SLO Based Assessment

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04 Pillars of Formal Education

1. Curriculum

2. Textbooks & Learning Materials

3. Instructional strategies

4. Assessment

Development of SLO Based Question Papers
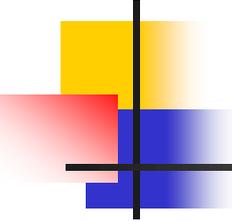
Understanding of

1. Curriculum
2. Format of Test Items
3. Bloom Taxonomy
4. Difficulty Level of an Item

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Structure of the National Curriculum 2006
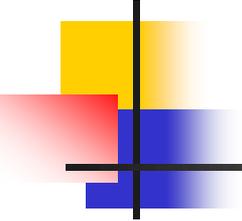
- Description of Competencies, standards, benchmarks and students learning outcomes

- Themes

- Teaching strategies

- Teaching and learning Resources (including guidance for textbook writing, A.V.aids, Online resources, materials and apparatus)

- Assessment and evaluation

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Competency:

A key learning areas. e.g In English there are 05 competencies :

1. reading & thinking skills,
2. writing skills ,
3. oral communication skills,
4. formal &n lexical aspects of language, and
5. appropriate ethical & social development)

■ **Standards**

These define the competency by specifying broadly, the knowledge, skills and attitudes that students will acquire, should know and be able to do in a particular subject during twelve years of schooling.

Benchmarks:

In terms of the curriculum, education from grades I-XII forms an integral whole.

- Description of performance, five developmental levels have been identified.

- The framework has been formulated, keeping in mind the ultimate requirement of Grade XII students' academic, job-related, social and individual language needs.

- It is very important that curriculum content is relevant to age and intellectual level of learner.

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- **Student Learning Outcomes (SLOs):**

- SLOs are statements that describes the K,S & A student should acquire at the end of a particular learning experience/activity or assignment.

- Well written SLO should be **SMART** (specific, measurable, achievable, relevant & time-bound)

03 Elements of SLOs: Behavior, Criteria and condition

SLO: Add two or more rational numbers

Behavior

Criteria

Condition
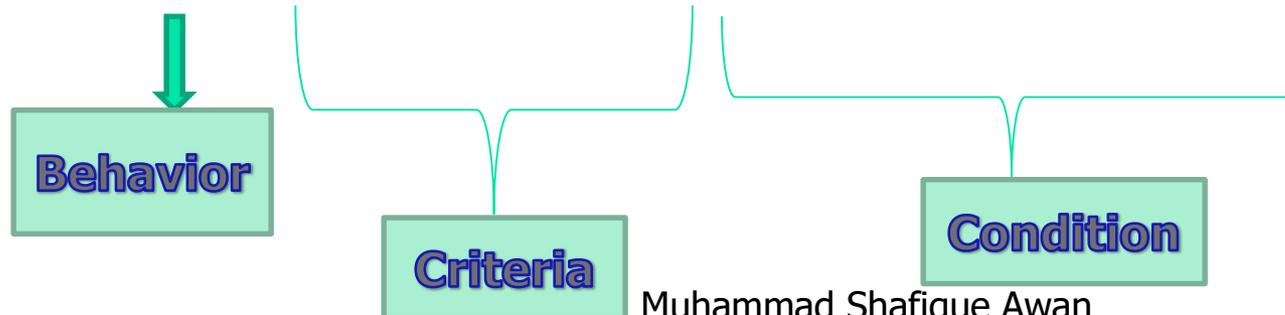
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A
Key
Learning
Area

Competency

A Standard defines
the competency

Each competency
has different number
of standards

Standards

Benchmarks further elaborate the standards.
A benchmark progresses through developmental levels.

I-II   III-V   VI-VIII   IX-X   XI-XII
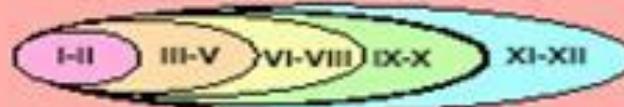
Benchmarks

SLO   SLO   SLO

SLOs are built on the descriptions of the benchmark.
Each benchmark has different number of student learning outcomes.

