آغا خان یونیورسٹی ایگزامینیشن بورڈ
AGA KHAN UNIVERSITY EXAMINATION BOARD

Notes from E-Marking Centre SSC-I Mathematics Annual Examinations 2024

Introduction

This document has been prepared for the teachers and candidates of Secondary School Certificate (SSC) Part I (Class IX) Mathematics. It contains comments on candidates' responses to the 2024 SSC-I Examination indicating the quality of the responses and highlighting their relative strengths and weaknesses.

E-Marking Notes

This includes overall comments on candidates' performance on every question and *some* specific examples of candidates' responses which support the mentioned comments. Please note that the descriptive comments represent an overall perception of the better and weaker responses as gathered from the e-marking session. However, the candidates' responses shared in this document represent some specific example(s) of the mentioned comments.

Teachers and candidates should be aware that examiners may ask questions that address the Student Learning Outcomes (SLOs) in a manner that requires candidates to respond by integrating knowledge, understanding and application skills they have developed during the course of study. Candidates are advised to read and comprehend each question carefully before writing the response to fulfil the demand of the question.

Candidates need to be aware that the marks allocated to the questions are related to the answer space provided on the examination paper as a guide to the length of the required response. A longer response will not in itself lead to higher marks. Candidates need to be familiar with the command words in the SLOs which contain terms commonly used in examination questions. However, candidates should also be aware that not all questions will start with or contain one of the command words. Words such as 'how', 'why' or 'what' may also be used.

General Observations

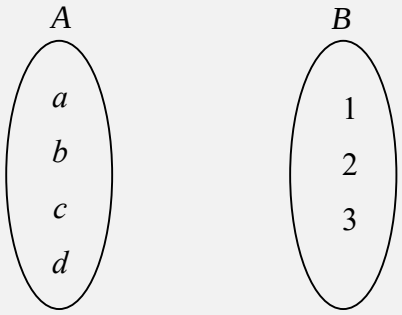
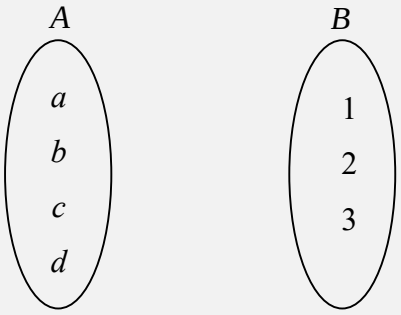
Candidates performed well in some concepts, such as Functions, Logarithms, Surds and Remainder Theorem. However, candidates who did not score well mostly failed to understand the demands of the questions, often misinterpreting the command words and the stimuli.

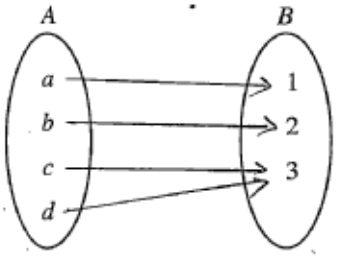
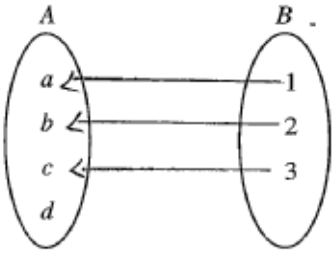
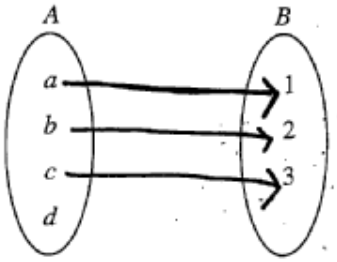
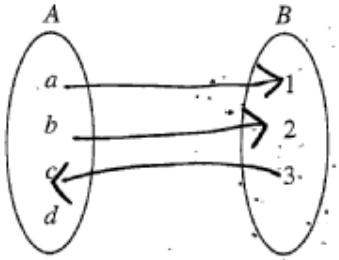
Mentioned below are a few concepts that teachers need to focus so that the candidates may perform even better.

- Factorisation
- Practical Geometry and Theorems.

Note: Candidates' responses shown in this report have not been corrected for grammar, spelling, format or information.

DETAILED COMMENTS
Constructed Response Questions (CRQs)

Question No. 1	
Question Text	For the given sets *A* and *B*, complete the given diagram. i. An onto (surjective) function from *A* to *B*  ii. An into function from *B* to *A*  iii. Can we write an onto function from *B* to *A*? Justify with a reason.
SLO No.	1.6.3
SLO Text	Find (and illustrate): a. into function b. one-one function c. into and one-one function (injective function) d. onto function (surjective function) e. one-one and onto function (bijective function);
Max Marks	3
Cognitive Level	U
Checking Hints	i. 1 mark for the illustration. ii. 1 mark for the illustration. iii. 1 mark for writing the reason. Only Yes or no will not be given any mark.
Overall Performance	This question was designed to evaluate candidates' ability to represent various types of functions. Most candidates demonstrated a solid understanding of how to present onto functions and into functions. However, some struggled with accurately conveying the concepts of onto and into functions.
Description of Better Responses	Better responses demonstrated their proficiency in representing the onto function and into function. In part (i) and (ii), candidates exhibited good understanding of functions and clearly showed the mapping of corresponding elements according to the requirements of the question. In part (iii), they accurately identified that the function from B to A cannot

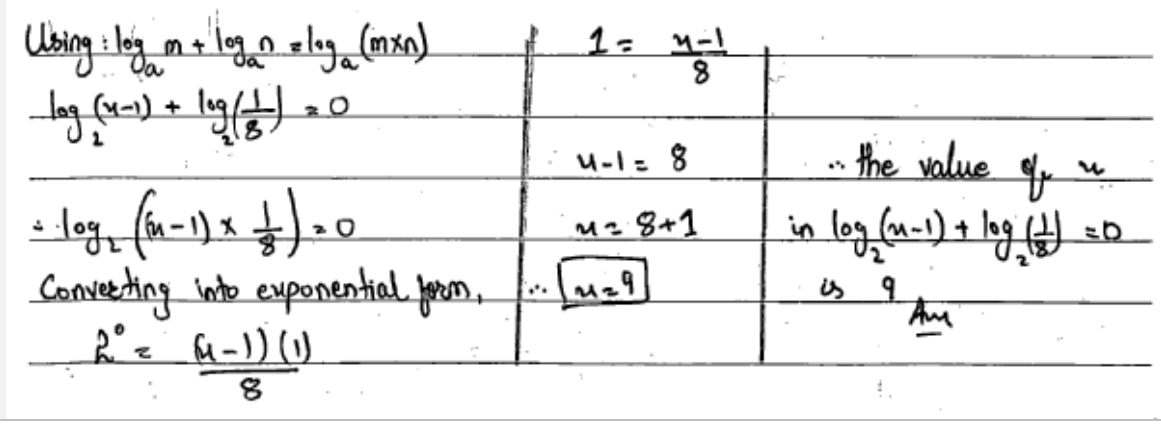
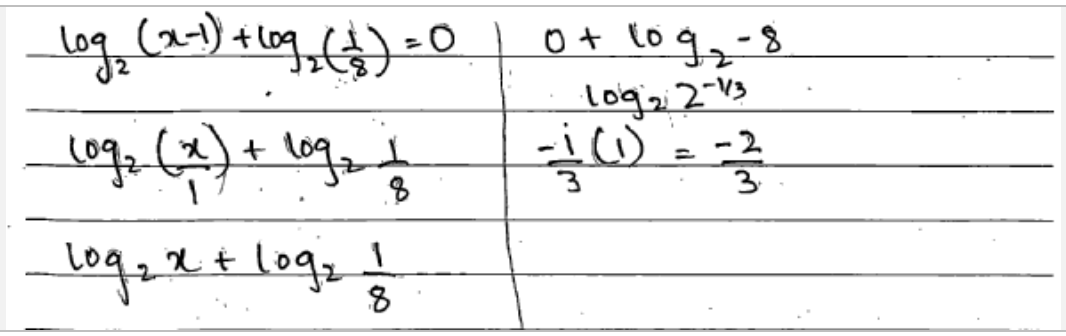
	be written and successfully justified with the reason i.e, the number of elements in B are less than the number of elements in A.
Image of Better Response	 ii. An into function from B to A (1 Mark)  iii. Can we write an onto function from B to A? Justify with a reason. (1 Mark) No, we cannot write an onto function from B to A, as if any element in the domain gets repeated, it will not be a function.
Description of Weaker Responses	Weaker responses showed that candidates struggled to represent the correct concept of function. In part (i), these responses mentioned relations instead of functions. In part (ii), confusions were witnessed with the concept of domain and range. In part (iii), some candidates were unable to mention the right reason. They gave the reason i.e., function A has all the elements that can be joined with the elements of function B uniquely.
Image of Weaker Response	 ii. An into function from B to A (1 Mark)  iii. Can we write an onto function from B to A? Justify with a reason. (1 Mark) Yes we can write an onto function from B to A. Because all the elements of A has the unique image.

Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Preferred Pedagogy** Used for this SLO	Assessment Strategies
• Identify the expectation of command words (use Command Word Guide) • Ensure the content is taught at the relevant cognitive level • Identify necessary content required (skills + concepts) • Review past paper questions on the concept • Utilise the resource guide for additional materials	• Story Board • Cause and Effect • Fish and Bone • Concept Mapping • Audio Visual Resources • Think, Pair and Share • Knowledge Platform videos • Questioning Technique (Socratic approach) • Practical Demonstration ** For description of each Pedagogy, refer to Annexure A	• Past paper questions • Discussion on E-Marking Notes • AKU-EB Digital Learning Solution powered by Knowledge Platform https://akueb.knowledgeplatform.com/login

Any Additional Suggestion:
When teaching these concepts, use diagrams and concrete examples to illustrate the definitions. Emphasise the differences between each type of function by showing specific examples and explaining the requirements for each. Practice problems with varying complexity can help reinforce understanding.

*K = Knowledge U = Understanding A = Application and other higher-order cognitive skills

Question No. 2	
Question Text	Evaluate the value of *x*, if $\log_2(x-1)+\log_2\left(\frac{1}{8}\right)=0$.
SLO No.	3.2.2 & 3.4.1
SLO Text	Solve problems related to SLO 3.2.1; Solve problems using the laws of logarithm (without using log and antilog tables).
Max Marks	3
Cognitive Level	A
Checking Hints	1 mark for writing the log in the form of $\log_2(x-1)-3\log_2 2=0$, **OR** $\log_2(x-1)\left(\frac{1}{8}\right)=0$ 1 mark for writing $\log_2 2=1$ **OR** $(x-1)\left(\frac{1}{8}\right)=1$ 1 mark for converting into exponential form for solution **OR** $x=8+1=9$
Overall Performance	A good number of candidates performed well in this question by correctly applying logarithmic law, While some struggled in applying the correct logarithmic property and conversion of logarithmic form to exponential form.
Description of Better Responses	Better responses applied logarithmic laws correctly, converting $\log_2(x-1)+\log_2\left(\frac{1}{8}\right)=0$ into $\log_2(x-1)-3\log_2 2=0$ or $\log_2(x-1)\left(\frac{1}{8}\right)=0$. They used identity rule or changed log form to exponential form as per the requirements and then, simplified the equation to find the value of x.
Image of Better Responses	
Description of Weaker Responses	Weaker responses showed wrong application of logarithmic laws. Candidates did not convert the logarithmic form into exponential form i.e., $\log_2(x-1)\left(\frac{1}{8}\right)=0$ into $\log 2^{\frac{-1}{3}}=x-1$. This happened due to lack of understanding about how to convert these forms and due to these mistakes, candidates lost their marks in finding out the correct value of x.
Image of Weaker Responses	

Suggestions for improvement (Highlight all that apply)

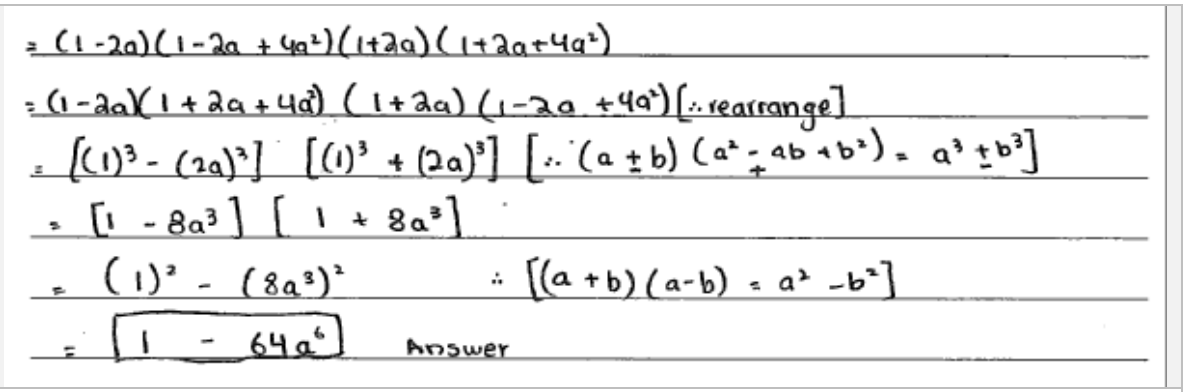
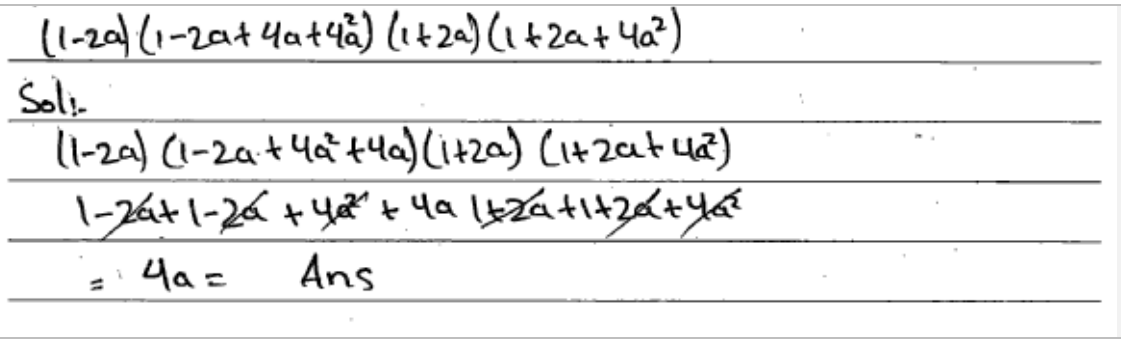
Maximising SLO Achievement	Preferred Pedagogy Used for this SLO	Assessment Strategies
• Identify the expectation of command words (use Command Word Guide)b • Ensure the content is taught at the relevant cognitive level • Identify necessary content required (skills + concepts) • Review past paper questions on the concept • Utilise the resource guide for additional materials	• Story Board • Cause and Effect • Fish and Bone • Concept Mapping • Audio Visual Resources • Think, Pair and Share • Knowledge Platform videos • Questioning Technique (Socratic approach) • Practical Demonstration	• Past paper questions • Discussion on E-Marking Notes • AKU-EB Digital Learning Solution powered by Knowledge Platform https://akueb.knowledgeplatform.com/login

Any Additional Suggestion:
Use real-life analogies or visual aids to make these rules relatable. For example, the product rule can be explained with combining groups of items, and the quotient rule can be illustrated with dividing a collection into smaller parts.

Question No. 3a

Candidates were given the choice to attempt any ONE out of the two questions: 3a and 3b. Majority of the candidates attempted 3a.

Question Text	Find the continued product of the expression $(1-2a)(1-2a+4a^2)(1+2a)(1+2a+4a^2)$.
SLO No.	4.2.9
SLO Text	Find the continued product by using the above formulae.
Max Marks	4
Cognitive Level	A
Checking Hints	1 mark for re-arranging the factors for applying the most feasible formula 1 mark for applying the formula for a^3-b^3 to write $1^3-(2a)^3$ 1 mark for applying the formula for a^3+b^3 to write $1^3+(2a)^3$ 1 mark for applying the formula for a^2-b^2 to write $1^2-(8a^3)^2$
Overall Performance	Many candidates performed well in this question by demonstrating the correct use of identities and command over the concept of continued product. While few of them struggled in application of correct identity.
Description of Better Responses	Better responses applied the correct cubic identities a^3-b^3 and a^3+b^3 after the rearrangement of proper factors. They also used the correct identitiy a^2-b^2 to find the product and to expand the expression completely, leading to scoring full marks.

