

ANM ADMISSION

পাঠ্যক্রমভিত্তিক অসমীয়া আৰু ইংৰাজী দুয়োটা মাধ্যমতে উপলব্ধ

SSUHS ANM Entrance Examination Guide

English - 40 Marks

Mathematics - 30 Marks

General Science - 30 Marks



SCAN HERE



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Reading with a clear purpose

Reading comprehension is the process of building meaning from a passage and using evidence in the passage to answer a question. It is more precise than finding a word that looks similar to a word in the question. A good reader first understands what the passage says, then checks which sentence supports the selected answer.

A short entrance-exam passage may describe an event, explain a process, compare two things, or present a problem and a response. Its subject may be familiar or unfamiliar. Unless a question explicitly asks for outside knowledge, base the answer on the information in the passage. Use the passage as the source of evidence: consider its statements, connections and limits.

Four aspects of a passage

Most comprehension questions concern one of four aspects of meaning.

Layer	What to identify	Useful question
Topic	The general subject being discussed	What is this passage about?
Main idea	The central point the writer makes about the topic	What does the writer want me to understand?
Supporting detail	A fact, example, reason or result that develops the main idea	Which sentence proves or illustrates it?
Inference	A conclusion supported by evidence in the passage, even when it is not stated word for word	What follows even though it is not stated word for word?

The topic may be a single word such as **rainwater**, while the main idea is a complete statement such as “A simple collection system can make rainwater useful during a dry period.” A detail may name the tank, the roof or the cleaning routine. An inference goes one careful step beyond the exact wording; it must still be supported.

উদাহরণ:

Read the statement: “The library stayed open for an extra hour during the examination month, because many students could not study at home.” What is the main idea?

উত্তর: The library extended its hours to support students who could not study at home. “Examination month” is a time detail, and “could not study at home” is the reason. The main idea connects the action with its purpose.

Evidence before assumption

An answer is **directly stated** when the passage says it clearly, even if the question changes the wording. An answer is an **inference** when the passage provides clues from which a short conclusion follows. An answer based only on general knowledge or personal opinion is not acceptable unless the passage supports it.

Question wording	Evidence to locate	Common mistake
According to the passage	A sentence or an exact equivalent	Choosing a true fact that the passage never gives

Question wording	Evidence to locate	Common mistake
Why did this happen?	A stated cause or a clear cause-effect link	Choosing a later event as the cause
This suggests that	The clue or clues pointing to one modest conclusion	Making a broad claim about all people or all situations
The word means	The local meaning in that sentence	Selecting the most familiar dictionary meaning

Words such as **always**, **never**, **only**, **all** and **must** make an option very strong. Select such an option only when the passage uses an equally strong condition. If a passage says “some learners used the room”, an answer saying “all learners used the room” exceeds the evidence.

An efficient passage method

Use a repeatable sequence. Speed improves when each step has a defined purpose.

1. Preview the shape

Read the title, if one is given, and notice the number of paragraphs. The opening sentence often introduces the topic. A final sentence may state a result, recommendation or contrast. This preview creates a map; it does not replace careful reading.

Do not spend too long predicting the content. A prediction is only a temporary expectation. If the passage gives different information, replace the expectation with the passage's evidence.

2. Read for the main idea and development

On the first reading, ask what changes from the beginning to the end. A passage may move from a problem to a solution, from an observation to an explanation, or from a common belief to a correction. Mark mentally the subject of each paragraph in one or two words.

Signal words reveal relationships:

Signal	Relationship	Examples of use
because, since, therefore	Cause and result	A blocked drain caused water to collect; therefore, the path was closed.
however, although, whereas	Contrast or qualification	The tank is small; however, it supplies drinking water for a short period.
first, next, finally	Sequence	First filter the water; next store it; finally label the container.
for example, such as	Illustration	Several grains, such as rice and millet, can be stored safely when dry.
in addition, also	Added information	The plan saves water and also reduces daily carrying work.

3. Locate the relevant sentences

Return to the passage after reading a question. Search for a key noun, a name, a time expression or a relationship word. Read the whole sentence containing the match and, when necessary, the sentence before or after it. The answer often depends on a few sentences rather than the whole passage.

The exact word in the question may be replaced by a synonym. **Rapid** may appear as **quick**, **reduce** as **lower**, and **purpose** as **reason**. Search for the idea, not just the spelling.

Using this chapter

Usage questions ask whether a sentence is built and punctuated correctly. Transformation questions ask you to change the form while keeping the meaning. The reliable method is to identify the message first, then change one grammatical feature at a time. Ask three questions before accepting an answer:

- Which words carry the action, and who or what receives it?
- Has the time, certainty, obligation, or relationship between ideas changed?
- Does the new sentence remain a complete, natural sentence?

This chapter covers selected Class X English grammar patterns and Class IX foundations named in the ASSEB English (Second Language) syllabus: voice, narration, synthesis of sentences, verb phrases, sentence correction, clauses, and modals. It also reviews punctuation where punctuation changes structure or meaning. The SSUHS notice gives Class X as the standard for the entrance paper but does not publish a topic-wise English syllabus. The chapter therefore uses the Class X level as the scope and treats the chapter sequence as an editorial preparation plan.

Unit	Main decision	Useful check
Voice	Change the focus between doer and receiver	Keep the tense and the object relationship.
Narration	Report a speaker's words	Change viewpoint and structure, not the message.
Joining	Connect two or more ideas	Show the correct logical relation.
Correction	Locate and repair one error	Read the whole sentence before editing.
Modals	Express ability, permission, possibility or duty	Use a modal with the correct verb form.
Punctuation	Mark boundaries and relationships	Do not use punctuation to repair a faulty clause.

The examples are authored for practice. They are not reproduced questions from an ASSEB or SSUHS paper. A transformed sentence may have more than one grammatical version; the answer shown here is one clear version that preserves the stated meaning.

Voice: changing the focus of an action

In the **active voice**, the grammatical subject is presented as performing or causing the action. It may be an agent, an instrument, or another participant. In the **passive voice**, the receiver of a transitive action becomes the grammatical subject. The change is one of focus. It does not normally change the event, time, or degree of certainty.

In The health worker checked the register, **the health worker** is the subject, **checked** is the verb, and **the register** is the object. A passive version is The register was checked by the health worker. The original object becomes the new subject. The past tense is still past: checked becomes was checked.

The structure of a passive verb phrase

A common finite passive verb phrase has two required parts and may include a third:

- a form of **be** to carry tense or agreement;

- the past participle of the main verb; and
- an optional **by**-phrase naming the agent.

The participle does not change for person or number. The form of **be** does: The form is signed, but The forms are signed. A passive sentence can omit the agent when it is unknown, obvious, or less important than the result. The door was locked at six may be more useful than The guard locked the door at six when the person is not relevant.

Tense or pattern	Active	Passive
Simple present	The clerk records the entry.	The entry is recorded by the clerk.
Simple past	The clerk recorded the entry.	The entry was recorded by the clerk.
Simple future	The clerk will record the entry.	The entry will be recorded by the clerk.
Present continuous	The clerk is recording the entry.	The entry is being recorded by the clerk.
Past continuous	The clerk was recording the entry.	The entry was being recorded by the clerk.
Present perfect	The clerk has recorded the entry.	The entry has been recorded by the clerk.
Past perfect	The clerk had recorded the entry.	The entry had been recorded by the clerk.
Modal	The clerk must record the entry.	The entry must be recorded by the clerk.

The passive pattern is therefore not simply “add **was**”. First identify the tense of the active verb. Then put that tense on the appropriate form of **be**, change the main verb to its past participle, and move the object into subject position.

উদাহৰণ:

Change to the passive voice: “The nurse is checking the patient’s temperature.”

উত্তৰ: The active verb is in the present continuous tense: **is checking**. Put the receiver, **the patient’s temperature**, first. The passive form is **is being checked**. The answer is: “The patient’s temperature is being checked by the nurse.”

Choosing the correct participle

Regular verbs usually form the past participle with **-ed**: clean → cleaned, record → recorded, and prepare → prepared. Irregular verbs must be learnt as a separate form: write → written, take → taken, give → given, see → seen, do → done, make → made, send → sent, and choose → chosen.

Base form	Simple past	Past participle
break	broke	broken
build	built	built
draw	drew	drawn
eat	ate	eaten
find	found	found
hold	held	held
know	knew	known
read	read	read
speak	spoke	spoken

Base form	Simple past	Past participle
teach	taught	taught
throw	threw	thrown
understand	understood	understood

Do not confuse the simple past with the past participle. The committee chose the date becomes The date was chosen by the committee, not was chose. In a perfect passive, the participle **been** follows the perfect auxiliary: The date has been chosen.