Student Learning Outcomes

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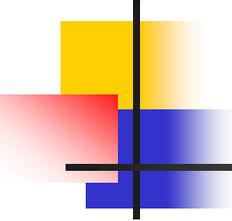
Process of Test Development

- Development of Assessment Framework
- Development of Table of Specification
- Item writing for each SLO
- Review the Test Items
- Piloting the Test items
- Reviewing & finalizing the Test items
- Assembling the test keeping in view the ToS

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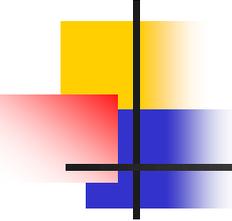
Format of test

Test Item Formats used by FBISE:
- Multiple-Choice Question (MCQ)
- Restricted Response Question (RRQ)
- Extended Response Question (ERQ)

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Type	Advantages	Limitations
Multiple-Choice Question	•**Can measure all levels of student ability** •**Enables wide sampling of subject content.** •**Quick and easy to score.** •**Enables objective scoring.** •**Minimum guessing factor**	▪**Difficult to construct good item** ▪**Tendency to measure simple recall**

Type	Advantages	Limitations
Restricted Response Question	■ Minimize guessing ■ Enables coverage of fairly wide content ■ Relatively easy to construct ■ **Develop an understanding of content hence rote learning is minimized** ■ Give more room to students to express their point of view ■ Scoring criteria/rubric based marking brings objectivity	■ Measuring limited range of ability ■ Can't be machine-scored ■ Scoring is high dependent on judgment ■ Involve teacher judgment
Extended Response Question	■ Can be quickly and easily constructed ■ Eliminate guessing ■ Can test high order of thinking ■ Rubric based marking brings objectivity	■ Limits amount of content sample ■ Time consuming in score ■ Result in low scoring reliability
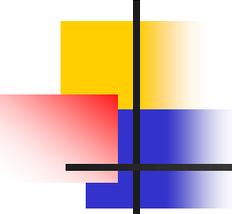
Multiple Choice Question- MCQ

MCQ is a form of an objective assessment in which respondents are asked to select only correct answers from the choices offered as a list.

Types of MCQ

1. **Multiple Choice Question :** Stem with 04 or 05 options
2. **Complex multiple Choice Question :** A stimulus and a set of MCQs

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Anatomy of MCQ

- The capital of Pakistan is **Stem**

Options/Alternatives

a. Lahore

b. Karachi   } **Distractors**

c. Peshawar

d. Islamabad **Key**

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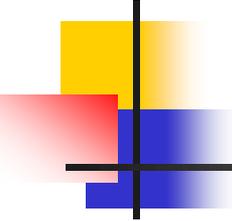
Multiple Choice Question- MCQ

STEM - 04 or 05 Options
03 or 04 Distractors and one Key

- STEM   Statement of question

- OPTIONS   Answer choices

- KEY   The correct answer

- DISTRACTORS   Unkeyable options

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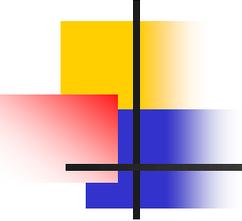
Stem

Stem of MCQ may

- ask question
- Give an incomplete statement
- State an issue
- Describe a situation

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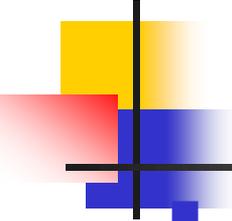
Rules for writing Stem

- Simple in language
- Understandable
- Directed
- Body of knowledge
- Smart
- Single idea/concept

The 3 C's: Clarity – Clarity – Clarity

Avoid the following

- Clue in the stem
- Difficult & ambiguous language
- Negative or Double Negative
- Not tricky

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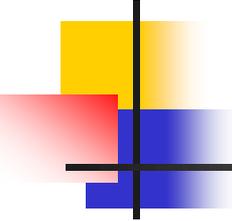
Options/Responses