Image of Better Response	
Description of Weaker Responses	In weaker responses, candidates firstly did not arrange the factors to apply the correct identities a^3-b^3 and a^3+b^3. They also struggled in identifying the necessary factors and made errors during the simplification process. They wrote third last step of the solution like $(1-8a^3)^2$ which is wrong. The correct way to write that step was $(1-8a^3)(1+8a^3)$.
Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Preferred Pedagogy Used for this SLO	Assessment Strategies
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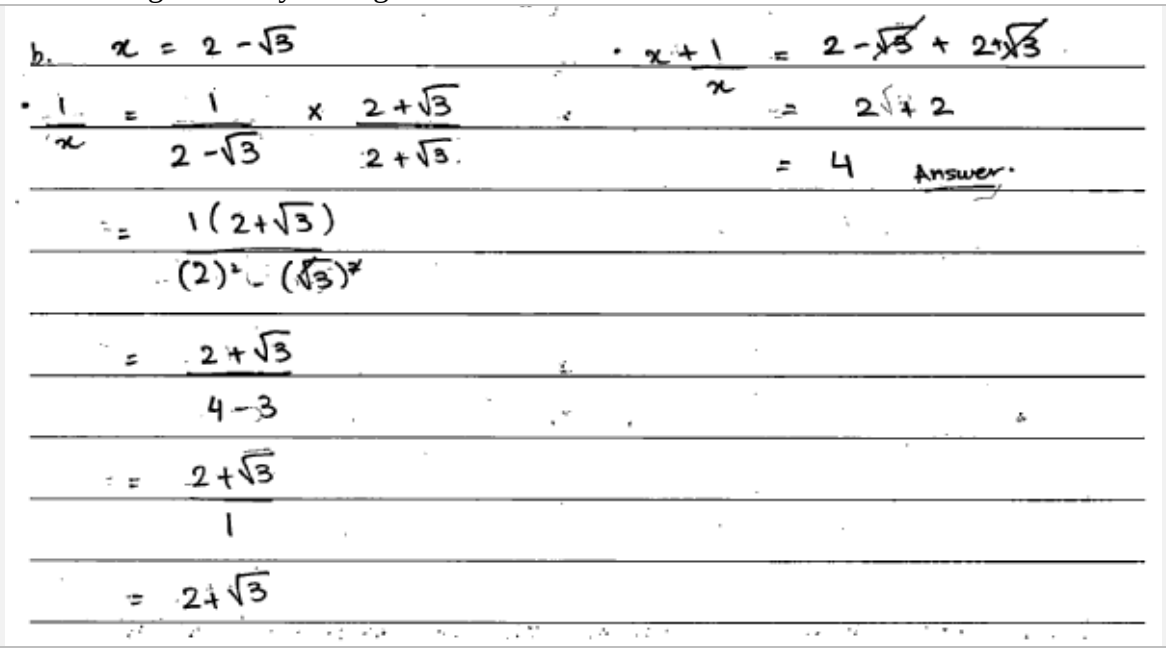
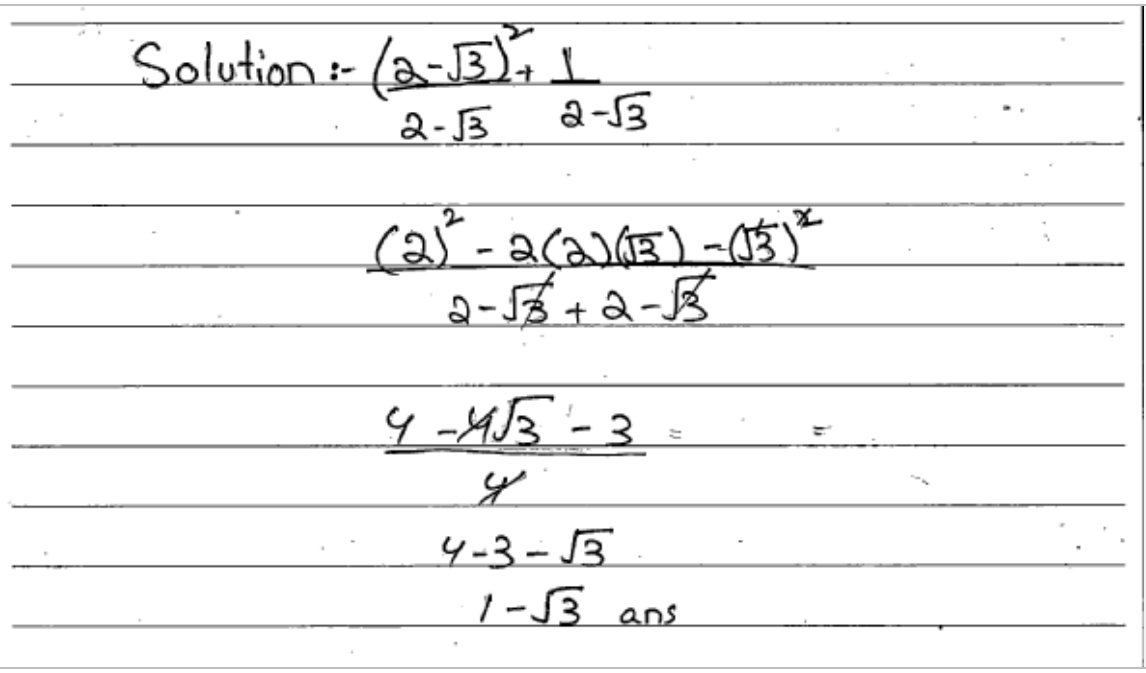
Any Additional Suggestion:
Encourage students to explain their reasoning and solutions to their peers, which can deepen their understanding and highlight different methods.

Question No. 3b	
Question Text	If $x=2-\sqrt{3}$, then find the value of $x+\frac{1}{x}$ in the simplest form.
SLO No.	4.4.2
SLO Text	Solve problems based on surds.
Max Marks	4

Cognitive Level	A
Checking Hints	1 mark for taking the reciprocal of x 1 mark for multiplication and division with the conjugate $\frac{1}{2-\sqrt{3}}\times\frac{2+\sqrt{3}}{2+\sqrt{3}}$ 1 mark for the simplification and writing in the form $\frac{1}{x}=2+\sqrt{3}$ 1 mark for adding $x+\frac{1}{x}$ and writing in the simplest form
Overall Performance	Overall good number of candidates achieved success in this question by applying the concepts of surds properly. However, some candidates struggled in multiplying and dividing with the correct conjugate.
Description of Better Responses	Better responses effectively used the conjugates to rationalise the denominator of expressions $\frac{1}{2-\sqrt{3}}\times\frac{2+\sqrt{3}}{2+\sqrt{3}}$, and found the value of 1/x and then, accurately calculated the resulting values by adding the values of x and 1/x.
Image of Better Response	

Description of Weaker Responses	Weaker responses made errors in applying conjugates, i.e., they wrote this $\frac{1}{2-\sqrt{3}}\times\frac{2+\sqrt{3}}{2-\sqrt{3}}$ at the place of $\frac{1}{2-\sqrt{3}}\times\frac{2+\sqrt{3}}{2+\sqrt{3}}$. Some candidates did not write the correct identity or found the least common multiple (LCM) of the denominator. These mistakes resulted in incorrect simplifications and caused candidates to lost marks.

Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Pedagogy Used for that SLO	Assessment Strategies
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Any Additional Suggestion:

Following are some teaching strategies related to misconceptions and common errors which candidates exhibited.

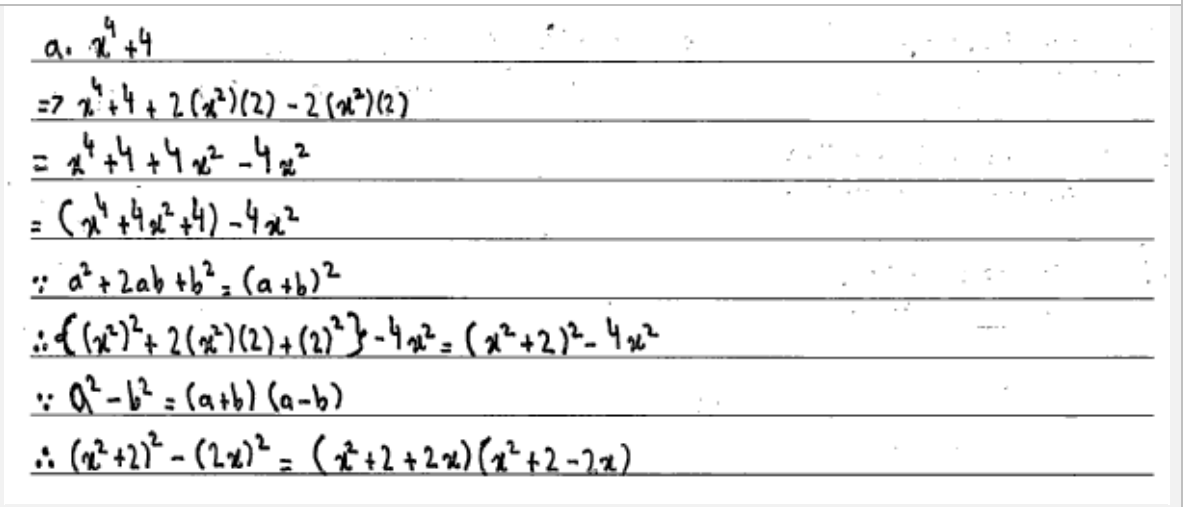
Incorrect Rationalisation: Provide step-by-step demonstrations of rationalisation for various types of expressions. Offer problems that require rationalisation and guide students through the correct process.

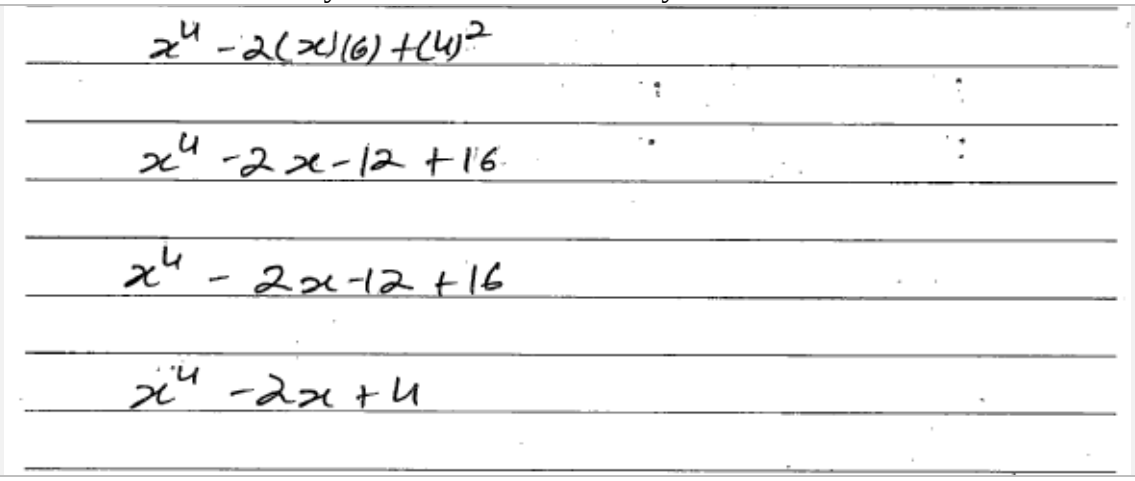
Misapplication of Formulas: Present a variety of problems that require different formulas for surd-related operations. Discuss the scenarios where each formula is applicable and encourage students to identify the correct formula. Break down the simplification process into clear steps. Guide students through problems where simplification is a crucial component and provide practice to reinforce these skills.

