First	Time at each mark	Reference calibration
Second	Time at the same marks	Difference from first trial
Third	Time at the same marks	Whether differences persist

Fair comparison

Change one feature at a time. Changing both hole size and water level prevents a clear comparison.

4 A simple pendulum

A simple pendulum has a bob suspended by a thread from a rigid support. Its repeated motion can help measure time.

4.1 Parts and positions

The bob hangs below the support. At rest it is at its mean position. The outer turning positions are extreme positions.

Christiaan Huygens invented the pendulum clock in 1656 and patented it in 1657. Galileo's pendulum investigations helped inspire him.

- The support must remain steady.
- The thread should be taut.
- Release the bob gently after a small sideways movement.

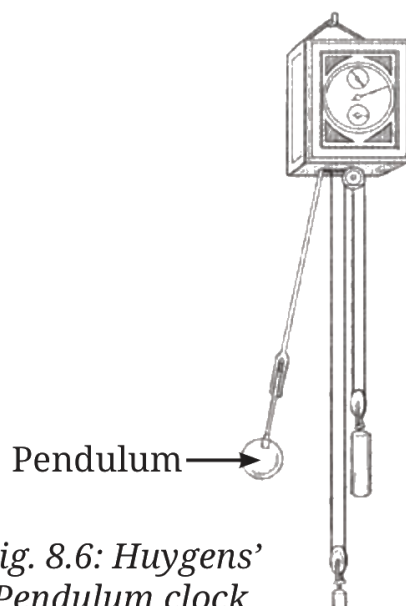


Fig. 8.6: Huygens' Pendulum clock

Fig. 8.6: Huygens' pendulum clock, NCERT Curiosity Class 7.

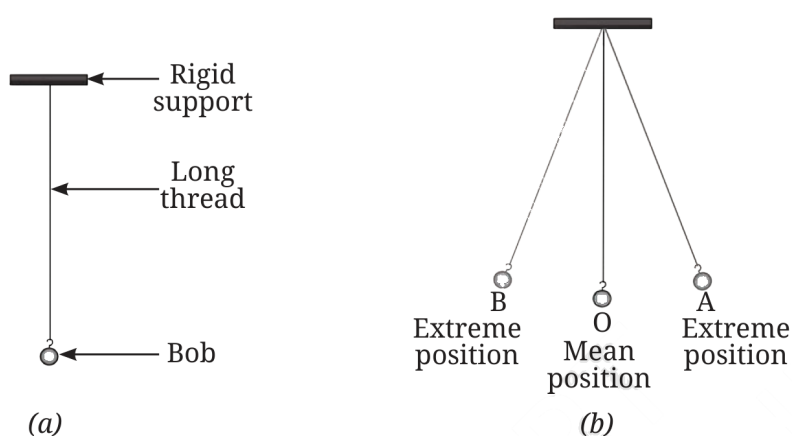


Fig. 8.7: A simple pendulum

Fig. 8.7: A simple pendulum and its positions, NCERT Curiosity Class 7.

Oscillatory and periodic

The bob moves to and fro. With small swings, the motion repeats in approximately equal time intervals.

4.2 What counts as one oscillation?

Starting at an extreme position, a complete oscillation goes to the other extreme and returns. A one-way trip is only half.



- Starting at A: A to B to A is one oscillation.
- Starting at O towards A: O to A to O to B to O is one oscillation.
- Return to the same position with the same direction of motion.

Do not double the count

A to B is not a complete oscillation. Counting every extreme arrival as one complete oscillation gives the wrong period.

4.3 Time period

The time period is the time for one complete oscillation. We use the symbol T in these notes.

Measure several oscillations

Result only: use the measured total and the complete oscillation count.

$$T = \frac{\text{total time for counted oscillations}}{\text{number of oscillations}}$$

If ten oscillations take 20 seconds, the period is $20/10 = 2$ s.

One return, one count

Choose one extreme as the reference. Begin at zero, then count each return to that same extreme.

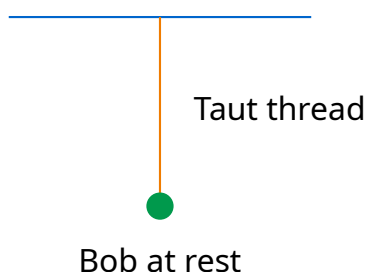
5 Measuring a pendulum's time period

Timing several swings reduces the effect of starting or stopping the watch slightly late. Repeated trials help check consistency.