When an active sentence can become passive

A normal passive transformation requires a transitive verb, that is, a verb with a direct object. The object supplies the new subject. The team solved the problem can become The problem was solved by the team because **the problem** is the object of **solved**.

Many intransitive verbs do not take a direct object, so they do not have an ordinary passive form. The child slept, The visitors arrived, The patient fainted, and The meeting ended cannot be changed by moving an object because no object is present. Avoid forms such as The meeting was ended when the original meaning is simply that the meeting came to an end. A transitive use may be different: The chairperson ended the meeting becomes The meeting was ended by the chairperson.

Some verb combinations allow a passive even though the noun follows a preposition: The nurse looked after the child becomes The child was looked after by the nurse. Retain the preposition as part of the verb combination. This does not mean that every prepositional phrase can supply a passive subject; learn the established pattern rather than inventing one.

Verb pattern	Active sentence	Passive decision
Transitive verb	The officer opened the gate.	The gate was opened by the officer.
Intransitive verb	The guests arrived early.	No ordinary passive; there is no object.
Linking verb	The water became cold.	No passive transformation; cold is a complement.

Keeping agreement after the change

After the object becomes the passive subject, the form of **be** must agree with the new subject. The report was submitted becomes The reports were submitted. The agent after **by** does not control agreement: The reports were submitted by the clerk, not was submitted merely because **clerk** is singular.

With a compound object, count the new subject accurately. The doctor examined the patient and the child becomes The patient and the child were examined by the doctor. With an uncountable noun, use a singular form when the noun is treated as a mass: The equipment was checked, The information was recorded, and The furniture was moved.

উদাহৰণ:

Change to the passive voice: "The assistants have packed the instruments."

উত্তৰ: The object is **the instruments**, which is plural. The present perfect passive is **have been packed**: "The instruments have been packed by the assistants."

সমান্তৰ প্ৰগতিৰ ধাৰণা

দৈনন্দিন জীৱনৰ বহু ক্ষেত্ৰত পৰিমাণৰ পৰিৱৰ্তন এটা নিৰ্দিষ্ট নিয়ম অনুসৰি হয়। উদাহৰণস্বৰূপে, প্ৰতি মাহে সঞ্চয় কৰা টকাৰ পৰিমাণ একে পৰিমাণে বাঢ়িব পাৰে, আসনৰ প্ৰতিটো শাৰীত আগৰ শাৰীটোতকৈ সমান সংখ্যক আসন বেছি থাকিব পাৰে, অথবা কোনো সঁজুলিৰ মূল্য প্ৰতি বছৰে একে পৰিমাণে কমিব পাৰে। এনে নিয়মেৰে সজোৱা সংখ্যাৰ তালিকাক বুজিবলৈ প্ৰথমে তালিকাখনৰ পদবোৰ আৰু পদৰ মাজৰ পৰিৱৰ্তন লক্ষ্য কৰিব লাগে।

এটা নিৰ্দিষ্ট ক্ৰমত সজোৱা সংখ্যাৰ তালিকাক **অনুক্রম** বোলা হয়। অনুক্রমৰ প্ৰতিটো সংখ্যক **পদ** বোলা হয়। উদাহৰণস্বৰূপে, 4, 7, 10, 13, ... এটা অনুক্রম; ইয়াৰ প্ৰথম পদ 4, দ্বিতীয় পদ 7 আৰু তৃতীয় পদ 10। অনুক্রমৰ n -তম পদক সাধাৰণতে a_n -ৰে লিখা হয়। প্ৰথম পদ a_1 বা সংক্ষেপে a , আৰু শেষ পদ থাকিলে তাক l -ৰে বুজাব পাৰি।

অনুক্রম আৰু সমান্তৰ প্ৰগতি একে কথা নহয়। 2, 4, 8, 16, ...-ত পদবোৰ দ্বিগুণ হৈছে, কিন্তু একেৰাহে দুটা পদৰ পাৰ্থক্য একে নহয়; সেয়ে ই সমান্তৰ প্ৰগতি নহয়। 5, 9, 13, 17, ...-ত প্ৰতিটো পৰৱৰ্তী পদ আগৰ পদত 4 যোগ কৰি পোৱা যায়; সেয়ে এইটো সমান্তৰ প্ৰগতি।

সমান্তৰ প্ৰগতিৰ সংজ্ঞা

যি অনুক্রমত প্ৰথম পদৰ পিছৰ প্ৰতিটো পদ আগৰ পদত একে নিৰ্দিষ্ট সংখ্যা যোগ কৰি পোৱা যায়, তাক **সমান্তৰ প্ৰগতি** (Arithmetic Progression, চমুকৈ AP) বোলা হয়। এই নিৰ্দিষ্ট সংখ্যক **সাধাৰণ অন্তৰ** বোলা হয় আৰু সাধাৰণতে d -ৰে লিখা হয়।

যদি AP-ৰ প্ৰথম পদ a আৰু সাধাৰণ অন্তৰ d হয়, তেন্তে অনুক্রমটো এইদৰে লিখিব পাৰি:

$$a, a + d, a + 2d, a + 3d, \dots$$

ইয়াৰ একেৰাহে দুটা পদৰ পাৰ্থক্য একে হয়:

$$(a + d) - a = (a + 2d) - (a + d) = d$$

d ধনাত্মক হ'লে পদবোৰ বাঢ়ি যায়, d ঋণাত্মক হ'লে পদবোৰ কমি যায় আৰু $d = 0$ হ'লে সকলো পদ একে হয়। সেয়ে “বাঢ়ি যোৱা অনুক্রম” দেখিলেই AP বুলি ক'ব নোৱাৰি; একেৰাহে থকা প্ৰতিযোগৰ পদৰ পাৰ্থক্য পৰীক্ষা কৰিব লাগে।

অনুক্রম	একেৰাহে পদৰ অন্তৰ	সিদ্ধান্ত
3, 8, 13, 18	5, 5, 5	সমান্তৰ প্ৰগতি; $d = 5$
20, 16, 12, 8	-4, -4, -4	সমান্তৰ প্ৰগতি; $d = -4$
1, 4, 9, 16	3, 5, 7	সমান্তৰ প্ৰগতি নহয়
-2, -2, -2, -2	0, 0, 0	সমান্তৰ প্ৰগতি; $d = 0$

সসীম আৰু অসীম AP

যি AP-ৰ পদৰ সংখ্যা সসীম আৰু শেষ পদ আছে, তাক **সসীম সমান্তৰ প্ৰগতি** বোলা হয়। যেনে, 4, 7, 10, 13 এটা সসীম AP; ইয়াৰ শেষ পদ 13। যি AP-ৰ পদৰ সংখ্যা অসীম আৰু শেষ পদ নাথাকে, তাক **অসীম সমান্তৰ প্ৰগতি** বোলা হয়, যেনে 4, 7, 10, 13, ...।

সাধাৰণ পদৰ সূত্ৰত n এটা ধনাত্মক অখণ্ড সংখ্যা। অসীম AP-ৰ ক্ষেত্ৰতো প্ৰথম n টা পদৰ যোগফল S_n -ৰে উলিয়াব পাৰি; “অসীম” শব্দটোৱে AP-ৰ মুঠ পদৰ সংখ্যক বুজায়, যোগ কৰিবলগীয়া পদৰ সংখ্যা n ক নহয়।

উদাহৰণ:

তলৰ কোনটো সমান্তৰ প্ৰগতি? (ক) 7, 10, 13, 16 (খ) 2, 4, 8, 16 (গ) 1, 3, 6, 10 (ঘ) 5, 10, 20, 40

উত্তৰ: (ক) সমান্তৰ প্ৰগতি, কাৰণ একেৰাহে পদৰ অন্তৰ 3, 3, 3। (খ), (গ) আৰু (ঘ)-ত অন্তৰ একে নহয়।

পদৰ স্থান আৰু সাধাৰণ পদ

AP-ৰ পদৰ স্থান জানিলে সেই স্থানৰ পদটো পোনপটীয়াকৈ উলিয়াব পাৰি। প্ৰথম পদ a ; দ্বিতীয় পদ $a + d$; তৃতীয় পদ $a + 2d$ । সেয়ে প্ৰথম পদৰ পৰা n -তম পদলৈ যাবলৈ সাধাৰণ অন্তৰটো $n - 1$ বাৰ যোগ কৰিব লাগে। ফলত,

$$a_n = a + (n - 1)d$$

এইটোৱেই AP-ৰ সাধাৰণ পদৰ সূত্ৰ। ইয়াত a_n মানে n -তম পদ, a প্ৰথম পদ, d সাধাৰণ অন্তৰ আৰু n পদটোৰ স্থান। n -ৰ মান বহুৱাওঁতে $n - 1$ অংশটো বাদ নিদিব।