Question No. 4a

Candidates were given the choice to attempt any ONE out of the two questions: 4a and 4b. Majority of the candidates attempted 4a.

Question Text	Factorise $\left(x^4 + 4\right)$ completely.
SLO No.	5.2.1a

SLO Text	Factorise the expression of the following types a) $a^4 + a^2a^2 + b^2$ *or* $a^4 + 4b^4$
Max Marks	4
Cognitive Level	A
Checking Hints	1 mark for writing $x^4 + 4$ as $\left(x^2\right)^2 + (2)^2$ 1 mark for adding and subtracting of $4x^2$ 1 mark for applying formula of $(a+b)^2$ 1 mark for converting expression to $a^2 - b^2$
Overall Performance	Although majority of the candidates attempted this question, but they struggled in the understanding of the concept of factorisation by wrongly applying the relevant formula at each step. Few candidates were able to attempt this question successfully.
Description of Better Responses	Better responses correctly added and subtracted the term $4x^2$. They also converted an expression into an answer by using a^2-b^2 and achieved full marks by writing the correct factors $(x^2+2+2x)(x^2+2-2x)$.
Image of Better Response	

Description of Weaker Responses	The weaker responses generally indicate that candidates were confused in distinguishing factors and products, and expression and factors. This resulted in losing marks though following the correct process. Specifically, candidates did not add and subtract the term $4x^2$ or in some cases they did not use a^2-b^2 correctly.
-Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

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Any Additional Suggestion:

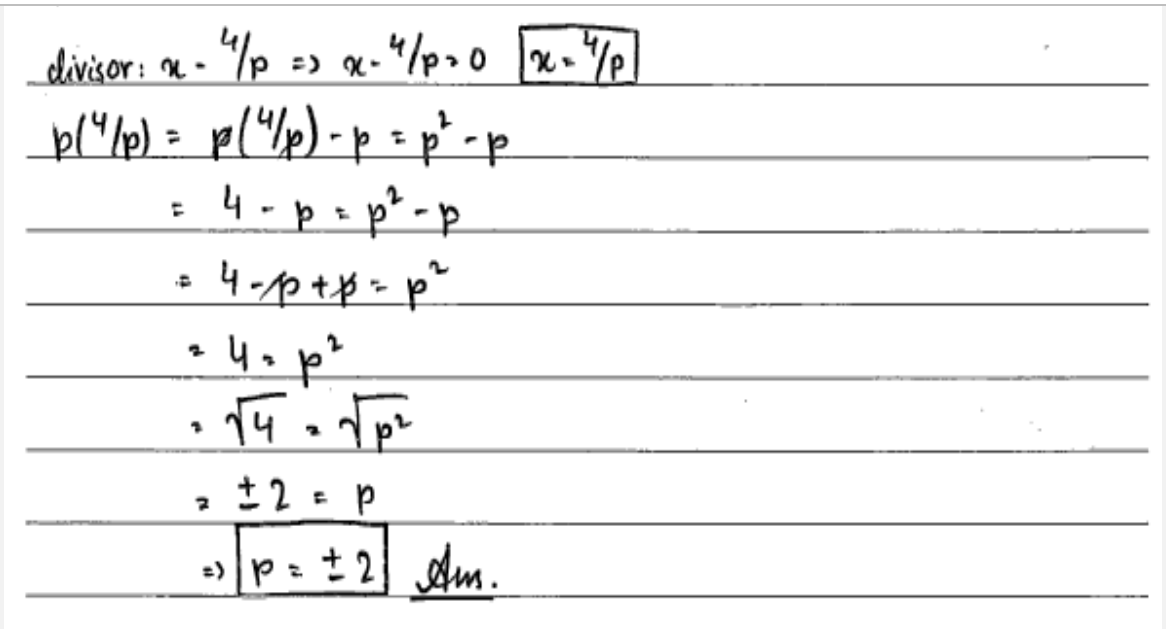
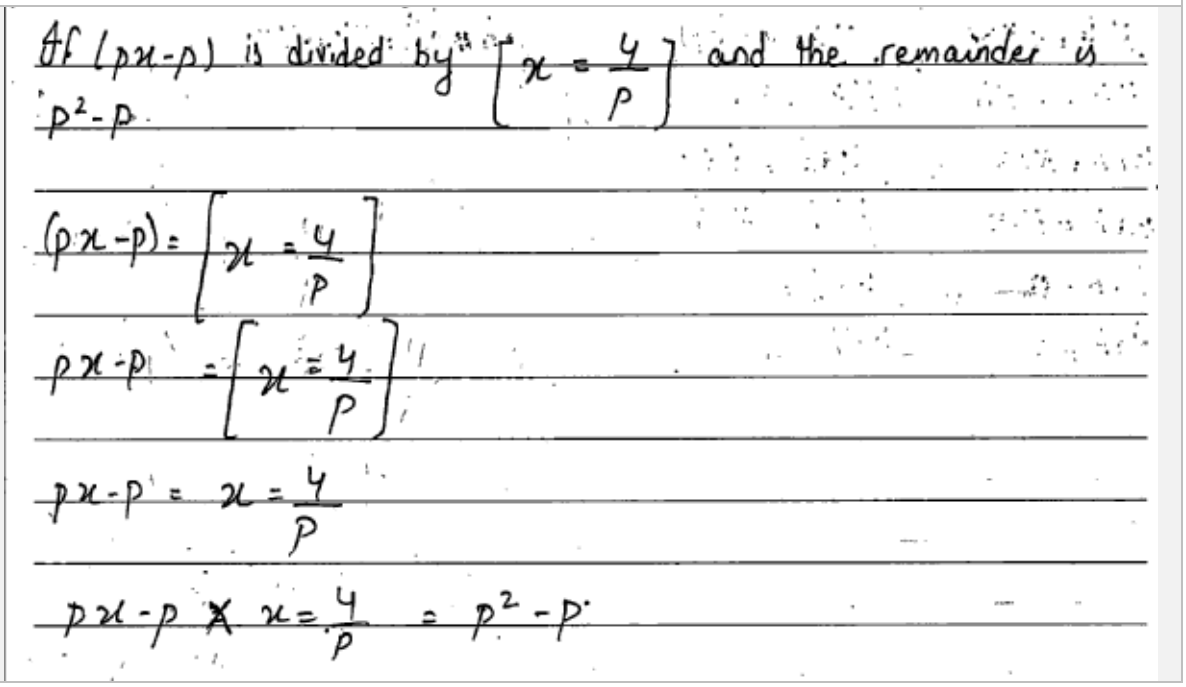
Teachers are suggested to incorporate following strategies while teaching factorisation.

Pattern Recognition: Encourage students to look for patterns in the expanded expressions. Guide them to recognise the identity $(a+b)^2$ and a^2-b^2

Formula Presentation: Introduce the formulas for the $(a+b)^2$ and a^2-b^2 expressions.

Explain the rationale behind each formula and how they relate to the pattern.

Question No. 4b	
Question Text	Find the possible values of p, if $(px-p)$ is divided by $\left(x-\frac{4}{p}\right)$ and the remainder is p^2-p.
SLO No.	5.3.1
SLO Text	Apply remainder theorem to find the remainder when a polynomial is divided by a linear polynomial;
Max Marks	4
Cognitive Level	A
Checking Hints	1 mark for taking $x=\frac{4}{p}$ 1 mark for equating $p^2-p=4-p$ 1 mark for factorisation 1 mark for finding the values of p
Overall Performance	This question was related to the application of remainder theorem. Although less of number of candidates attempted this part, however among those majority of the candidates attempted this question successfully. Some of the candidates did mistake in factorisation and finding the value of p.
Description of Better Responses	Candidates demonstrated a clear understanding of the remainder theorem and found the correct value of x and worte $x=\frac{4}{p}$. Furthermore they simplified the question correctly and successfully found the correct value of p by taking square root.

Image of Better Response	
Description of Weaker Responses	Weaker responses struggled with this question due to related factors and remainders. They made errors in following the correct steps in determining the value of x, resulting in incorrect values for p. Candidates wrote the solution like $4p^2 - p = p^2 - p$ while the correct way to represent that step is $4 - p = p^2 - p$. These mistakes were the reasons to lost their marks.
Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

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• Identify necessary content required (skills + concepts) • Review past paper questions on the concept • Utilise the resource guide for additional materials	• Knowledge Platform videos • Questioning Technique (Socratic approach) • Practical Demonstration	

Any Additional Suggestion:

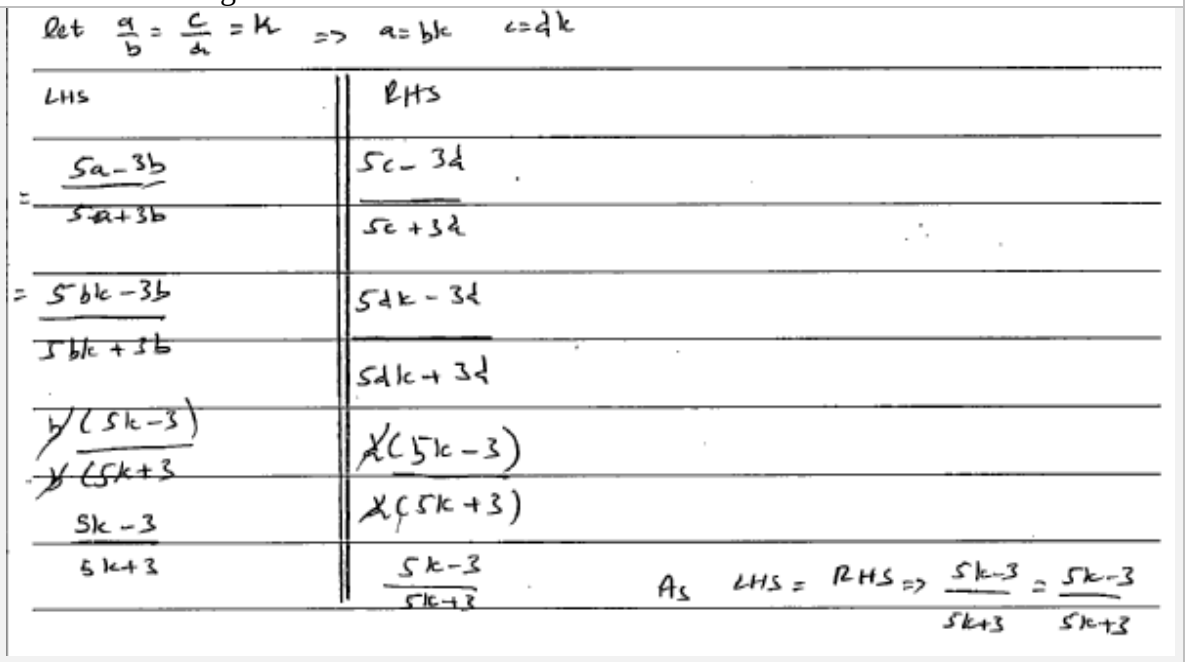
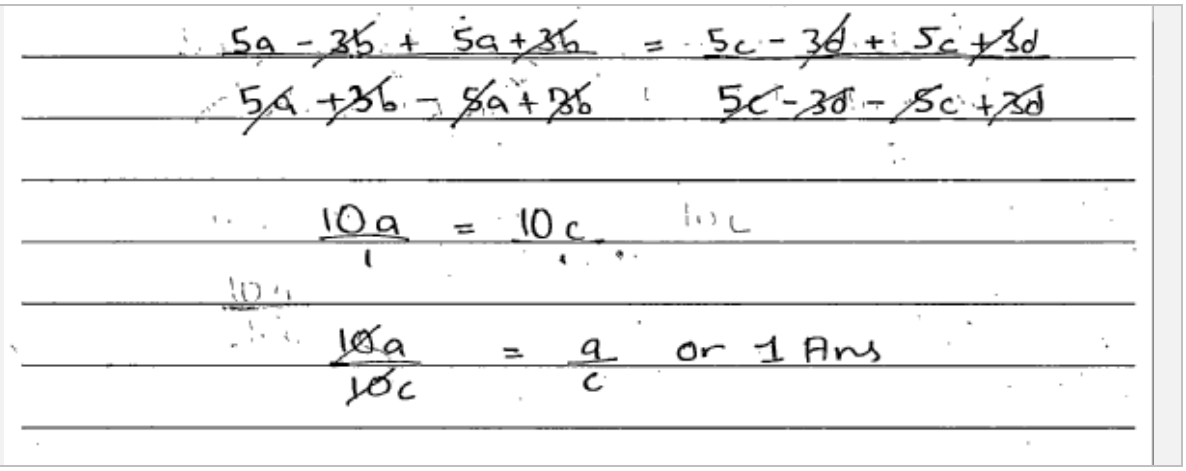
Question No. 5	
Question Text	If $a : b :: c : d$, then show that $\frac{5a-3b}{5a+3b}=\frac{5c-3d}{5c+3d}$ by using *K*-method.
SLO No.	6.4.1
SLO Text	Prove conditional equalities involving proportions using K-method
Max Marks	3
Cognitive Level	A
Checking Hints	1 mark for writing $a=bk$ and $c=dk$ 1 mark for substituting in the LHS and simplification 1 mark for substituting in the RHS and proving equality
Overall Performance	Overall, candidates demonstrated proficiency in this question by formulating an equation based on the provided data and correctly identifying a specific value corresponding to the given information. Their performance reflects a solid grasp of the K-method.
Description of Better Responses	Better responses demonstrated a clear understanding of K-Method. They successfully substituted the correct values for 'a' which is $a=bk$ and for 'c' which is $c=dk$ in the given ratio. Then, candidate cancelled out 'b' and 'd' after taking common to achieve the desired result and earning full marks.
Image of Better Response	
Description of Weaker Responses	Weaker responses struggled in understanding the question. They did not comprehend the question properly because they did not apply the K-Method which was mandatory and attempted to solve it using methods like componendo-dividendo or by substituting incorrect values for 'a' and 'c', resulting in errors during simplification.

Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

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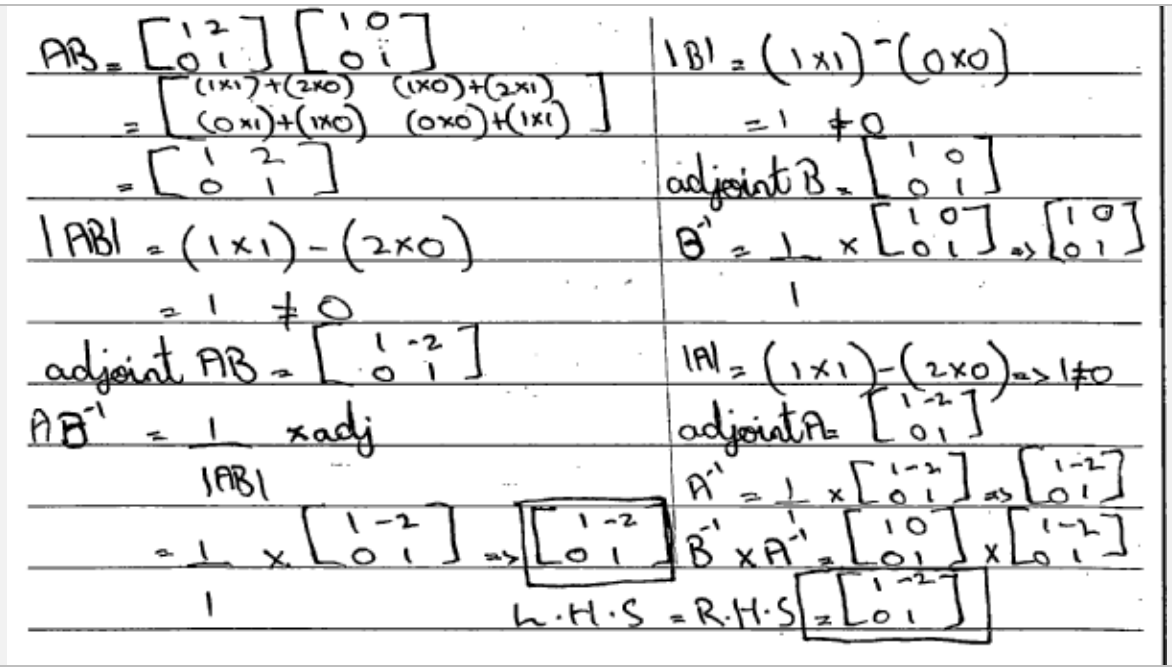
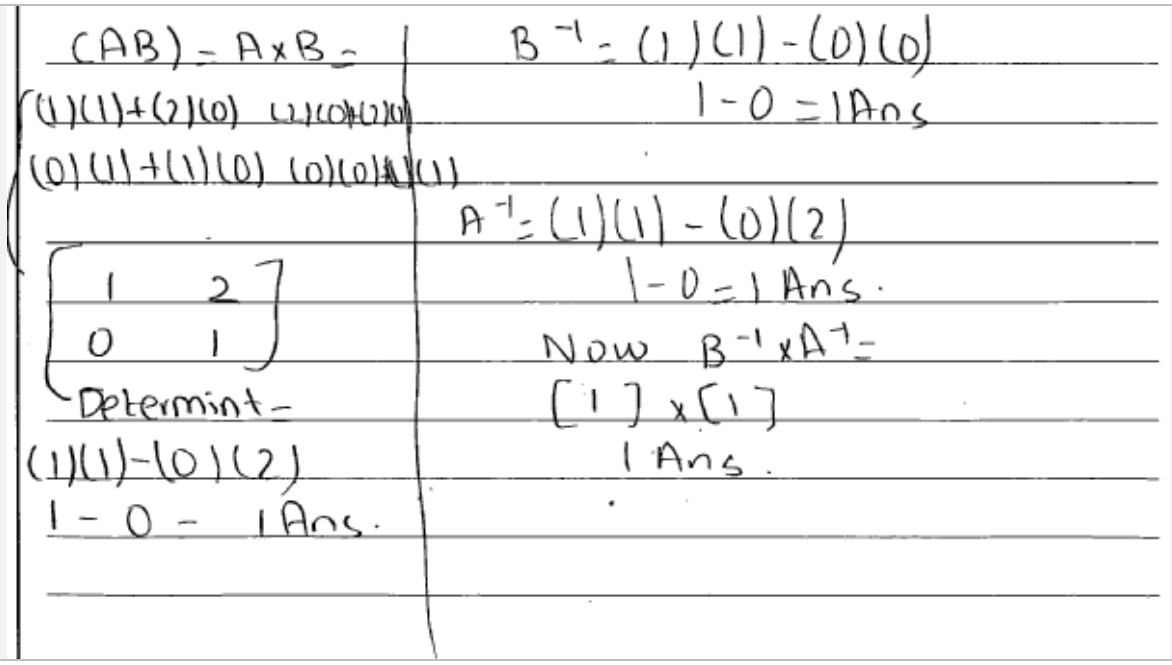
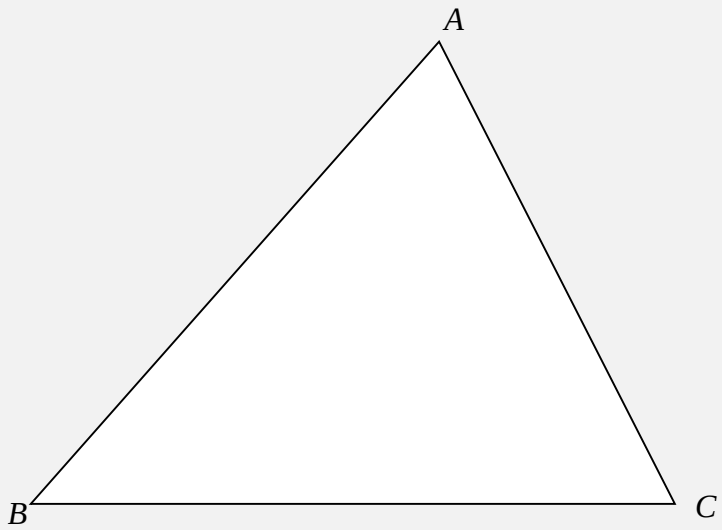
Any Additional Suggestion:		