5.1 Classroom procedure

Set up the pendulum away from people's faces. Keep the swing small and leave a clear space around the bob.

1. Let the bob come to rest.
2. Move it a little to one side.
3. Release it without a push.
4. Time ten complete oscillations.
5. Divide the measured time by ten.
6. Repeat and compare the results.



Small swings are the condition

For a given length at a place, the time period is approximately constant for small swings. Do not test with large pushes.

5.2 An example observation table

The following values illustrate a classroom record. They are example measurements, not a claim about every pendulum.

Trial	Time for 10 oscillations	Time period
1	20.0 s	2.00 s
2	20.2 s	2.02 s
3	19.8 s	1.98 s

- Trial 1: $20.0/10 = 2.00$ s.
- Trial 2: $20.2/10 = 2.02$ s.
- Trial 3: $19.8/10 = 1.98$ s.

Total time and period differ

Twenty seconds for ten oscillations does not mean a twenty-second time period. Divide by the number counted.

5.3 Exploring changes fairly

Compare pendulums of different lengths while keeping other conditions similar. A longer pendulum takes more time per small oscillation.

Also compare bobs of different masses at the same pendulum length and place. Use small swings and time ten complete oscillations. Their periods are approximately equal: the period does not depend on bob mass under these conditions.

- Use the same counting rule each time.
- Keep the support firm and the swing small.
- Compare repeated readings, rather than one reading alone.

A playground swing

A gently moving swing resembles a pendulum. Measure ten complete swings, then divide by ten. Stay clear of moving swings.

6 Units, watches, and elapsed time

The SI unit of time is the second, with symbol s. Minutes and hours are convenient for longer everyday intervals.

6.1 Converting time units

A conversion changes the unit without changing the interval. Multiply when moving to a smaller unit because more units are needed.

Time conversions

Results only: these equal intervals define the unit conversions.

$$1 \text{ min} = 60 \text{ s}, \quad 1 \text{ h} = 60 \text{ min} = 3600 \text{ s}$$

- $3 \text{ min} = 3 \times 60 = 180 \text{ s}$.
- $120 \text{ s} = 120/60 = 2 \text{ min}$.
- $\frac{1}{2} \text{ h} = 30 \text{ min} = 1800 \text{ s}$.



Smaller units, larger number

One minute contains many seconds. The same interval therefore has a larger numerical value in seconds than in minutes.

6.2 Reading clocks

Analogue clocks show time with hands. Digital watches show numbers. A stopwatch measures the interval since it was started.

Modern clocks also use repeated processes. Quartz clocks use rapid crystal vibrations. Atomic clocks use repeating processes associated with particular atoms.



Fig. 8.8: Some common clocks and watches

Fig. 8.8: Common clocks and watches, NCERT Curiosity Class 7.



Fig. 8.9: A wall clock

Fig. 8.9: A wall clock, NCERT Curiosity Class 7.

The illustrated wall clock measures intervals as small as one second, as identified in NCERT Activity 8.3.

- Check the smallest marked interval before reading.
- Check whether a digital reading uses hours, minutes, or seconds.
- Do not treat a clock's displayed instant as a measured duration.

Accessible timekeeping

Braille watches and talking watches help people read time without relying on ordinary printed clock faces.

Measuring fractions of a second

Sports timing may distinguish hundredths or thousandths of a second. Heart-monitor measurements and digital sound recording also use very short intervals.

6.3 Finding an interval from two times

Count forward from the starting time to the ending time. Across an hour boundary, split the interval into two parts.

Example: 9:45 to 10:20

$$15 \text{ min} + 20 \text{ min} = 35 \text{ min}$$

- From 9:45 to 10:00: 15 minutes.
- From 10:00 to 10:20: 20 minutes.
- Total: 35 minutes, or $35 \times 60 = 2100 \text{ s}$.

Hours are not decimal hundreds

One hour contains 60 minutes. A time written as 1 h 30 min equals 1.5 h, not 1.30 h.