উদাহৰণস্বৰূপে, 6, 10, 14, 18, ...-ত $a = 6$, $d = 4$ । পঞ্চম পদৰ বাবে $n = 5$; সেয়ে $a_5 = 6 + (5 - 1)4 = 22$ । প্ৰথম পদৰ পৰা পঞ্চম পদলৈ অন্তৰ চাৰিবাৰ যোগ হৈছে, তিনিবাৰ নহয়।

উদাহৰণ:

$-3, 2, 7, 12, \dots$ AP-ৰ 15-তম পদ উলিয়াওক।

উত্তৰ: ইয়াত $a = -3$ আৰু $d = 2 - (-3) = 5$ । সেয়ে $a_{15} = a + (15 - 1)d = -3 + 14 \times 5 = -3 + 70 = 67$ । গতিকে 15-তম পদ 67।

সাধাৰণ অন্তৰ আৰু অজ্ঞাত পদ নিৰ্ণয়

প্ৰথম পদ আৰু দ্বিতীয় পদ জনা থাকিলে সাধাৰণ অন্তৰ পোৱা যায়:

$$d = a_2 - a_1$$

যিকোনো দুটা একেৰাহে পদৰ পৰা একে পদ্ধতিত d পোৱা যায়। পৰৱৰ্তী পদটো আগৰ পদটোতকৈ সৰু হ'লে d ঋণাত্মক হ'ব পাৰে।
উদাহৰণস্বৰূপে, 31, 27, 23, ...-ত $d = 27 - 31 = -4$ ।

কেতিয়াবা AP-ৰ এটা পদ আৰু d দিয়া থাকে, কিন্তু প্ৰথম পদ দিয়া নাথাকে। সাধাৰণ পদৰ সূত্ৰটো পুনৰ সজাই,

$$a = a_n - (n - 1)d$$

উলিয়াব পাৰি। একেদৰে a_n আৰু a জনা থাকিলে,

$$d = \frac{a_n - a}{n - 1}$$

য'ত $n > 1$ । এই সূত্ৰ ব্যৱহাৰ কৰাৰ আগতে পদটোৰ স্থান ঠিক আছে নে নাই চাব লাগে।

উদাহৰণ:

এটা AP-ৰ 8-তম পদ 31 আৰু সাধাৰণ অন্তৰ 3। প্ৰথম পদ উলিয়াওক।

উত্তৰ: $a_8 = a + (8 - 1)d$ । সেয়ে $31 = a + 7 \times 3 = a + 21$ । সেয়েহে $a = 31 - 21 = 10$ । AP-টো 10, 13, 16, ...।

এটা নিৰ্দিষ্ট সংখ্যা AP-ৰ পদ নে নহয়

এটা সংখ্যা দিয়া AP-ৰ পদ হয় নে নহয় জানিবলৈ সাধাৰণ পদৰ সমীকৰণত a_n -ৰ ঠাইত সংখ্যাটো বহুৱাই n -ৰ মান উলিয়াওঁ। যদি পোৱা n এটা ধনাত্মক অখণ্ড সংখ্যা হয়, তেন্তে সংখ্যাটো অসীম AP-ৰ পদ। সসীম AP-ত মুঠ N টা পদ থাকিলে লগতে $n \leq N$ হ'ব লাগিব।

যদি $a_n = x$, তেন্তে $x = a + (n - 1)d$; সেয়ে,

$$n = 1 + \frac{x - a}{d}$$

$d = 0$ হ'লে এই সূত্ৰ ব্যৱহাৰ নকৰিব; তেতিয়া AP-ৰ সকলো পদ a -ৰ সমান।

উদাহৰণ:

7, 12, 17, 22, ...-ৰ 100 পদৰ ভিতৰত 62 আছে নে?

উত্তৰ: $a = 7$, $d = 5$, $x = 62$ । $n = 1 + \frac{62 - 7}{5} = 1 + \frac{55}{5} = 12$ । $n = 12$ ধনাত্মক অখণ্ড সংখ্যা আৰু $12 \leq 100$; সেয়ে 62 এই AP-ৰ 12-তম পদ।

শেষ পদ আৰু পদৰ সংখ্যা

AP-ৰ প্ৰথম পদ a , সাধাৰণ অন্তৰ d আৰু পদৰ সংখ্যা n হ'লে শেষ পদ l হৈছে a_n । গতিকে,

$$l = a + (n - 1)d$$

ইয়াৰ পৰা পদৰ সংখ্যা,

$$n = 1 + \frac{l - a}{d}$$

যদি a , d আৰু শেষ পদ দিয়া থাকে আৰু $d \neq 0$ হয়, তেন্তে এই সূত্রত পোৱা n এটা ধনাত্মক অখণ্ড সংখ্যা হোৱা উচিত। উদাহৰণস্বৰূপে, 11, 15, 19, ..., 79-ত $a = 11$, $d = 4$, $l = 79$ ।

$$n = 1 + \frac{79-11}{4} = 1 + 17 = 18$$

গতিকে মুঠ 18টা পদ আছে। যদি n ধনাত্মক অখণ্ড সংখ্যা নহয়, তেন্তে দিয়া শেষ সংখ্যাটো সেই AP-ৰ পদ নহয়। $d = 0$ আৰু $l = a$ হ'লে সকলো পদ একে হয়; সেই ক্ষেত্ৰত কেৱল শেষ পদ জানি n নিৰ্ণয় কৰিব নোৱাৰি।

উদাহৰণ:

100ৰ পৰা আৰম্ভ কৰি 7কৈ বাঢ়ি যোৱা AP-ৰ শেষ পদ 268 হ'ব পাৰে নে?

উত্তৰ: $n = 1 + \frac{268-100}{7} = 1 + \frac{168}{7} = 25$ । n ধনাত্মক অখণ্ড সংখ্যা হোৱা বাবে 268 এই AP-ৰ 25-তম পদ; সেয়ে শেষ পদ হিচাপে সম্ভৱ।

শেষৰ ফালৰ পৰা পদ নিৰ্ণয়

সসীম AP-ত মুঠ n টা পদ থাকিলে শেষৰ ফালৰ পৰা k -তম পদটো আৰম্ভণিৰ ফালৰ পৰা $(n - k + 1)$ -তম পদ। সেয়ে,

$$a_{n-k+1} = l - (k - 1)d$$

ইয়াত $1 \leq k \leq n$ । শেষ পদ l আৰু সাধাৰণ অন্তৰ d জনা থাকিলে এই সূত্ৰৰে পোনপটীয়াকৈ পদটো উলিয়াব পাৰি। মুঠ পদৰ সংখ্যা জনা থাকিলে আৰম্ভণিৰ ফালৰ স্থানৰ সহায়তো গণনা কৰিব পাৰি।

উদাহৰণ:

10, 7, 4, ..., -62 AP-ৰ শেষৰ ফালৰ পৰা 11-তম পদটো উলিয়াওক।

উত্তৰ: $a = 10$, $d = -3$, $l = -62$ । মুঠ পদ, $n = 1 + \frac{-62-10}{-3} = 25$ । শেষৰ ফালৰ পৰা 11-তম পদটো আৰম্ভণিৰ ফালৰ পৰা $25 - 11 + 1 = 15$ -তম পদ। সেয়ে $a_{15} = 10 + (15 - 1)(-3) = -32$ ।

সমান্তৰ প্ৰগতিৰ যোগফল

এটা AP-ৰ প্ৰথম n টা পদৰ যোগফলক S_n -ৰে বুজাওঁ।

$$S_n = a + (a + d) + (a + 2d) + \dots + [a + (n - 1)d]$$

যোগফলটো আগফালৰ পৰা আৰু পিছফালৰ পৰা লিখিলে,

$$S_n = a + (a + d) + \dots + l$$

$$S_n = l + (l - d) + \dots + a$$

দুয়োটা সমীকৰণ যোগ কৰিলে প্ৰতিযোৰ পদৰ যোগফল $a + l$ হয় আৰু এনে যোৰ n টা পোৱা যায়। সেয়ে $2S_n = n(a + l)$, অৰ্থাৎ,

$$S_n = \frac{n}{2}(a + l)$$

l -ৰ ঠাইত $a + (n - 1)d$ বহুৱালে আন এটা বহুল ব্যৱহৃত ৰূপ পোৱা যায়:

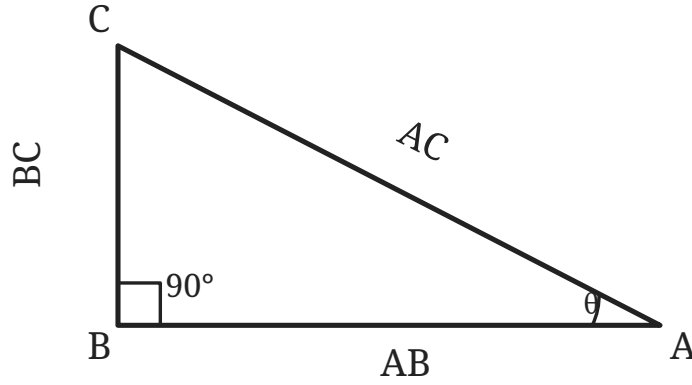
$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