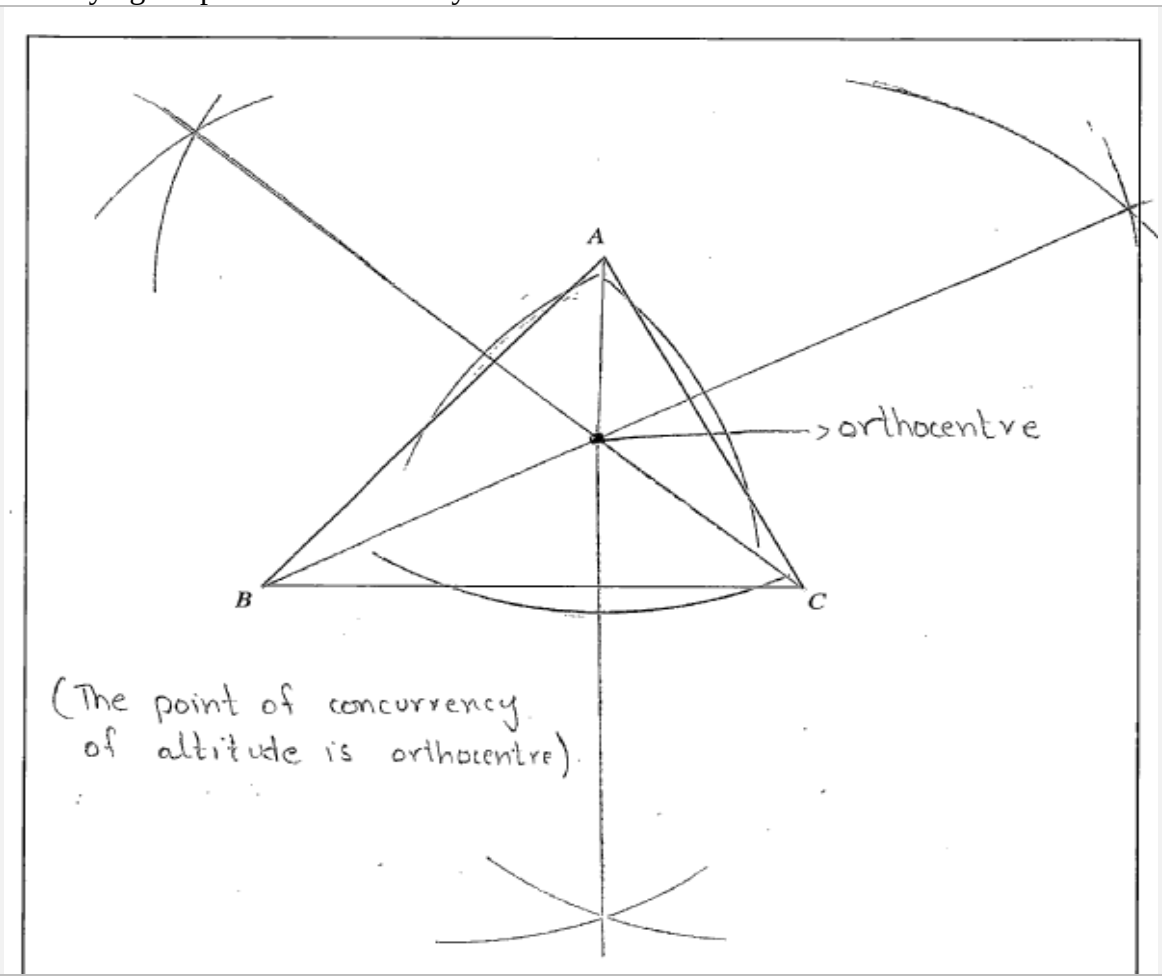
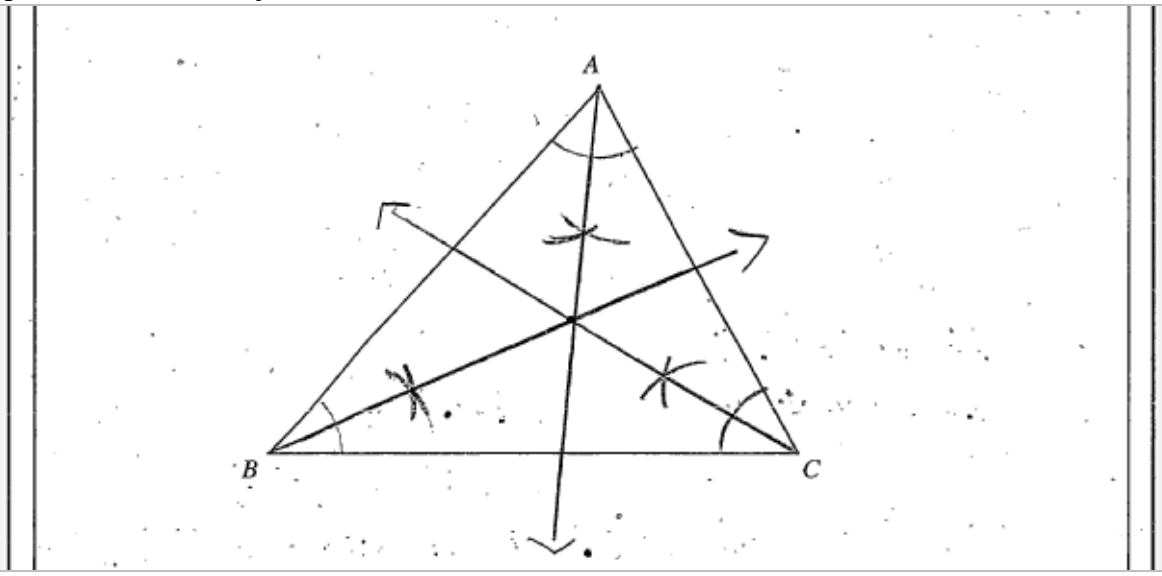
Question No. 6	
Question Text	If $A=\begin{bmatrix}1 & 2\\ 0 & 1\end{bmatrix}$ and $B=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$, then verify that $(AB)^{-1}=B^{-1}\times A^{-1}$.
SLO No.	7.5.10
SLO Text	Verify the result (AB)^-1=B^-1xA^-1 with the help of examples;
Max Marks	4
Cognitive Level	A
Checking Hints	1 mark for finding AB 1 mark for finding $(AB)^{-1}$ 1 mark for finding the inverses of A and B 1 mark for multiplying the inverses of B and A
Overall Performance	This question pertains to matrices, where candidates were tasked with verifying a property. The majority of the candidates completed the solution effectively and managed their workspace efficiently. However some of the candidates struggled in finding the product

	between matrices A and B.
Description of Better Responses	Better responses demonstrated accurate multiplication of matrices A and B, calculation of B^{-1} and A^{-1}, determination of their determinants and comprehension of the inverses of AB, A and B. Candidates showed good understanding of identity matrix in multiplication of two matrices. Candidates fulfilling all these requirements were able to score well in the question.
Images of Better Responses	
Description of Weaker Responses	Weaker responses showed misconception in applying matrix manipulation and finding inverse of the matrix resulting in a loss of marks. They did not have a concept of multiplying a matrix with a unit matrix will give you the same matrix (AI=A).
Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Preferred Pedagogy Used for this SLO	Assessment Strategies
• Identify the expectation of command words (use Command Word Guide) • Ensure the content is taught at the relevant cognitive level • Identify necessary content required (skills + concepts) • Review past paper questions on the concept • Utilise the resource guide for additional materials	• Story Board • Cause and Effect • Fish and Bone • Concept Mapping • Audio Visual Resources • Think, Pair and Share • Knowledge Platform videos • Questioning Technique (Socratic approach) • Practical Demonstration	• Past paper questions • Discussion on E-Marking Notes • AKU-EB Digital Learning Solution powered by Knowledge Platform https://akueb.knowledgeplatform.com/login
Any Additional Suggestion:		