- The "BEST" answer is the key

- The other responses are "DISTRACTORS"

- "DISTRACTORS" are the logical misconceptions of the best answer seem plausible to the candidate who have partial, incomplete or inappropriate knowledge

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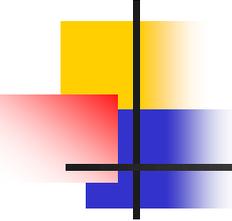
Rules for writing Options

- Parallel in structure
- Homogenous
- Clear and concise
- Smart in size
- Fit logical with stem /Syntax (with stem)
- In order (smallest to largest)

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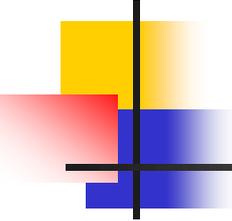
Rules for writing Distractors

Distractors:
- The hard part
- Use to control for difficulty of item
- Logical misconception to the key
- Plausible but wrong; attractive to those lacking KSA
- Parallel in syntax and grammar AND make sense
- Avoid "specific determiners": Always, never
- If the stem is negative, avoid negative distracters.
- Avoid AOTA and NOTA

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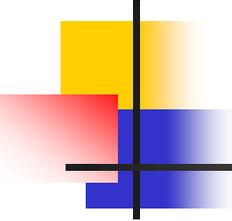
Rules for writing Key

1. One key and one key only
2. Single best answer
3. Should not stand out
4. Should not contrast directly with another option
5. Not clue in the stem
6. Not follow any pattern in placing key

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MCQ	Dos	don'ts'
Stem	✓ **Simple in language** ✓ **Understandable** ✓ **Directed** ✓ **Body of knowledge** ✓ **Smart** ✓ **Single idea/concept**	• **Clue in the stem** • **Difficult & ambiguous language** • **Negative or Double Negative** • **Not tricky**
Options/distractors	✓ **Parallel in structure** ✓ **Homogenous** ✓ **Clear and concise** ✓ **Smart in size** ✓ **Fit logical with stem /Syntax** ✓ **In order (smallest to largest**	• **Heterogeneous** • **Different in Size** • **No Clue** • **Avoid "specific determiners": Always, never** • **If the stem is negative, avoid negative distracters** • **AOTA and NOTA**
Key	✓ **One key and one key only** ✓ **Single best answer** ✓ **Different position when assemble test**	✓ **Should not stand out** ✓ **Should not contrast directly with another option** ✓ **Not clue in the stem** ✓ **Not follow any pattern in placing key**