দুয়োটা সূত্ৰৰ পৰা একে যোগফল পোৱা যায়; কোনটো ব্যৱহাৰ কৰিব সেয়া দিয়া তথ্যৰ ওপৰত নিৰ্ভৰ কৰে। a , d আৰু n দিয়া থাকিলে দ্বিতীয়টো পোনপটীয়া; a , l আৰু n দিয়া থাকিলে প্ৰথমটো সুবিধাজনক।

উদাহৰণ:

5, 9, 13, ...-ৰ প্ৰথম 20টা পদৰ যোগফল উলিয়াওক।

উত্তৰ: $a = 5$, $d = 4$, $n = 20$ । $S_{20} = \frac{20}{2}[2 \times 5 + (20 - 1)4] = 10[10 + 76] = 10 \times 86 = 860$ । অন্য পদ্ধতিত শেষ পদ $l = 5 + 19 \times 4 = 81$; সেয়ে $S_{20} = \frac{20}{2}(5 + 81) = 860$ ।



চিত্ৰ 3: θ কোণৰ সাপেক্ষে BC বিপৰীত বাহু, AB সন্নিহিত বাহু আৰু AC অতিভুজ।

ছয়টা ত্রিকোণমিতিক অনুপাত

A কোণৰ ত্রিকোণমিতিক অনুপাতবোৰ তলত দিয়া ধৰণে সংজ্ঞায়িত কৰা হয়। ইয়াত “বিপৰীত”, “সন্নিহিত” আৰু “অতিভুজ” শব্দ তিনিটা সদায় একেটা A কোণৰ সাপেক্ষে পঢ়িব লাগে।

অনুপাত	সংজ্ঞা	চমু ৰূপ
sine	বিপৰীত বাহু / অতিভুজ	$\sin A = \frac{BC}{AC}$
cosine	সন্নিহিত বাহু / অতিভুজ	$\cos A = \frac{AB}{AC}$
tangent	বিপৰীত বাহু / সন্নিহিত বাহু	$\tan A = \frac{BC}{AB}$
cosecant	অতিভুজ / বিপৰীত বাহু	$\operatorname{cosec} A = \frac{AC}{BC}$
secant	অতিভুজ / সন্নিহিত বাহু	$\sec A = \frac{AC}{AB}$
cotangent	সন্নিহিত বাহু / বিপৰীত বাহু	$\cot A = \frac{AB}{BC}$

সংশোধিত পাঠ্যপুথিত ত্রিকোণমিতিক অনুপাতৰ নাম sine, cosine, tangent, cosecant, secant আৰু cotangent। “জ্যা” আৰু “কোটি জ্যা” শব্দ দুটা ঐতিহাসিক উদ্ভৱৰ টোকা দেখা যায়; এই অধ্যায়ত অনুপাতৰ এই নামবোৰেই ব্যৱহাৰ কৰা হৈছে। পৰীক্ষাত সাধাৰণতে $\sin$, $\cos$, $\tan$, cosec , $\sec$, $\cot$ সংকেত ব্যৱহাৰ হয়। $\sin A$ মানে $\sin$ আৰু A -ৰ পূৰণফল নহয়; ই A কোণৰ বিপৰীত বাহু আৰু অতিভুজৰ অনুপাত।

উদাহৰণ:

$\triangle ABC$ -ত $\angle B = 90^\circ$, $AB = 6 \text{ cm}$ আৰু $BC = 8 \text{ cm}$ । A কোণৰ $\sin A$, $\cos A$ আৰু $\tan A$ উলিয়াওক।

উত্তৰ: পাইথাগোৰাচৰ উপপাদ্যৰ পৰা $AC = \sqrt{6^2 + 8^2} = 10 \text{ cm}$ । A -ৰ বিপৰীত বাহু $BC = 8 \text{ cm}$ আৰু সন্নিহিত বাহু $AB = 6 \text{ cm}$ । সেয়ে $\sin A = \frac{8}{10} = \frac{4}{5}$, $\cos A = \frac{6}{10} = \frac{3}{5}$ আৰু $\tan A = \frac{8}{6} = \frac{4}{3}$ ।

অনুপাতবোৰৰ মাজৰ সৰল সম্পৰ্ক

ছয়টা অনুপাতৰ ভিতৰত তিনিযোৰ অনুপাত পৰস্পৰৰ ব্যস্ত। লগতে $\tan$ আৰু $\cot$ -ৰ ক্ষেত্ৰত বিপৰীত আৰু সন্নিহিত বাহু পৰস্পৰ সলনি হয়।

$$\operatorname{cosec} A = \frac{1}{\sin A}, \sec A = \frac{1}{\cos A}, \cot A = \frac{1}{\tan A}$$

$$\tan A = \frac{\sin A}{\cos A}, \cot A = \frac{\cos A}{\sin A}$$

এই সম্পৰ্কবোৰত যি ৰাশিৰে ভাগ কৰা হৈছে, সেই ৰাশি শূন্য হ’ব নোৱাৰে। সেয়ে $A = 0^\circ$ -ত $\cot A$ আৰু $\operatorname{cosec} A$ সংজ্ঞাবদ্ধ নহয়, কিন্তু $\tan 0^\circ = 0$ । সূক্ষ্মকোণৰ ক্ষেত্ৰত সকলো বাহুৰ দীঘ ধনাত্মক, সেয়ে ছয়টা অনুপাতৰ মান ধনাত্মক।

37. $2x^2 - 8 = 0$ ৰ মূলবোৰ হ'ল:

(ক) -2 আৰু 2

(খ) -4 আৰু 4

(গ) 0 আৰু 2

(ঘ) -2 আৰু 4

উত্তৰ: (ক) -2 আৰু 2

ব্যাখ্যা: 2 ৰে ভাগ কৰিলে $x^2 - 4 = 0$, অৰ্থাৎ $(x - 2)(x + 2) = 0$ । সেয়ে $x = 2$ বা $x = -2$ ।

38. $x^2 + 6x + 9 = 0$ ৰ ভেদ নিকপক কিমান?

(ক) -12

(খ) -3

(গ) 3

(ঘ) 0

উত্তৰ: (ঘ) 0

ব্যাখ্যা: ইয়াত $a = 1$, $b = 6$ আৰু $c = 9$ । সেয়ে $D = b^2 - 4ac = 6^2 - 4(1)(9) = 36 - 36 = 0$ ।

39. $2x^2 + 3x + 5 = 0$ ৰ মূলৰ প্ৰকৃতি কেনে?

(ক) দুটা পৃথক বাস্তৱ মূল

(খ) কোনো বাস্তৱ মূল নাই

(গ) দুটা সমান বাস্তৱ মূল

(ঘ) এটা ধনাত্মক বাস্তৱ মূল

উত্তৰ: (খ) কোনো বাস্তৱ মূল নাই

ব্যাখ্যা: $D = 3^2 - 4(2)(5) = 9 - 40 = -31 < 0$ । ভেদ নিকপক ঋণাত্মক হোৱা বাবে দ্বিঘাত সমীকৰণটোৰ কোনো বাস্তৱ মূল নাই।

40. $x^2 - 6x + k = 0$ ৰ মূল দুটা সমান হ'বলৈ k ৰ মান কিমান হ'ব লাগিব?

(ক) -9

(খ) 6

(গ) 9

(ঘ) 12

উত্তৰ: (গ) 9

ব্যাখ্যা: সমান মূলৰ বাবে $D = 0$ লাগে। ইয়াত $D = (-6)^2 - 4(1)(k) = 36 - 4k$; সেয়ে $36 - 4k = 0$ আৰু $k = 9$ ।

41. দুটা ক্ৰমিক ধনাত্মক অখণ্ড সংখ্যাৰ গুণফল 56 । ডাঙৰ সংখ্যাটো কিমান?

(ক) 8

(খ) 7

(গ) 9

(ঘ) 14

উত্তৰ: (ক) 8

ব্যাখ্যা: সৰু সংখ্যাটো x ধৰা হওক। তেন্তে $x(x + 1) = 56$, অৰ্থাৎ $(x - 7)(x + 8) = 0$ । সংখ্যাটো ধনাত্মক হোৱা বাবে $x = 7$; সেয়ে ডাঙৰ সংখ্যাটো 8 ।

42. এটা আয়তক্ষেত্ৰৰ দৈৰ্ঘ্য $x + 3$ cm আৰু প্ৰস্থ x cm। ইয়াৰ কালি 40 cm² হ'লে x ৰ ধনাত্মক মান কিমান?