7 Comparing motion and finding speed

Speed tells us how much distance an object covers per unit time. Compare like quantities before deciding which object is faster.

7.1 Same time or same distance

For a common starting time, the runner covering more distance in the same interval has the greater average speed.



Fig. 8.10: Boys running a race on a straight track

Fig. 8.10: A race on a straight track, NCERT Curiosity Class 7.

- Same time: compare distances.
- Same distance: compare times.
- Different distances and times: calculate speeds first.

A —————→ 60 m

B —————→ 40 m

Both measured over 10 s

A fair comparison

In ten seconds, A covers 60 m and B covers 40 m. Their average speeds are 6 m/s and 4 m/s.

7.2 The speed formula

Divide the total distance by the total time. The answer describes the whole measured journey, including changes in speed.

Average speed

Definition: average speed is total distance divided by total time.

$$v = \frac{d}{t}$$

Here v means average speed, d total distance, and t total elapsed time.

- Distance in metres and time in seconds give m/s.
- Distance in kilometres and time in hours give km/h.
- Always write the unit with the answer.

The school journey

A bicycle may slow near a crossing and speed up on an open road. Total distance divided by total time gives its average speed.

7.3 A fully worked bicycle example

A cyclist covers 3.6 km in 15 minutes. Find the average speed in m/s.

1. Convert distance: $3.6 \times 1000 = 3600$ m.
2. Convert time: $15 \times 60 = 900$ s.
3. Divide: $v = 3600/900 = 4$ m/s.
4. Check: $4 \times 900 = 3600$ m, matching the distance.

Keep units consistent

Dividing 3.6 by 15 gives km/min, not m/s. Convert both quantities before writing an m/s answer.

8 Using speed, distance, and time

The same relationship finds any missing quantity when the other two are known. The chosen units must match throughout.

8.1 Finding distance

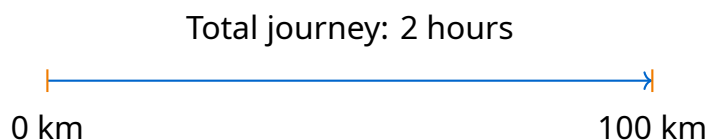
At a stated constant speed, distance equals speed multiplied by time. The same calculation works with a stated average speed for the whole interval.

Distance

Result only: this is the distance form of the speed relationship.

$$d = v \times t$$

1. A bus moves at an average speed of 50 km/h for 2 h.
2. Substitute: $d = 50 \times 2$.
3. The distance is 100 km.



Read the condition

If the speed is constant, equal hours give equal distances. With average speed, the total is known but each hour may differ.

8.2 Finding time

Divide distance by speed. Express distance in the length unit used in the speed before dividing.

Time

Result only: this is the time form of the speed relationship.

$$t = \frac{d}{v}$$

1. A train covers 360 km at an average speed of 90 km/h.
2. Substitute: $t = 360/90$.
3. The required time is 4 h.
4. Check: $90 \times 4 = 360$ km.

Check what the answer should measure

Distance answers need length units. Time answers need time units. Speed answers need a distance unit divided by a time unit.

8.3 Converting speed units

One kilometre is 1000 metres. One hour is 3600 seconds. Use both facts when converting km/h to m/s.

Speed conversions

Conversion working: use 1000 metres per kilometre and 3600 seconds per hour.

$$1 \text{ km/h} = \frac{1000}{3600} \text{ m/s} = \frac{5}{18} \text{ m/s}$$

$$1 \text{ m/s} = \frac{18}{5} \text{ km/h} = 3.6 \text{ km/h}$$

- $72 \text{ km/h} = 72 \times 5/18 = 20 \text{ m/s}$.
- $15 \text{ m/s} = 15 \times 3.6 = 54 \text{ km/h}$.
- A larger number in another unit does not automatically mean faster motion.

[Download the Full NCERT Chapter](#)

9 Uniform and non-uniform linear motion

Linear motion follows a straight path. Its speed may stay constant or change. The path alone does not decide uniformity.

9.1 Uniform linear motion

An object in uniform linear motion covers equal distances in equal time intervals along a straight line.