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Bloom Taxonomy

Level 6: Evaluation

Level 5: Synthesis

Level 4: Analysis

Level 3: Application

Level 2: Understanding

Level 1: Knowledge

COMPLEX

SIMPLE
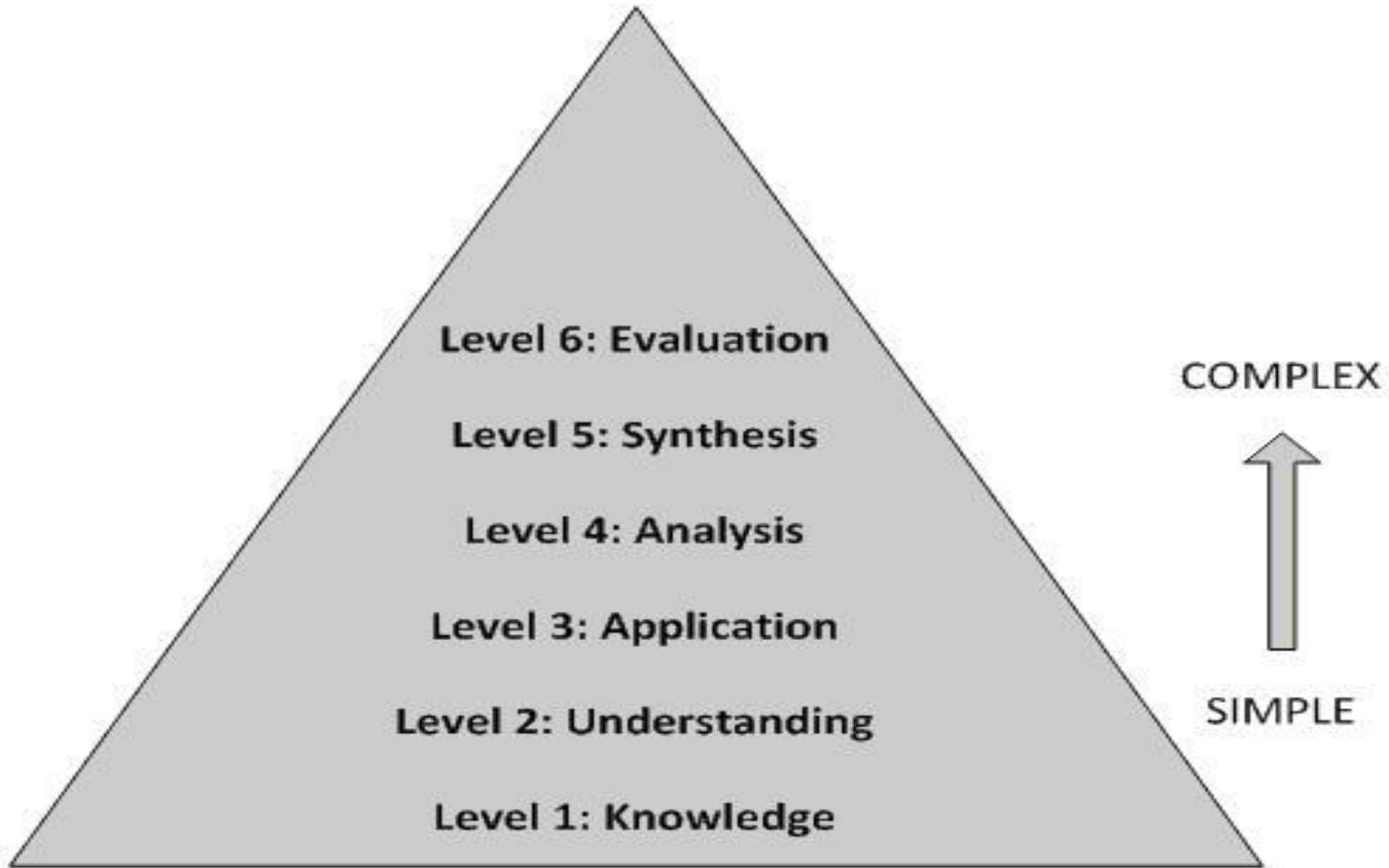
Bloom's Taxonomy: Levels 1 - 6

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Revised Bloom's Taxonomy (Lorin Anderson & David Krathwohl,2001

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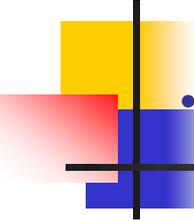
……Knowledge- remembering

- The learner is able to recall, restate and remember learned information.

- Listing

- Describing

- Retrieving

- Naming

- Locating

- Defining

- Finding etc

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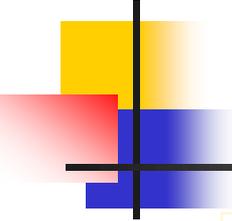
Item. Remembering

- Maths Grade 9
- Unit 4
- Topic: Algebraic Expression and Algebraic Formula
- Difficulty Level: Easy
- SLO: The Students will be able to know the formulas
- $(a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$
- $(a + b)^2 - (a - b)^2 = 4ab$
- Item: Which of the following is equal to 4xy.