(ক) 3

(খ) 4

(গ) 8

(ঘ) 5

উত্তৰ: (ঘ) 5

ব্যাখ্যা: কালিৰ পৰা $x(x + 3) = 40$, সেয়ে $x^2 + 3x - 40 = 0$ । ইয়াৰ উৎপাদককৰণ $(x + 8)(x - 5) = 0$; ধনাত্মক মানটো $x = 5$ ।

43. $(x - 2)^2 = 9$ ৰ সমাধানবোৰ হ'ল:

(ক) -5 আৰু 1

(খ) -1 আৰু 5

(গ) 1 আৰু 5

(ঘ) -1 আৰু -5

উত্তৰ: (খ) -1 আৰু 5

ব্যাখ্যা: বৰ্গমূল ল'লে $x - 2 = \pm 3$ । সেয়ে $x = 5$ বা $x = -1$ ।

44. দ্বিঘাত সূত্র ব্যৱহাৰ কৰিলে $x^2 - 4x + 1 = 0$ ৰ মূলবোৰ হ'ল:

(ক) $2 \pm \sqrt{5}$

(খ) $4 \pm \sqrt{3}$

(গ) $2 \pm \sqrt{3}$

(ঘ) $4 \pm \sqrt{5}$

উত্তৰ: (গ) $2 \pm \sqrt{3}$

ব্যাখ্যা: ইয়াত $a = 1$, $b = -4$ আৰু $c = 1$; সেয়ে $D = 12$ । দ্বিঘাত সূত্র বহুৱালে $x = (4 \pm \sqrt{12})/2 = 2 \pm \sqrt{3}$ ।

45. $2x^2 - 7x + 3 = 0$ ৰ এটা মূল 3 । আনটো মূল কিমান?

(ক) $1/2$

(খ) $2/3$

(গ) $3/2$

(ঘ) 2

উত্তৰ: (ক) $1/2$

ব্যাখ্যা: মূল দুটাৰ গুণফল $c/a = 3/2$ । এটা মূল 3 হোৱা বাবে আনটো মূল $(3/2) \div 3 = 1/2$ ।

46. তলৰ কোনটো অনুক্রম সমান্তৰ প্ৰগতি?

(ক) $3, 6, 12, 24$

(খ) $1, 4, 9, 16$

(গ) $-4, 1, 6, 11$

(ঘ) $20, 15, 9, 2$

উত্তৰ: (গ) $-4, 1, 6, 11$

ব্যাখ্যা: সমান্তৰ প্ৰগতিত একেৰাহে পদৰ অন্তৰ একে থাকে। (ক)-ত অন্তৰ $3, 6, 12$; (খ)-ত $3, 5, 7$; (গ)-ত $5, 5, 5$; আৰু (ঘ)-ত $-5, -6, -7$ । সেয়ে (গ)-ৰ অনুক্রমটোহে সমান্তৰ প্ৰগতি।

47. সমান্তৰ প্ৰগতি $22, 17, 12, 7, \dots$ -ৰ সাধাৰণ অন্তৰ কিমান?

(ক) -7

(খ) -5

(গ) 5

(ঘ) 7

উত্তৰ: (খ) -5

ব্যাখ্যা: পৰৱৰ্তী পদৰ পৰা আগৰ পদ বিয়োগ কৰিলে $d = 17 - 22 = -5$ পোৱা যায়। পৰৱৰ্তী অন্তৰ $12 - 17$ আৰু $7 - 12 = -5$ ।

48. সমান্তৰ প্ৰগতি $5, x, 17$ -ত x -ৰ মান কিমান?

(ক) 9

(খ) 12

(গ) 13

(ঘ) 11

উত্তৰ: (ঘ) 11

ব্যাখ্যা: সমান অন্তৰৰ বাবে $x - 5 = 17 - x$ । সেয়ে $2x = 22$ আৰু $x = 11$ ।



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SSUHS ANM Entrance Examination Guide

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READING WITH A CLEAR PURPOSE

Reading comprehension is the process of building meaning from a passage and using evidence in the passage to answer a question. It is more precise than finding a word that looks similar to a word in the question. A good reader first understands what the passage says, then checks which sentence supports the selected answer.

A short entrance-exam passage may describe an event, explain a process, compare two things, or present a problem and a response. Its subject may be familiar or unfamiliar. Unless a question explicitly asks for outside knowledge, base the answer on the information in the passage. Use the passage as the source of evidence: consider its statements, connections and limits.

FOUR ASPECTS OF A PASSAGE

Most comprehension questions concern one of four aspects of meaning.

Layer	What to identify	Useful question
Topic	The general subject being discussed	What is this passage about?
Main idea	The central point the writer makes about the topic	What does the writer want me to understand?
Supporting detail	A fact, example, reason or result that develops the main idea	Which sentence proves or illustrates it?
Inference	A conclusion supported by evidence in the passage, even when it is not stated word for word	What follows even though it is not stated word for word?

The topic may be a single word such as **rainwater**, while the main idea is a complete statement such as “A simple collection system can make rainwater useful during a dry period.” A detail may name the tank, the roof or the cleaning routine. An inference goes one careful step beyond the exact wording; it must still be supported.

WORKED EXAMPLE:

Read the statement: “The library stayed open for an extra hour during the examination month, because many students could not study at home.” **What is the main idea?**

Ans. The library extended its hours to support students who could not study at home. “Examination month” is a time detail, and “could not study at home” is the reason. The main idea connects the action with its purpose.

EVIDENCE BEFORE ASSUMPTION

An answer is **directly stated** when the passage says it clearly, even if the question changes the wording. An answer is an **inference** when the passage provides clues from which a short conclusion follows. An answer based only on general knowledge or personal opinion is not acceptable unless the passage supports it.

Question wording	Evidence to locate	Common mistake
According to the passage	A sentence or an exact equivalent	Choosing a true fact that the passage never gives
Why did this happen?	A stated cause or a clear cause-effect link	Choosing a later event as the cause
This suggests that	The clue or clues pointing to one modest conclusion	Making a broad claim about all people or all situations
The word means	The local meaning in that sentence	Selecting the most familiar dictionary meaning

Words such as **always**, **never**, **only**, **all** and **must** make an option very strong. Select such an option only when the passage uses an equally strong condition. If a passage says “some learners used the room”, an answer saying “all learners used the room” exceeds the evidence.

AN EFFICIENT PASSAGE METHOD

Use a repeatable sequence. Speed improves when each step has a defined purpose.

1. PREVIEW THE SHAPE

Read the title, if one is given, and notice the number of paragraphs. The opening sentence often introduces the topic. A final sentence may state a result, recommendation or contrast. This preview creates a map; it does not replace careful reading.

Do not spend too long predicting the content. A prediction is only a temporary expectation. If the passage gives different information, replace the expectation with the passage's evidence.

2. READ FOR THE MAIN IDEA AND DEVELOPMENT

On the first reading, ask what changes from the beginning to the end. A passage may move from a problem to a solution, from an observation to an explanation, or from a common belief to a correction. Mark mentally the subject of each paragraph in one or two words.

Signal words reveal relationships:

Signal	Relationship	Examples of use
because, since, therefore	Cause and result	A blocked drain caused water to collect; therefore, the path was closed.
however, although, whereas	Contrast or qualification	The tank is small; however, it supplies drinking water for a short period.
first, next, finally	Sequence	First filter the water; next store it; finally label the container.
for example, such as	Illustration	Several grains, such as rice and millet, can be stored safely when dry.
in addition, also	Added information	The plan saves water and also reduces daily carrying work.

3. LOCATE THE RELEVANT SENTENCES

Return to the passage after reading a question. Search for a key noun, a name, a time expression or a relationship word. Read the whole sentence containing the match and, when necessary, the sentence before or after it. The answer often depends on a few sentences rather than the whole passage.

The exact word in the question may be replaced by a synonym. **Rapid** may appear as **quick**, **reduce** as **lower**, and **purpose** as **reason**. Search for the idea, not just the spelling.

4. COMPARE EVERY OPTION WITH THE EVIDENCE

For a direct question, cross out options that are absent, reversed or broader than the passage. For an inference, ask whether each option follows from the same clues. Do not choose an option merely because it sounds positive or scientific.

5. CHECK THE QUESTION'S EXACT DEMAND

The answer to "What happened first?" is an event, not a reason. The answer to "Which word is closest in meaning?" is a word or phrase, not a complete summary. The answer to "What can be inferred?" must be a conclusion, not a repeated sentence.

READING DISCIPLINE: Distinguish three sources of information: **the passage says**, **the passage implies**, and **I happen to know**. Only the first two can support an answer in a passage question.