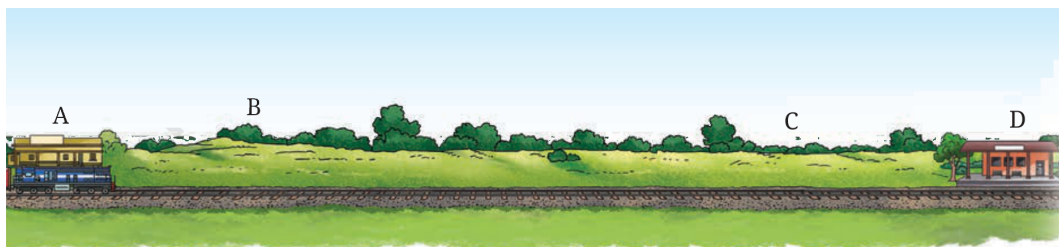
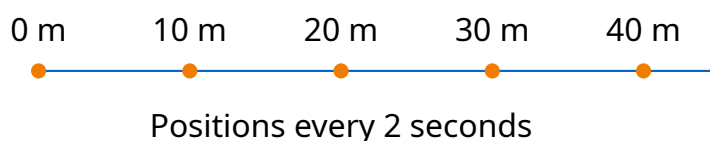


Fig. 8.11: A train on a straight track

Fig. 8.11: A train on a straight track, NCERT Curiosity Class 7.

- The speed stays constant.
- Equal intervals must be compared.
- Uniform motion over long journeys is an idealisation.

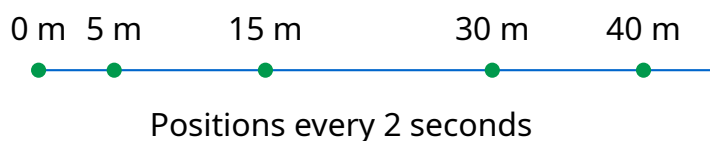


Equal intervals matter

Ten metres in two seconds and twenty metres in four seconds represent the same speed. The intervals differ, so compare ratios.

9.2 Non-uniform linear motion

When speed changes along a straight line, the motion is non-uniform linear motion. A train accelerates from a station and slows before stopping.



- Unequal spacing represents unequal distances in equal times.
- The object may speed up, slow down, or stop.

- Traffic commonly makes a car journey non-uniform.

Speedometer and odometer

A speedometer displays a vehicle's speed. An odometer records distance travelled. Neither name should be used for the other instrument.

9.3 Distance readings versus interval distances

A table may show total distance from the start. Subtract consecutive readings to find distance covered during each interval.

Time (s)	Total distance (m)	Distance in last 10 s (m)
0	0	Not applicable
10	20	20
20	40	20
30	60	20

- Between 10 s and 20 s: $40 - 20 = 20$ m.
- Between 20 s and 30 s: $60 - 40 = 20$ m.
- Equal interval distances support uniform motion in the given data.

10 Journeys, tables, and careful reasoning

Average speed summarises a whole journey. It does not reveal every change along the route. Tables help examine those changes.

10.1 A three-hour journey

A car covers 60 km, 70 km, and 50 km in three successive hours. The equal-hour distances are unequal.

1. Total distance: $60 + 70 + 50 = 180$ km.
2. Total time: $1 + 1 + 1 = 3$ h.
3. Average speed: $180/3 = 60$ km/h.
4. Motion is non-uniform because hourly distances differ.

Same average does not mean same motion

A car moving steadily at 60 km/h for three hours also covers 180 km. Its average matches, but its motion differs.

10.2 A journey with a stop

A walker covers 600 m in 10 min, rests for 5 min, then covers another 600 m in 15 min.

1. Total distance: $600 + 600 = 1200$ m.
2. Total elapsed time: $10 + 5 + 15 = 30$ min = 1800 s.
3. Average speed: $1200/1800 = 2/3$ m/s, about 0.67 m/s.

- Include the rest when the whole journey is specified.
- The distance does not increase during the rest.
- Moving-time speed answers a different question.

Read the whole interval

Average speed uses the total time named in the question. Do not silently remove a stop from the journey.

10.3 Solving a mixed-speed journey

A vehicle covers 2 km in 200 s. Its first 500 m takes place at 10 m/s, and the next 500 m at 5 m/s.