Question No. 7	
Question Text	Using compass, draw the altitudes for the given triangle and identify the point of concurrency. 
SLO No.	8.1.3b
SLO Text	Verify, for a given triangle, the concurrency of a) angle altitudes
Max Marks	3
Cognitive Level	U
Checking Hints	1 mark for drawing altitudes (at least two correct) 1 mark for showing that the altitudes are concurrent 1 mark for identifying the point of concurrency

Overall Performance	This question was related to practical geometry for which majority of the candidates did not perform well. The task required drawing altitudes and accurately constructing all the necessary arcs. Furthermore, some candidates did not prioritise precision and accuracy in their constructions.
Description of Better Responses	In this practical geometry question, few candidates earned good scores by not only drawing the altitude using a compass with marking correct arcs but also correctly identifying the point of concurrency.
Image of Better Response	
Description of Weaker Responses	Weaker responses struggled to distinguish between altitude, angle bisector, and side bisector, resulting in confusion and loss of marks. Another notable issue was that some candidates only drew two altitudes or incorrectly marked the intersection point as the point of concurrency.
Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Preferred Pedagogy Used for this SLO	Assessment Strategies
• Identify the expectation of command words (use Command Word Guide) • Ensure the content is taught at the relevant cognitive level • Identify necessary content required (skills + concepts) • Review past paper questions on the concept • Utilise the resource guide for additional materials	• Story Board • Cause and Effect • Fish and Bone • Concept Mapping • Audio Visual Resources • Think, Pair and Share • Knowledge Platform videos • Questioning Technique (Socratic approach) • Practical Demonstration	• Past paper questions • Discussion on E-Marking Notes • AKU-EB Digital Learning Solution powered by Knowledge Platform https://akueb.knowledgeplatform.com/login

Any Additional Suggestion:

1. Practice with Various Triangles

- **Different Triangles:** Practice verifying the concurrency of altitudes for different types of triangles (e.g., acute, obtuse, right). This will help solidify your understanding that the altitudes are always concurrent regardless of the triangle type.

2. Review and Analyze

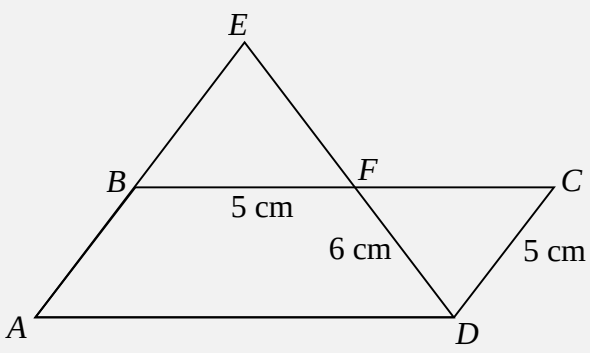
- **Check Results:** Review the results of your constructions and measurements. Ensure that all three altitudes meet at the same point.
- **Error Analysis:** If the altitudes do not appear concurrent, recheck the accuracy of your drawings and measurements.

Question No. 8a

Candidates were given the choice to attempt any TWO out of the three questions: 8a, 8b, and 8c.

Question Text

In the given diagram, *ABCD* is a parallelogram and the side *BC* of the parallelogram is passing through the midpoints *AE* and *ED* of the triangle *AED*.



NOT TO SCALE

Find the length of

i. *AD*.

ii. *BE*.

iii. *CF*.

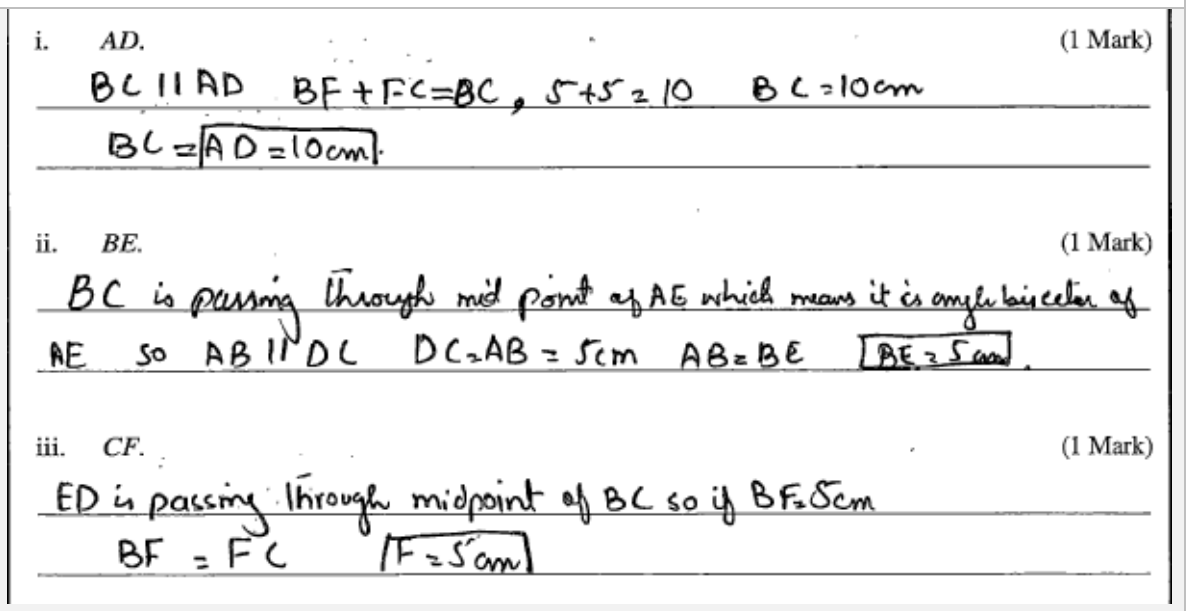
SLO No.	10.1.1 a, c
SLO Text	**Apply the following theorems to solve related problems:** **a. in a parallelogram:** **i. the opposite sides are congruent** **ii. the opposite angles are congruent** **iii. the diagonals bisect each other;** **the line segment, joining the midpoints of two sides of a triangle, is parallel to the third side and is equal to one half of its length.**
Max Marks	3
Cognitive Level	A
Checking Hints	i. 1 mark for finding *AD* ii. 1 mark for finding *BE* iii. 1 mark for finding *CF*
Overall Performance	Overall performance of this question was on a lower side. As this question is related to the application of theorems, only few were able to write the correct lengths of the sides. Most of the candidates struggled in achieving good marks.
Description of Better Responses	Better responses applied the relevant theorem to find the required measurements. This reflects the deeper understanding of theorems at candidates' end. They correctly add the lengths of BF and FC to get the length of BC and then applied the theorem which says BC=AD.
Image of Better Response	 i. *AD.* (1 Mark) BC ∥ AD BF + FC = BC, 5+5 = 10 BC = 10cm BC = AD = 10cm. ii. *BE.* (1 Mark) BC is passing through mid point of AE which means it is angle bisector of AE so AB ∥ DC DC = AB = 5cm AB = BE BE = 5cm. iii. *CF.* (1 Mark) ED is passing through midpoint of BC so if BF = 5cm BF = FC F = 5cm
Description of Weaker Responses	Candidates often encounter difficulties with theorem-based questions. While the question does not explicitly require reasoning, many candidates included reasoning in their responses. They struggled to visualise the application of the theorem correctly. For instance, in the example mentioned, candidates mistakenly considered triangle AED as isosceles instead of applying the properties of a parallelogram.

Image of Weaker Response	i. *AD.* (1 Mark) BF is half of the lenght of AD so 5cm + 5cm = 10cm AD = 10cm. ii. *BE.* (1 Mark) FD is 6cm and BF is midpoint of FA or FD so BF = 6cm. iii. *CF.* (1 Mark) CF is 1/3 lenght of BF so CF = 4cm.

Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	**Preferred Pedagogy Used for this SLO**	**Assessment Strategies**
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Any Additional Suggestion:

- **Visual Aids:** Use diagrams and visual aids to help students understand geometric properties. Interactive whiteboards or geometry software can be especially useful for dynamic demonstrations.
- **Hands-On Activities:** Incorporate activities where students can construct shapes, measure angles, and explore properties using physical tools or software.

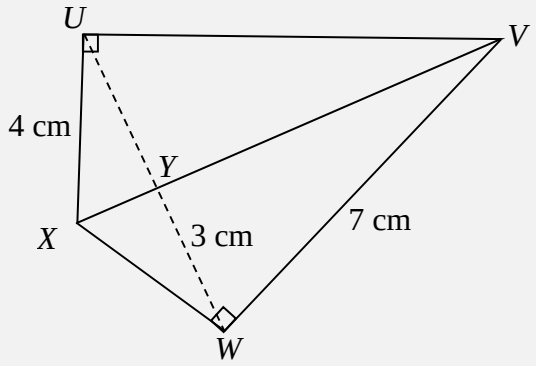
Question No. 8b	
Question Text	Sarah was playing with a thread connecting to pins on a soft board. The positions of the pins were labelled as *U*, *V*, *W* and *X*. She measured the threads connecting the pins as *VW* = 7 cm, *UX* = 4 cm and *WY* = 3 cm. She observed that the angles *UVX* and *WVX* were equal in measurement and the thread *XV* bisected the thread connected to *UW* at right angle.  NOT TO SCALE Based on the given information, i. find the length of the threads connecting *U* and *V*. ii. find the length of the threads connecting *W* and *X*. iii. what would be the minimum length of thread required to connect *U* and *W* ?
SLO No.	11.1.1b 11.1.1d 12.1.1d
SLO Text	Apply the following theorems to solve related problems - any point equidistant from the end points of a line segment is on the right bisector of it - any point on the bisector of an angle is equidistant from its arms. - perpendicular is the shortest distance from a point to the line.
Max Marks	3
Cognitive Level	A
Checking Hints	i. 1 mark *UV* ii. 1 mark for *WX* iii. 1 mark for *UW*
Overall Performance	In this question, candidates were expected to apply their understanding of the theorem. Only fewer candidates were able to solve this question successfully, while majority of the candidates struggled in mentioning the minimum length of thread required to connect *U* and *W*.
Description of Better Responses	Better responses demonstrated that candidates not only grasped the question but also effectively applied the properties of angle and side bisectors. They applied the correct theorem which says ‘any point on the bisector of an angle is equidistant from its arms’ to find the value of VU which was 7cm. Therefore, they provided accurate values and substantiated their answers.