HOW PASSAGES ARE ORGANISED

Recognising a passage's structure helps predict where information will appear. The same passage can contain more than one structure, but one pattern usually guides the development of the main idea.

DESCRIPTION AND EXPLANATION

A descriptive passage presents features, conditions or parts. An explanatory passage shows how or why something happens. In an explanation, nouns and verbs often identify a process: **collect**, **filter**, **store**, **release** and **reuse**.

WORKED EXAMPLE:

“The seed is placed in moist soil. After a few days, the covering splits and a small root appears. The shoot then grows towards light.” Is the passage mainly a description of appearance or a description of sequence?

Ans. It is mainly a description of sequence. The actions are arranged in time and the words **after** and **then** show what happens next. The passage describes visible changes in their order; it does not explain why they occur.

CAUSE AND EFFECT

Cause answers **why**; effect answers **what happened because of it**. A single sentence may contain both. The order in which they appear is not always the same.

Pattern	Cause	Effect
Because the road flooded, the bus turned back.	The road flooded	The bus turned back
The bus turned back because the road flooded.	The road flooded	The bus turned back
The flooded road prevented the bus from continuing.	The flooded road	The bus could not continue

Do not assume that a time relationship proves a cause. “When the bell rang, the children left” states when they left. The bell may have been a signal, but the sentence does not explicitly state that it caused them to leave.

COMPARISON AND CONTRAST

A comparison identifies a shared feature or a difference. Look for words such as **both**, **similar**, **unlike**, **more**, **less**, **whereas** and **but**. An option that describes one item only cannot be the main point of a balanced comparison.

PROBLEM AND RESPONSE

In a problem-response passage, locate four parts: the difficulty, who or what is affected, the response, and the result or remaining limit. A response may help without solving every part of the problem.

WORKED EXAMPLE:

A village clinic loses power during storms. A battery lamp is installed, but the refrigerator still needs a separate backup. What is the limitation of the response?

Ans. The battery lamp provides light; it does not power the refrigerator. The response addresses visibility and leaves cold storage dependent on another backup.

TYPES OF QUESTIONS AND ANSWER CHOICES**DIRECT FACT QUESTIONS**

These ask for a stated person, place, time, action, number or reason. Find the sentence, then check whether an option preserves the same condition. A paraphrase is correct only when it does not remove a necessary detail.

If the passage says “the first trial used two containers”, both **the first trial used two containers** and **two containers were used in the initial trial** may be equivalent. **The project always uses two containers** is broader and is not equivalent.

MAIN-IDEA QUESTIONS

The best main idea covers the whole passage without becoming so broad that it could describe almost anything. A detail may be true but too narrow. An attractive option may mention a word repeated in the passage while missing the writer’s point.

Option type	How it behaves	Decision
Too narrow	Correctly states one example or paragraph only	Reject for a main-idea question
Too broad	Adds a claim about society, the future or every case	Reject unless the passage supports it

43. In the sentence “It was prudent to carry a torch on the unlit path”, “prudent” means

- (A) careless and risky (B) wise and careful
(C) cautious but unnecessary (D) routine and unconsidered

Answer: (B) wise and careful

Explanation: Carrying a torch on an unlit path is a wise and careful choice.

44. In the sentence “Sorting the mixed papers was tedious”, “tedious” means

- (A) boring and lengthy (B) difficult but rewarding
(C) urgent and demanding (D) simple and brief

Answer: (A) boring and lengthy

Explanation: A tedious task is dull and often takes a long time.

45. Please retain the receipt until the item is checked. Which word is the best antonym of “retain”?

- (A) keep (B) store
(C) preserve (D) discard

Answer: (D) discard

Explanation: To retain something is to keep it; to discard it is to throw it away, which is the opposite.

46. Choose the word formed from “danger” that correctly completes the sentence: “The wet floor was ____, so the caretaker put up a warning.”

- (A) danger (B) dangerously
(C) endanger (D) dangerous

Answer: (D) dangerous

Explanation: The adjective “dangerous” describes the wet floor; “danger” is a noun, “dangerously” an adverb and “endanger” a verb.

47. Choose the word formed from “assist” that correctly completes the sentence: “The volunteer offered useful ____ to the elderly visitors.”

- (A) assisted (B) assistance
(C) assisting (D) assist

Answer: (B) assistance

Explanation: The noun “assistance” means help and fits after “offered useful”.

48. Choose the word formed from “hope” that correctly completes the sentence: “Even after the delay, the families remained ____ that the new clinic would open soon.”

- (A) hopeful (B) hopefully
(C) hope (D) hopeless

Answer: (A) hopeful

Explanation: The adjective “hopeful” means believing that something wanted will happen and fits the positive expectation in the sentence; “hopefully” is an adverb.

49. Choose the word formed from “quick” that correctly completes the sentence: “The volunteer responded ___ to the alarm.”

- (A) quickness (B) quick
(C) quicken (D) quickly

Answer: (D) quickly

Explanation: The adverb “quickly” describes how the volunteer responded. “Quickness” is a noun, “quick” an adjective in standard formal usage, and “quicken” a verb.

50. Choose the word formed with the prefix “un-” that correctly completes the sentence: “The date was ___ because the notice gave two different days.”

- (A) unprepared (B) unnoticed
(C) unavailable (D) uncertain

Answer: (D) uncertain

Explanation: The prefix “un-” forms “uncertain”, meaning not definite; that meaning fits a date with two conflicting possibilities.

51. In the sentence “The nurse checked the chart,” which word is the verb?

- (A) nurse (B) chart
(C) the (D) checked

Answer: (D) checked

Explanation: “Checked” expresses the action performed by the subject, so it is the verb.

52. In “Rina said she would return,” which word is a pronoun?

- (A) Rina (B) said
(C) she (D) return

Answer: (C) she

Explanation: “She” stands in place of a person’s name, so it is a pronoun.

53. Which word is an adjective in “The clean ward welcomed the visitors”?

- (A) ward (B) welcomed
(C) visitors (D) clean

Answer: (D) clean

Explanation: “Clean” describes the noun “ward”, so it functions as an adjective.

54. Which word is an adverb in “The attendant spoke politely to the patient”?

- (A) attendant (B) spoke
(C) patient (D) politely

Answer: (D) politely

Explanation: “Politely” describes how the attendant spoke, so it is an adverb.

55. In "The doctor examined the child," what is the subject?

- (A) The doctor (B) examined
(C) the child (D) the

Answer: (A) The doctor

Explanation: "The doctor" is the subject because it performs the action of examining.

56. In "The nurse measured the pulse," what is the direct object?

- (A) The nurse (B) measured
(C) nurse (D) the pulse

Answer: (D) the pulse

Explanation: "The pulse" receives the action of the verb "measured", so it is the direct object.

57. In "The student completed the form," which group is the predicate?

- (A) The student (B) completed
(C) the form (D) completed the form

Answer: (D) completed the form

Explanation: The predicate states what the subject did; here it is "completed the form".

58. Which sentence contains a conjunction joining two words?

- (A) The nurse and doctor arrived early. (B) The nurse arrived early.
(C) The nurse arrived at noon. (D) The nurse arrived quietly.

Answer: (A) The nurse and doctor arrived early.

Explanation: The word "and" joins the two nouns "nurse" and "doctor", so it is a conjunction.

59. Which is a complete sentence?

- (A) Because the clinic was closed. (B) After the examination.
(C) The clinic opened at eight. (D) When the nurse arrived.

Answer: (C) The clinic opened at eight.

Explanation: "The clinic opened at eight" has a subject, a finite verb and a complete thought.

60. In the question "Did the patient take the tablet?" which group is the complete subject?

- (A) Did (B) take the tablet
(C) the tablet (D) the patient

Answer: (D) the patient

Explanation: The complete subject is "the patient". The auxiliary "did" comes before it in this question, but it is part of the verb phrase.

READING THE FIGURE AND CHOOSING THE MEASURE

Geometry describes position, shape and size. A problem becomes manageable when its words are converted into a small diagram or a named set of quantities. Mark the points, identify the right angle or the centre, write the known lengths and then choose a relation that connects the known and unknown quantities. A formula is useful only after its symbols have been given their correct meanings.

This chapter brings together the Class X ideas needed for direct calculations: angle relations and similar triangles; Pythagoras' theorem; ratios in a right triangle; elementary height and distance questions; tangent facts; the perimeter and area of circles and their parts; and the surface area and volume of common solids. Construction procedures and long theorem proofs are outside this preliminary treatment.