1. First time: $500/10 = 50$ s.
2. Second time: $500/5 = 100$ s.
3. Remaining time: $200 - 50 - 100 = 50$ s.
4. Remaining distance: $2000 - 500 - 500 = 1000$ m.
5. Required final speed: $1000/50 = 20$ m/s.
6. Whole-journey average: $2000/200 = 10$ m/s.

Combine times before averaging

The three speed values alone cannot give the journey average. Use total distance divided by total time.

11 Practice and self-check

These questions check the chapter's main ideas. Write units at every numerical step. Explain a comparison instead of naming only a faster object.

11.1 Short questions with answers

Try each question before reading the explanation.

1. Why does a sundial fail at night? It needs sunlight to form the time-indicating shadow.
2. What is a pendulum's bob? It is the small suspended mass at the lower end of the thread.
3. What is the SI unit of time? The second, written s.
4. Why time ten oscillations? A start-stop delay affects the time for one swing more strongly.
5. Can straight-line motion be non-uniform? Yes. The object may change speed while remaining on a straight path.
6. Does an odometer measure speed? No. It measures distance travelled.

Explain the reason

Use the defining feature in an answer. For non-uniform motion, mention unequal distances in equal intervals along the stated path.

11.2 Numerical practice

The following values are additional practice examples. They use only the relationships developed in this chapter.

1. A runner covers 100 m in 20 s. Speed: $100/20 = 5$ m/s.
2. A bus averages 40 km/h for 3 h. Distance: $40 \times 3 = 120$ km.

3. A cyclist covers 24 km at 12 km/h. Time: $24/12 = 2$ h.
4. Fifteen oscillations take 30 s. Period: $30/15 = 2$ s.
5. Convert 36 km/h to m/s: $36 \times 5/18 = 10$ m/s.
6. Convert 8 m/s to km/h: $8 \times 3.6 = 28.8$ km/h.

Check by reversing

Multiply speed by time to recover distance. Multiply period by the oscillation count to recover total timing.

11.3 Plan a small investigation

Measure walking speed on a safe, level path. Do not use a road with traffic. Work with an adult or teacher.

1. Mark a measured straight distance, such as 20 m.
2. Ask one person to walk normally between the marks.
3. Time the interval with the same start-stop rule.
4. Calculate distance divided by time.
5. Repeat and compare readings.
6. Record possible timing and distance-reading errors.

A sensible conclusion

Report the measured conditions. A short walking test does not establish someone's speed on every journey.

Related Collegedunia Resources

Same chapter, other resources:

[Chapter 8: NCERT Book PDF](#)

Continue learning:

- [Chapter 6 Notes: Adolescence](#)

12 Quick Reference Summary

Use this section for a final revision. Read a definition, recall an example, and check the unit before moving on.

12.1 Definitions to recall

Each term names a different part of timekeeping or motion.

Term	Meaning
Time interval	Duration between two instants
Oscillation	One complete to-and-fro motion
Time period	Time for one complete oscillation
Average speed	Total distance divided by total time
Uniform linear motion	Straight-line motion with constant speed
Non-uniform linear motion	Straight-line motion with changing speed

Distance, time, then divide

For average speed, gather the complete distance and complete interval first. Only then divide. This order prevents many journey mistakes.

12.2 Formula and unit sheet

Use matching units. Formula symbols are shorthand for measured quantities, not extra facts to memorise without meaning.

Core relationships

$$v = d/t, \quad d = vt, \quad t = d/v$$
$$T = \frac{\text{time for } n \text{ oscillations}}{n}$$

- Time: second (s), minute (min), hour (h).
- Distance: metre (m), kilometre (km).
- Speed: m/s or km/h.
- 1 km = 1000 m; 1 h = 3600 s.

12.3 Final checklist

A complete answer states what was measured and how the result follows.

- Distinguish time of day from elapsed time.
- Count complete oscillations, not half-swings.
- Convert before substituting values.
- Compare equal time intervals when testing uniformity.
- Use total distance and total elapsed time for average speed.
- Write a unit and check whether the result is reasonable.

Scope of these notes

These notes follow Class 7 Curiosity, Chapter 8. They cover core concepts and selected activities in timekeeping, pendulums, speed, and linear motion. They do not reproduce every textbook project or exercise.