A) $(x^2 + y^2) + (x^2 - y^2)$
B) $(x + y)^2 - (x - y)^2$
C) $(x^2 + y^2) - (x^2 - y^2)$
D) $(x + y)^2 + (x - y)^2$

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SLO based MCQ (SSc Mathematics-K)

SLO: Define $a - ib$ **as the complex conjugate of** $z = a + ib.$

- **Cognitive Level: Knowledge**

Item:

The complex conjugate of $3 + 5i$ is:

A. $-3 + 5i$

B. $-3 - 5i$

C. $3 - 5i$

D. $5 - 3i$ **Key: C**

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Comprehension

The ability to grasp and utilize the meaning of material

It comprises into three types of behaviors;

1. **Translation:** To translate material from one form to another (e.g. words to numbers),from one language or form of communication to another(e.g. translation questions)

2. **Interpretation:** To interpret material in meaningful way (e.g. explaining, summarizing),

3. **Extrapolation:** To infer and predict something based on literal knowledge , to draw certain implications (e.g. predict continuation of trends or patterns)

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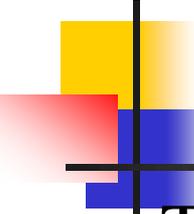
......Comprehension-Understanding

The learner grasp the meaning of information by interpreting and translating what has been learned.

- Interpreting
- Summarizing
- Inferring
- Paraphrasing
- Explaining
- Comparing
- Classifying etc

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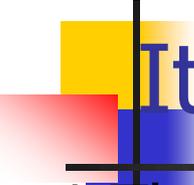
Item . Interpretation & Extrapolation

1. The statement that "John received a standard score of zero" means that John

a. failed that test
b. exceeded all the examinees
c. exceeded 50% of the examinees
d. has a raw score of zero

2. A boy who failed in the final exam is likely to be

a. Sad
b. Happy
c. Apathetic
d. Curious

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Item-Comprehension (pattern)

The images show the stages in the life cycle of a butterfly.

A   B   C   D
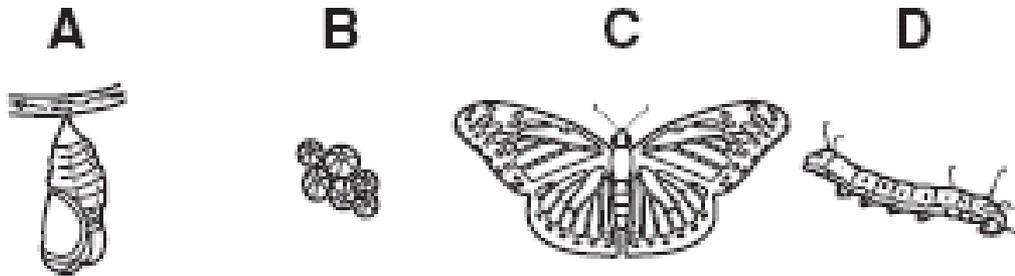
The correct order of the life cycle of the butterfly is

A   B, A, D, C.

B   B, D, A, C.

C   D, C, B, A.

D   A, B, D, C.

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Item: Comprehension/Understanding

- **Maths Grade 9 (Unit 4)**

Topic: Algebraic Expression and Algebraic Formula

Cognitive Level: Understanding   **Difficulty Level:** Moderate

SLO: Examine weather a given rational expression is in lowest term or not.

Item: Which of the following rational expression is in its lowest term.

	Key C
A) $\dfrac{x^3-1}{x^2+x+1}$ B) $\dfrac{x^2-1}{x+1}$	
C) $\dfrac{x^2+4}{x+2}$ D) $\dfrac{x^2-9}{x+3}$	

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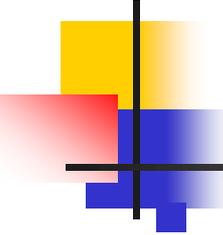
Item

The greatest common factor of 45 and 60 is

A. 3.

B. 5.

C. 15.

D. 3.

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SLO based MCQ (SSc Mathematics-U)

Unit# 2: Matrices and Determinants

SLO: Distinguish between homogenous and non-homogenous linear equations in 2 and 3 unknowns.

Cognitive Level: Understanding

Item.