Area	What to identify	Useful relation
Triangles	Angles, correspondence, a right angle, base and perpendicular height	$a^2 + b^2 = c^2$
Trigonometry	Opposite, adjacent and hypotenuse relative to a chosen angle	$\sin A$, $\cos A$, $\tan A$
Circles	Centre, radius, chord, secant, tangent, arc and sector	$d = 2r$, $C = 2\pi r$
Plane measurement	Perimeter or area, with linear or square units	$A_{\text{circle}} = \pi r^2$
Solids	Base, height, slant height, curved and total surface	square units for area; cubic units for volume

AN ORDERLY CALCULATION: Write (1) the given quantities with their units, (2) the quantity required, (3) the relation or formula, (4) the substitution and calculation, and (5) the answer with its unit. Check that a radius has not been confused with a diameter, that a slant height has not been used as a perpendicular height, and that area and volume have the correct dimensions.

LENGTHS, ANGLES AND UNITS

An angle measures a turn between two rays and is written in degrees in this chapter. A length is measured in a unit such as millimetres, centimetres, metres or kilometres. A perimeter is a length, so it uses a linear unit. An area is measured in square units such as cm^2 or m^2 . A volume is measured in cubic units such as cm^3 or m^3 . Keep all lengths in one unit before applying a formula.

Quantity	Meaning	Unit example
Length	Distance between two points	cm, m
Perimeter or circumference	Length of a boundary	cm, m
Area	Measure of the region enclosed by a boundary	cm^2 , m^2
Volume	Space occupied by a solid or capacity of a container	cm^3 , m^3 , L

If a length is changed from centimetres to metres, divide by 100. If an area is changed from cm^2 to m^2 , divide by $100^2 = 10,000$. If a volume is changed from cm^3 to m^3 , divide by $100^3 = 1,000,000$. The powers occur because the unit is multiplied once for length, twice for area and three times for volume.

WORKED EXAMPLE:

Convert 2.4 m^2 into cm^2 .

Ans. Since $1 \text{ m} = 100 \text{ cm}$, $1 \text{ m}^2 = 100^2 = 10,000 \text{ cm}^2$. Therefore $2.4 \text{ m}^2 = 2.4 \times 10,000 = 24,000 \text{ cm}^2$.

LINES AND QUADRILATERALS

Some triangle and measurement questions are decided by elementary angle facts before a formula is needed. Intersecting straight lines form vertically opposite angles that are equal. Adjacent angles on a straight line add to 180° . The angles around one point add to 360° .

When two parallel lines are crossed by a transversal, corresponding angles are equal, alternate interior angles are equal, and interior angles on the same side add to 180° . Use a stated parallel mark or a given condition; the appearance of a drawing is not evidence of parallelism.

Situation	Relation	Typical use
Straight line	Adjacent angles total 180°	Find a missing linear-pair angle
Around a point	All angles total 360°	Complete a rotation or junction
Intersecting lines	Vertically opposite angles are equal	Copy an angle across a crossing
Parallel lines	Corresponding or alternate angles are equal	Supply an equal angle for similarity

A quadrilateral is a closed figure with four sides. Splitting it by a diagonal creates two triangles, so the interior angles of a quadrilateral total 360° . A parallelogram has opposite sides parallel and equal, and opposite angles equal. A rectangle has four right angles. A square is both a rectangle and a rhombus, with four equal sides and four right angles.

WORKED EXAMPLE:

Two adjacent angles on a straight line are $(3x + 10)^\circ$ and $(2x - 5)^\circ$. Find x and the two angles.

Ans. Their sum is 180° : $(3x + 10) + (2x - 5) = 180$, so $5x + 5 = 180$ and $x = 35$. The angles are $3(35) + 10 = 115^\circ$ and $2(35) - 5 = 65^\circ$.

WORKED EXAMPLE:

Three angles of a quadrilateral are 82° , 96° and 104° . Find the fourth angle.

Ans. The four interior angles total 360° . The fourth angle is $360^\circ - 82^\circ - 96^\circ - 104^\circ = 78^\circ$.

WORKED EXAMPLE:

Two parallel lines are crossed by a transversal. One acute angle is 57° . What is the adjacent obtuse angle?

Ans. Adjacent angles on a straight line are supplementary. Thus the obtuse angle is $180^\circ - 57^\circ = 123^\circ$. The corresponding acute angles are 57° , and the corresponding obtuse angles are 123° .

TRIANGLE RELATIONS

A triangle is a closed figure formed by three line segments. Its vertices may be named A , B and C , and its sides are then AB , BC and CA . The interior angles are written $\angle A$, $\angle B$ and $\angle C$. The angle sum of every triangle is 180° .

Type	Recognising feature	Immediate fact
Equilateral	All three sides are equal	Each angle is 60°
Isosceles	Two sides are equal	The opposite angles are equal
Scalene	All three sides have different lengths	All three angles have different measures
Right-angled	One angle is 90°	The opposite side is the hypotenuse

The longest side of a triangle is opposite the largest angle. In a right-angled triangle, the side opposite 90° is the **hypotenuse**. It is the only side that is always called the hypotenuse; the other two sides can be called the legs or, relative to a chosen acute angle, the opposite and adjacent sides.

WORKED EXAMPLE:

In triangle ABC , D and E are the midpoints of AB and AC . If $BC = 18$ cm, find DE .

Ans. The midpoint theorem gives $DE = \frac{1}{2}BC = \frac{1}{2} \times 18 = 9$ cm.

PYTHAGORAS' THEOREM

In a right-angled triangle, the square of the hypotenuse equals the sum of the squares of the other two sides. In the figure below, B is the right angle, so AC is the hypotenuse and

$$AC^2 = AB^2 + BC^2.$$

This is Pythagoras' theorem. Always identify the right angle before using it. For an unknown hypotenuse, add the two squared legs and take the positive square root. For an unknown leg, subtract the known leg's square from the hypotenuse's square.

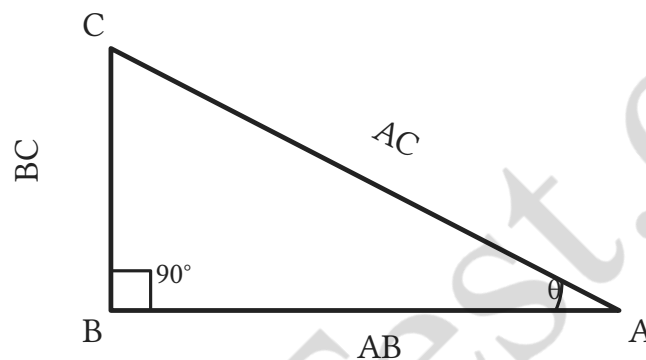


Figure 2: In the right-angled triangle, BC is opposite the marked angle θ , AB is adjacent to it, and AC is the hypotenuse. The drawing is schematic and is not a scale diagram.

WORKED EXAMPLE:

A right-angled triangle has legs 7 cm and 24 cm. Find the hypotenuse.

Ans. Let the hypotenuse be c . Then $c^2 = 7^2 + 24^2 = 49 + 576 = 625$. Since a length is positive, $c = \sqrt{625} = 25$ cm.

WORKED EXAMPLE:

The hypotenuse of a right-angled triangle is 13 m and one leg is 5 m. Find the other leg.

Ans. Let the unknown leg be x . Then $13^2 = 5^2 + x^2$, so $x^2 = 169 - 25 = 144$. Thus $x = \sqrt{144} = 12$ m.

THE CONVERSE AND USEFUL TRIPLES

The converse of Pythagoras' theorem tests whether a triangle is right-angled. Let c be the longest of three sides. If $c^2 = a^2 + b^2$, the angle opposite c is 90° . The longest side must be selected before squaring; testing an arbitrary side can give a false conclusion.

WORKED EXAMPLE:

Do sides 9 cm, 12 cm and 15 cm form a right-angled triangle?

Ans. The longest side is 15 cm. Since $15^2 = 225$ and $9^2 + 12^2 = 81 + 144 = 225$, the equality holds. Therefore the angle opposite the 15 cm side is 90° .

The triples (3, 4, 5), (5, 12, 13) and (7, 24, 25) are common examples. Any positive multiple of a triple gives another right-triangle triple. A triple is a quick check, but it does not replace the condition that the longest side must be the candidate hypotenuse.

FOOD CHAINS, FOOD WEBS AND TROPHIC LEVELS

READING A FOOD CHAIN

A **food chain** is a sequence in which each organism is eaten by the next organism. The arrow is drawn from the food to the organism that obtains food from it. It therefore represents the direction of transfer of food and energy, not the direction in which an animal moves.

Grass → grasshopper → frog → snake → eagle

In this example, grass is the producer, grasshopper is the primary consumer, frog is the secondary consumer, snake is the tertiary consumer and eagle is the quaternary consumer. The eagle is the fourth consumer but occupies the fifth trophic level because the producer forms the first level. Each position in the chain is a **trophic level**. The first trophic level is made up of producers; the second is made up of primary consumers; the third is made up of secondary consumers; and later positions contain higher consumers.

