Instant vs Time Interval

Physics with Tiaotiao 跳跳 · Kinematics · High School Physics

Study sheet for the video "Instant vs Time Interval": key ideas, practice questions, answers

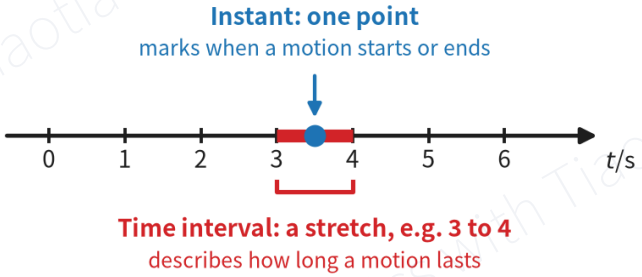
Matches: NCERT Class 11 Ch 2 · FSc Part 1 Ch 3 · AS & A Level 9702 · WAEC/JAMB · HSC · College Physics

Key ideas

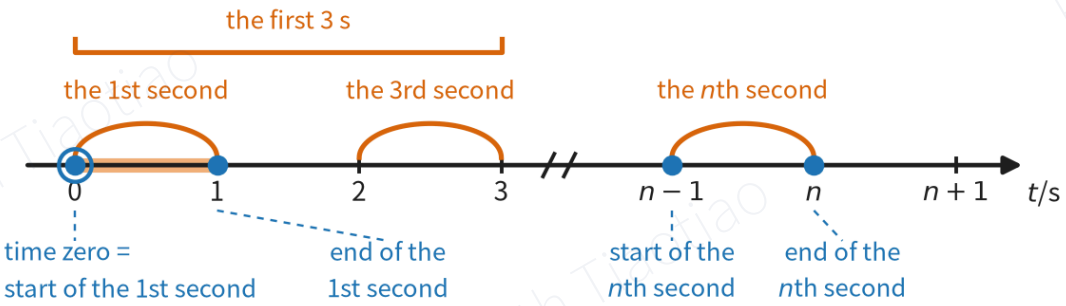
In daily life, "time" means two things: a point in time (5:00, 3 a.m.) or a stretch of time (2 days, half an hour). Physics gives them two different names.

Instant: a single point in time, **one point** on the time axis. It marks when a motion starts or ends.
A photo records what happened at one instant.

Time interval: a stretch of time, **one segment** of the time axis. It describes how long a motion lasts.
1 s, 1 h, 1 day, three days and three nights: all time intervals.

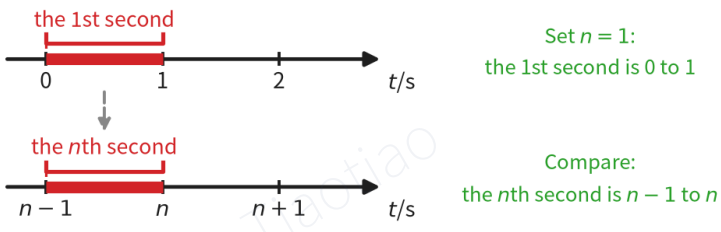


Commonly tested



There is no "0th second". The time axis starts at 0, so the very first stretch, 0 to 1, is the 1st second. But there *is* a time zero (an instant).

Trick for "*n*th" questions: if you get stuck, **set *n* = 1**. The 1st second is 0 to 1, so the *n*th second is *n*−1 to *n*.



Practice

Try these before checking the answers on the last page.

1. Warm-up. A pupil wrote a diary letter to his dad. Is each phrase an instant (I) or a time interval (T)?

_____ (1) "it should already be 5:00"
_____ (2) "for the last 2 days"
_____ (3) "from 7:00 in the morning to 12:00 at night"
_____ (4) "more than ten hours straight"
_____ (5) "startled me awake at 3 a.m."
_____ (6) "took half an hour to fall asleep again"
_____ (7) "I slept for forty minutes in math class"

2. Which of the following timing data refers to a time interval? ( )

A typical Grade 10 exam question in China.

A. CCTV's news broadcast lasts 30 min

B. The Hong Kong handover took effect at 0:00 on 1 July 1997

C. The Beijing Olympics opening ceremony began at 8 p.m. on 8 August 2008

D. At 21:16:03 on 29 September 2011, Tiangong-1 was launched from the Jiuquan Satellite Launch Center

Answer: _____ Why?

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3. Fill in. Time intervals or instants?

(1) the 3rd second: _____ (2) the first 3 s: _____ (3) the end of the 1st second: _____

(4) time zero: _____ (5) the start of the *n*th second: _____

(6) The *n*th second runs from _____ to _____ .

4. For the time axis shown, which statement about instants and time intervals is correct? ( )



A. t_2 is an instant, called the end of the 2nd second or the start of the 3rd second, and can also be called "within 2 s"

B. t_2 to t_3 is a time interval, called the 3rd second

C. t_0 to t_2 is a time interval, called the first 2 s or the 2nd second

D. t_{n-1} to t_n is a time interval, called the (n−1)th second

Answer: _____ Why are the others wrong?

Answers and explanations

Tap a blue time to jump to the part of the video that explains the question.

1. **(1) I** **(2) T** **(3) T** **(4) T** **(5) I** **(6) T** **(7) T**
Points in time: 5:00 and 3 a.m. Stretches of time: 2 days, 7:00 to 12:00, over ten hours, half an hour, forty minutes.
▶ **Watch 2:35, Warm-up**

2. **A**. A runs from 7:00 to 7:30 p.m., so it is a time interval.
B 0:00 on 1 July is one instant, not a stretch of time.
C The ceremony began right after 8 p.m. Read C as 8:00:00 p.m.: an instant.
D The launch happened at that one instant, even though the time is given to the second.
▶ **Watch 5:29, Example 1**

3. (1) **interval** (2) **interval** (3) **instant** (4) **instant** (5) **instant** (6) ***n*−1 to *n***
Set $n = 1$ to check (6): the 1st second is 0 to 1, so the nth second is $n-1$ to n.
▶ **Watch 7:15, Phrases**

4. **B**. t_2 to t_3 is a stretch, so it is a time interval. Counting from 0: 0 to 1 is the 1st second, 1 to 2 the 2nd, 2 to 3 the 3rd.
A t_2 is a point, so it is an instant. "End of the 2nd second or start of the 3rd" is right, but "within 2 s" is a stretch. A point can't also be a time interval.
C 0 to t_2 is "the first 2 s", but not "the 2nd second". The 2nd second is only 1 to 2.
D Set $n = 1$: t_{n-1} to t_n becomes t_0 to t_1, which the option calls the "0th second". There is no 0th second. Change $n-1$ to n and D is right.
▶ **Watch 10:31, Example 2**

One-line summary

An instant is a point; a time interval is a stretch. The nth second is $n-1$ to n (stuck? set $n = 1$), and there is no 0th second.

Key terms

Term	Meaning	Chinese
instant	one point on the time axis	时刻 shíkè
time interval	a stretch (segment) of the time axis	时间（间隔） shíjiān (jiàngé)
time axis	a line that shows time t in seconds	时间轴 shíjiānzhóu
time zero	the instant $t = 0$, the start of the 1st second	零时刻 líng shíkè
the nth second	the stretch from $n-1$ to n	第 n 秒 dì n miǎo
the first 3 s	the stretch from 0 to 3	前 3 秒 qián sān miǎo
the end of the 1st second	the instant $t = 1$ s	第 1 秒末 dì yī miǎo mò