In the following pairs of linear equations, the system of homogenous linear equations is:

A. $x_1 + 2x_2 = 0, and\ 2x_1 + x_2 = 0$

B. $x_1 + 2x_2 = 0, and\ 2x_1 + x_2 = 4$

C. $x_1 + 2x_2 = 2, and\ 2x_1 + x_2 = 0$

D. $x_1 + 2x_2 = 2, and\ 2x_1 + x_2 = 4$

Key: A

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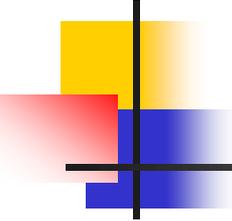
Understanding

’پھول توڑا گیا‘ کا معروف جملہ ہے:

- A۔ اکبر پھول توڑ رہا ہے۔
- B۔ وہ پھول توڑتے ہیں۔
- C۔ امجد نے پھول توڑا۔
- D میں پھول توڑوں گا ۔

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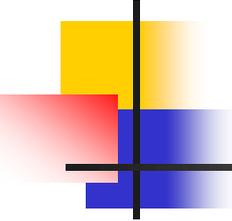
Application

- The ability to utilize learned material in new situation to necessitate the application of principles, theories, rules, etc.

- Application of abstraction in a situation in which no mode of solution is specified

- Use of abstractions in particular and concrete situations

- Apply the literal knowledge to the real life

(e.g. to apply social skills in the society, to find the way by using map etc)

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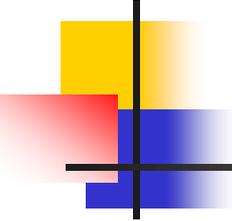
......Application

The learner makes use of information in a context different from the one in which it was learned

- Applying
- Implementing
- Carrying out
- Using
- Executing etc

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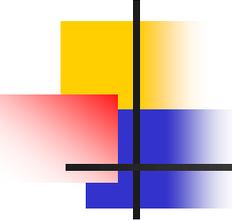
Item. Application

- **Maths Grade 9   Unit 4**
- Topic: Algebraic Expression and Algebraic Formula
  Difficulty Level: Difficult
- **SLO:** Find the value of a^2+b^2 and of ab when the value of a+b and a-b are known.

Item: If x+y=2 and x-y=1 then find the value of 4xy.

A) =1
B) =-1
C) =3
D) =-3

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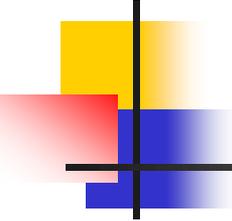
Item . Application

- How much square feet carpet is required for squarish hockey ground equal to 24

a. 36

b. 6

c. 2

d. 6

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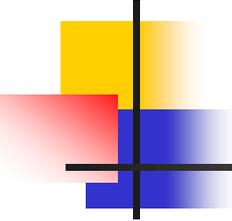
Item . Application

He is building an house.

The word building is a(n)

 a. verb

 b. adverb

 c. adjective

 d. noun

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Item – application

8 A student has a mixture of sand, rocks, and iron shavings. He wants to separate them into three piles: sand, rocks, and iron shavings.
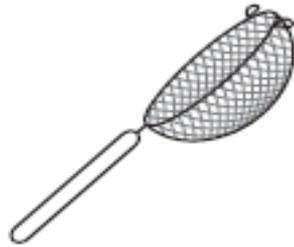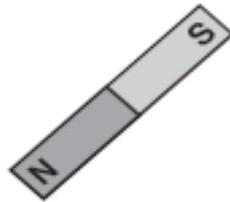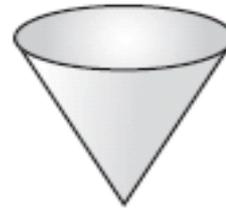
Sieve   **Magnet**   **Filter paper**   **Magnifying glass**

Which tools should be used to separate the mixture into the three piles?