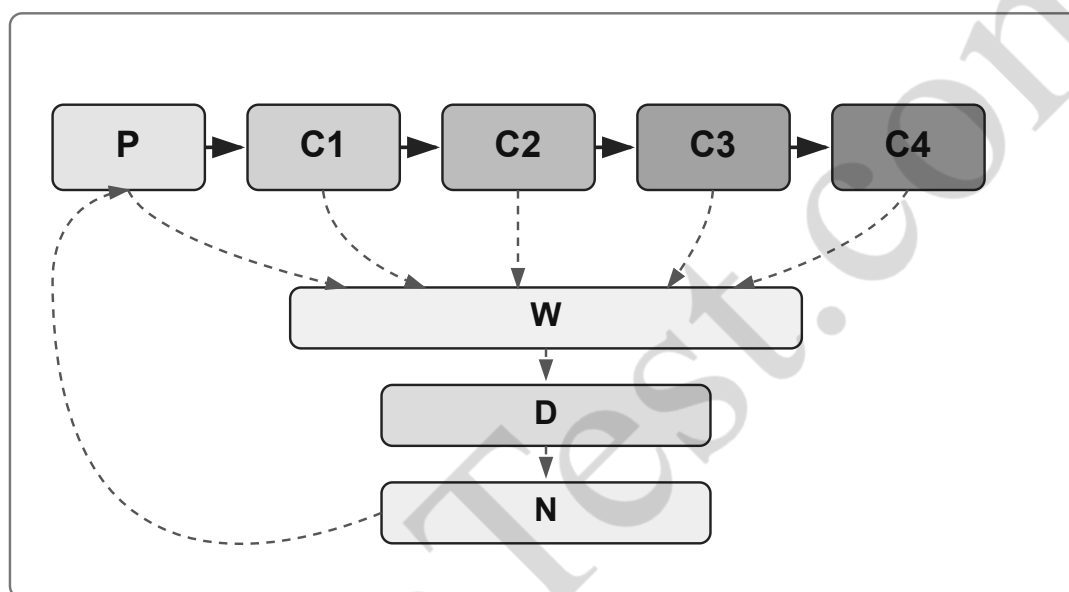


Figure 19: Food and energy transfer, decomposition and nutrient recycling. P is a producer; C1 to C4 are successive consumers; W is dead organic matter and waste; D represents decomposers; N represents inorganic nutrients in the environment. Solid arrows show feeding and energy transfer. Dashed arrows show dead matter from every feeding level reaching decomposers and nutrients returning to producers.

This return path recycles matter, not energy.

The decomposer group is connected to dead matter and waste from several trophic levels. It is not correct to place the decomposer only after the last consumer in a chain. Decomposition returns simpler materials to the physical environment, while much of the energy flowing through life processes is eventually released as heat.

Trophic level	Organism type	Illustration
First	Producer	Grass, crop plant or algae; prepares food
Second	Primary consumer	Grasshopper, goat or deer; eats a producer
Third	Secondary consumer	Frog or small fish; eats a primary consumer
Fourth	Tertiary consumer	Snake in the illustrated chain; eats the secondary consumer
Fifth	Quaternary consumer	Eagle in the illustrated chain; eats the tertiary consumer

FOOD WEBS

In a real ecosystem, one organism may have more than one food source and may be eaten by several organisms. Grass may be eaten by both a grasshopper and a goat; a grasshopper may be eaten by a frog and a bird. Interconnected food chains form a **food web**. A food web provides alternative feeding paths, but it does not make an ecosystem unaffected by change. If an important producer becomes scarce, several consumers may lose food. If a predator falls in number, one of its prey may increase and place greater pressure on plants. The actual result depends on the other feeding links and on the conditions of that ecosystem.

ONE-WAY FLOW OF ENERGY

Sunlight is the principal energy input for most ecosystems. Producers store a part of it as chemical energy in food. When a consumer eats a producer, only a part of that stored energy becomes available to the consumer. Uneaten parts, undigested material and dead organisms may pass energy to decomposers instead. Energy supports movement, growth and maintenance; much of the energy released during respiration is eventually lost as heat. Consequently, energy moves from one trophic level to the next and does not return to an earlier level as usable food energy.

The familiar Class X model uses an approximate ten-per-cent transfer from one trophic level to the next. It is a teaching approximation, not a fixed result for every organism or every chain.

Level	Approximate statement	Energy remaining in a simple model
Producer	Starting energy stored in food	1000 units
Primary consumer	About 10% of producer energy	100 units
Secondary consumer	About 10% of the preceding level	10 units
Tertiary consumer	About 10% of the preceding level	1 unit

WORKED EXAMPLE:

If a simple model starts with 800 energy units in producers, about how much reaches the secondary consumer after two transfers?

Ans. The primary consumer receives approximately 10% of 800, which is 80 units. The secondary consumer receives approximately 10% of 80, which is 8 units. This is an illustrative estimate; actual transfer depends on the organisms and the ecosystem.

An energy pyramid is broad at the producer level and becomes narrower towards the top because available energy decreases at successive trophic levels. A pyramid of numbers or a pyramid of biomass may have a different shape in some ecosystems. These diagrams should not be treated as identical measures.

ARROW AND LEVEL CHECKS: In “rice → insect → frog → snake”, the arrow points from rice to the insect because the insect eats rice. Rice is at the first trophic level, the insect at the second, the frog at the third and the snake at the fourth. A decomposer can receive dead matter from all four levels.

PERSISTENT POLLUTANTS AND BIOLOGICAL MAGNIFICATION

Some pollutants are not easily broken down and may remain in soil or water. Small organisms can take them in, and a consumer may receive the pollutant when it eats many contaminated organisms. If a contaminant is absorbed from food or the environment faster than it is excreted, it can accumulate in the body's tissues over time. This is often called **bioaccumulation** or accumulation within an organism.

When the concentration of a persistent pollutant increases at successively higher trophic levels, the process is called **biological magnification**. For example, a persistent pesticide residue in a pond may enter small aquatic organisms, pass to fish that eat many of them, and reach a higher concentration in a bird or other predator that eats many fish.

The two ideas are related but not identical. Accumulation refers to change within one organism over time; magnification refers to the pattern across successive feeding levels. Biological magnification is especially associated with persistent substances that are not readily broken down or excreted. It is not a rule that the concentration of every chemical increases at every level.

Question	What to examine	Correct idea
Does it persist?	Whether biological and environmental processes break it down readily	Persistence makes long-term transfer possible
Where is it stored?	Whether the organism removes the substance quickly	Storage can allow accumulation
Which level?	The concentration in organisms at different feeding levels	A higher level may receive more concentrated residue

18. In the chlor-alkali process, which gas is released at the anode?

- (A) Chlorine (B) Hydrogen
(C) Oxygen (D) Nitrogen

Answer: (A) Chlorine

Explanation: Electrolysis of brine releases chlorine at the anode and hydrogen at the cathode. Sodium hydroxide remains in the solution.

19. Which formula represents baking soda (sodium hydrogencarbonate)?

- (A) Na_2CO_3 (B) NaOH
(C) NaHCO_3 (D) CaCO_3

Answer: (C) NaHCO_3

Explanation: Baking soda is sodium hydrogencarbonate, whose chemical formula is NaHCO_3 . Sodium carbonate is Na_2CO_3 , a different salt.

20. Blue copper(II) sulphate crystals are heated until they lose their water of crystallisation. What colour is the anhydrous copper(II) sulphate formed?

- (A) Blue (B) Green
(C) Black (D) White

Answer: (D) White

Explanation: Hydrated copper(II) sulphate is blue. On losing its water of crystallisation, it becomes white anhydrous copper(II) sulphate. Adding water restores the blue colour.

21. The property of a metal that allows it to be beaten into thin sheets is called:

- (A) Malleability (B) Ductility
(C) Hardness (D) Sonority

Answer: (A) Malleability

Explanation: Malleability is the ability of a metal to be hammered or beaten into sheets. Drawing a metal into wires is ductility.

22. The property that allows a metal to be drawn into wires is called:

- (A) Electrical conductivity (B) Malleability
(C) Lustre (D) Ductility

Answer: (D) Ductility

Explanation: Ductility is the ability to draw a metal into a wire. Malleability refers to making sheets by hammering.

23. Which metal is liquid at ordinary room temperature?

- (A) Iron (B) Copper
(C) Aluminium (D) Mercury

Answer: (D) Mercury

Explanation: Mercury is the familiar metal that is liquid at ordinary room temperature. Iron, copper and aluminium are normally solid under these conditions.



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39. Where was the first medical college of Assam established?

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