A filter paper and magnifying glass

B sieve and magnet

C magnet and filter paper

D sieve and magnifying glass

SLO based MCQ (SSC Mathematics-A)
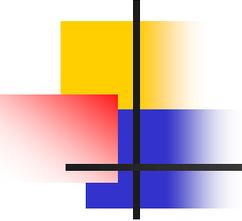
Unit#4: <u>**Sequences and Series**</u>

SLO: Find the nth or general term of an arithmetic sequence.

Cognitive Level: Application

Item: The general term of an arithmetic sequence, whose first term and the common difference are 2 and -3 respectively, is:

- $3 + 5n$
- $3 - 5n$
- $5 + 3n$
- $5 - 3n$ **Key: D**

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Key verbs for Students Learning Outcome

Level/Category	Key Verbs
1 – Knowledge	list, recite, outline, define, name, match, quote, recall, identify, label, recognize.
2.Comprehension	describe, explain, paraphrase, restate, give original examples of, summarize, contrast, interpret, discuss.
3 – Application/	classify, break down, categorize, analyze, diagram, illustrate, criticize, simplify, associate.
4 – Analysis	classify, break down, categorize, analyze, diagram, illustrate, criticize, simplify, associate.
5 – Synthesis	design, formulate, build, invent, create, compose, generate, derive, modify, develop.
6 – Evaluation	choose, support, relate, determine, defend, judge, grade, compare, contrast, argue, justify, support, convince, select, evaluate.

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Restricted Response Questions (RRQs)
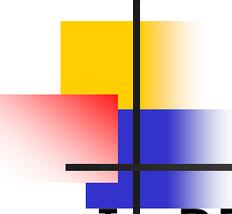
- In RRQs students asked to apply knowledge, skills, and critical thinking abilities to real-world, standards-driven performance tasks.

- RRQs can be very simple, requiring students to answer with only a sentence or two, or quite complex.

- Whether simple or complex, all RRQs measure students' ability to apply, analyze, evaluate, and synthesize the knowledge that they have acquired in a more abstract way

- These items are marked through a **marking scheme/rubrics** having   possible answer and distribution of marks with checking hints.

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RRQs
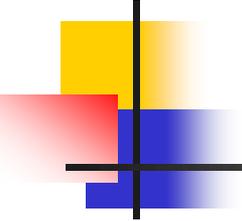
For example, in English, students may be asked **'to paraphrase one of the given stanza.'**

In Maths , students may be asked to **simplify/solve any given ……. .**

In Pak studies, they may be asked to **Identify the three major features of Pakistan's culture.**

In Bio, student may asked to **explain the three major difference between plant and animal cell**.

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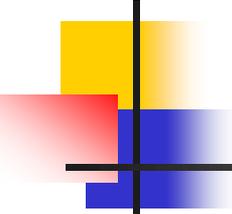
Example of RRQ

Example:

Identify three major features of Pakistan's culture

Answere:_____

_____

_____

Rubrics (checking hints & distribution of marks:

Correct one major feature	Correct second major feature	Correct third major feature	Total marks for complete response
01	01	01	03
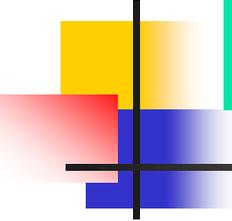
RRQ

Example:

Subject: Science   Class 5

Q. Define vertebrates and give any two examples.   (**3 Marks)**

_____

_____

Rubric:

Correct definition of vertebrates	One correct example of vertebrates	Second correct example of vertebrate	Total
1 Mark	01 Mark	01 Mark	3 Marks

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Extended Response Questions (ERQs)
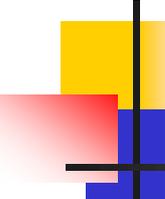
- ERQs are those items where students are asked to give a detailed answer to a question, hence allowing them to write down their detailed view point in response to a question.

- ERQs take more time and allows more space for thoughts and expression as compared to other question items like MCQs & RRQs.

- It allows students not only to give answer to the question but also judges their comprehension level of the question.

- Hence ERQs can assess comprehension, application and other HOTs as well as writing skills of a student at the same time.

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Constructing an effective ERQs

- Be clear about the demand of the SLO

- For assessing application and higher levels of abilities of the students it is more appropriate to use ERQs.

- In constructing essay items be sure to allot appropriate time for responding to the questions.

- Items should be constructed in such a way to look attractive and motivating for the students.

- Clearly identify the main points to be addressed in the essay.

- Place ERQs at the end of the question paper.

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Example of ERQs
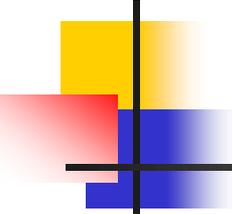
Examples: English:

Write a paragraph of 100 words on …..

Write an application …….

Write a letter ……

Write a story…..

Write a dialogue

Maths:

Prove that …..

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Test Development Process (SLO based Item Bank)

Cognitive level
- Knowledge
- Comprehension
- Application

Curriculum 2006 → **S.Learning outcomes** → **Assessment Framework**

Item Development

Reference
- Textbooks
- Other reference material

- Table of Specification (Biology 9th)

CH. No	Chapter Name	weightage in %	Items selected		
			MCQS (Marks) Each MCQs has 1 Marks	RRQs(Marks) Each RRQ has 4 marks	ERQs(Marks) Each ERQ hasmarks 3+4= 07
1	Introduction to biology	6	1	1(4)	-
2	Solving Biological Problem	6	1	1(4)	1(4)
3	Biodiversity	6	1	-	1(4)
4	Cells and Tissues	16	2	2(8)	1(3)
5	Cell Cycle	14	2	2(8)	1(4)
6	Enzymes	12	1	1(4)	1(3)
7	Bio-Energetics	14	2	1(4)	1(4)
8	Nutrition	12	1	1(4)	1(3)
9	Transport	14	1	2(8)	1(3)
	Total	**100**	**12**	**32/44**	**21/28**

Difficulty level
- Easy
- Moderate
- Difficult

Pilot & review

- Paper setting

Item Bank

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How Bloom Taxonomy is useful for teachers
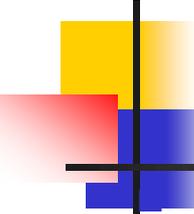
- **Bloom's Taxonomy is a hierarchical ordering of cognitive skills that   can**, **help teachers teach and students learn**. Bloom's Taxonomy can be used to:
- level/categorize SLOs
- plan instruction and lessons accordingly
- develop test item/s against that SLO
- Use the item at the right time
- Adjust and improve the instruction
- Grading the Assessment
- Feedback to the students
- Report to the stakeholders

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How Bloom Taxonomy works with learning process

Bloom's taxonomy is a powerful tool to develop learning outcomes because it explains the process of learning. It has an hierarchical organization of cognitive domain:

➤ Before you can *understand* a concept, you must *remember* it.

➤ To *apply* a concept you must first *understand* it.

➤ In order to *evaluate* a process, you must have *analyzed* it.

➤ To *create* an accurate conclusion, you must have completed a thorough *evaluation*.

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Cognitive Level	Key Words	Activities	Learning Outcomes
Apply	calculate, predict, apply, solve, illustrate, use, demonstrate, determine, model, perform, present.	Presentation, demonstration, experiment, model making, project, any hands on activity, problem solving & essay writing on unseen topic , create a chart	By the end of this lesson, the student will be able to calculate the kinetic energy of a projectile.
Understand	describe, explain, paraphrase, restate, give original examples of, summarize, contrast, interpret, discuss.	Narrate the story, explain the stanza, Think pair & share, Summarizing of text, Jigsaw, compare & contrast with charts, predict next in story	By the end of this lesson, the student will be able to explain Newton's three laws of motion to in her/his own words
Remember	list, recite, outline, define, name, match, quote, recall, identify, label, recognize.	Remembering of new words/numbers/tables , recall of formula, singing poem, questioning, recitation, retelling story, matching	By the end of this lesson, the student will be able to recite Newton's three laws of motion.

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