Image of Better Response	i. find the length of the threads connecting U and V. (1 Mark) WV = VU = 7cm ii. find the length of the threads connecting W and X. (1 Mark) The thread connecting x and W is of 4cm as VX = XW iii. what would be the minimum length of thread required to connect U and W? (1 Mark) WY = YU ⇒ 3cm = 3cm , VW = WY + YU ⇒ 3 + 3 = 6cm
Description of Weaker Responses	The following response was deemed inadequate because the candidate not only misunderstood the question but also made errors in applying the theorems, revealing misconceptions and failing to provide the correct required length. In part (iii), the candidate incorrectly stated the length, due to a lack of understanding. Some candidates did not have concept of shortest distance. Therefore they have calculated UW=4+4=8cm.
Image of Weaker Response	i. find the length of the threads connecting U and V. (1 Mark) The length of the thread connecting U and V is 7cm. ii. find the length of the threads connecting W and X. (1 Mark) The length of the thread connecting W and X is 3.8cm iii. what would be the minimum length of thread required to connect U and W? (1 Mark) The minimum length of thread required to connect U and W is 7cm.

Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Preferred Pedagogy Used for this SLO	Assessment Strategies
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	Technique (Socratic approach) • Practical Demonstration	

Any Additional Suggestion:
Teachers are advised to use following teaching activities.
Step-by-Step Problem Solving: Break down the problem-solving process into step-by-step instructions. Model how to apply the theorem correctly, emphasising the logic and reasoning behind each step. Encourage students to follow along and ask questions as you work through examples.

Question No. 8c

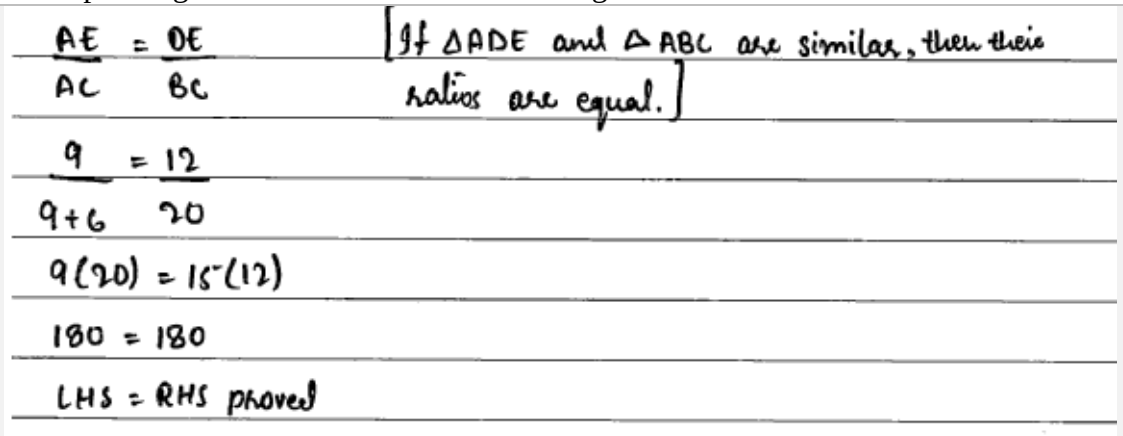
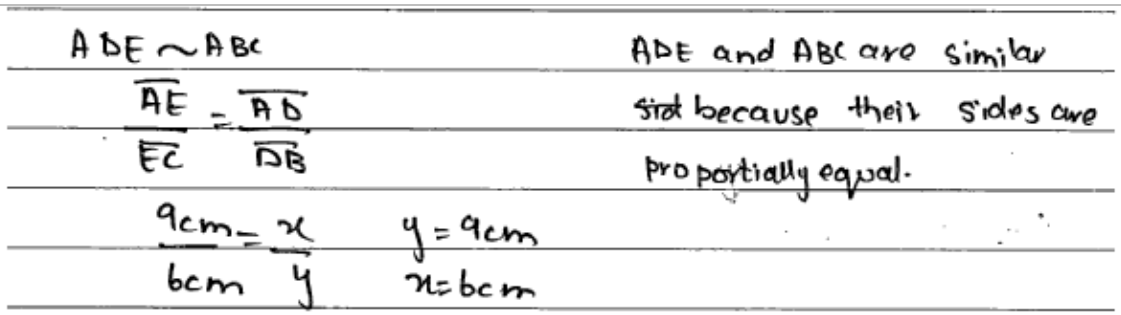
Question Text	
SLO No.	13.1.1d
SLO Text	Apply the following theorems to solve related problems: d. if two triangles are similar, the measures of their corresponding sides are proportional.
Max Marks	3
Cognitive Level	A
Checking Hints	1 mark for identifying the corresponding sides to apply the condition 1 mark for writing the condition of similarity 1 mark for substituting values and showing similarity
Overall Performance	Majority of the candidates successfully completed this part by accurately applying their understanding of the theorem stating that "if two triangles are similar, the measures of their corresponding sides are proportional. While some of the candidates struggled in writing the correct ratio.
Description of Better Responses	Better responses demonstrated a thorough comprehension of similar triangles and the underlying reasoning. . Some of them wrote $\frac{AE}{AC}=\frac{DE}{BC}$ which showed they practiced alot of similar triangles' ratios. As a result, these candidates correctly determined the ratios of corresponding sides and validated their findings.
Image of Better Response	
Description of Weaker Responses	Weaker responses struggled to apply the concept of similar triangles. Some candidates attempted to take ratios of corresponding sides but failed to correctly identify which triangles were similar. Some of them wrote $\frac{AE}{EC}=\frac{AD}{DB}$ which showed they do not have understanding of similar triangles.

Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	**Preferred Pedagogy Used for this SLO**	**Assessment Strategies**
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Any Additional Suggestion:

- Better comprehension of the question
- More practice to label the given figure from information

Annexure A: Pedagogies Used for Teaching the SLOs

Pedagogy: Storyboard
Description: A visual pedagogy that uses a series of illustrated panels to present a narrative, encouraging creativity and critical thinking. It helps learners organise ideas, sequence events, and comprehend complex concepts through storytelling.
Example: In a Literature class, students are tasked with creating storyboards to visually retell a novel. They draw key scenes, write captions, and present their stories to the class, enhancing their reading comprehension and fostering their imagination.

Pedagogy: Cause and Effect
Description: This pedagogy explores the relationships between actions and consequences. By analysing cause-and-effect relationships, learners develop a deeper understanding of how events are interconnected and how one action can lead to various outcomes.
Example: In a History class, students study the causes and effects of the Industrial Revolution. They research and discuss how technological advancements in manufacturing led to significant societal changes, such as urbanisation and labour reform movements.

Pedagogy: Fish and Bone
Description: A method that breaks down complex topics into main ideas (the fish) and supporting details (the bones). This visual approach enhances comprehension by highlighting essential concepts and their relevant explanations.
Example: During a Biology class on human anatomy, the teacher uses the fish and bone technique to teach about the human skeletal system. Teacher presents the main components of the human skeleton (fish) and elaborates on each bone's structure and function (bones).

Pedagogy: Concept Mapping
Description: An effective way to visually represent relationships between ideas. Learners create diagrams connecting key concepts, aiding in understanding the overall structure of a subject and fostering retention.
Example: In a Psychology assignment, students use concept mapping to explore the various theories of personality. They interlink different theories, such as Freud's psychoanalysis, Jung's analytical psychology, and Bandura's social-cognitive theory, to see how they relate to each other.

Pedagogy: Audio Visual Resources
Description: Incorporating multimedia elements like videos, images, and audio into lessons. This approach caters to different learning styles, making educational content more engaging and memorable.

Example: In a General Science class, the teacher uses a documentary-style video to teach about the solar system. The video includes stunning visual animations of the planets, interviews with astronomers, and background music, enhancing students' interest and understanding of space.

Pedagogy: Think, Pair, and Share
Description: A collaborative learning technique where students ponder a question or problem individually, then discuss their thoughts in pairs or small groups before

sharing with the entire class. It fosters active participation, communication skills, and diverse perspectives.

Example: In a Literature in English class, the teacher poses a thought-provoking question about a novel's moral dilemma. Students first reflect individually, then pair up to exchange their opinions, and finally participate in a lively class discussion to explore different viewpoints.

Pedagogy: Questioning Technique (Socratic Approach)
Description: Based on Socratic dialogue, this method stimulates critical thinking by posing thought-provoking questions. It encourages learners to explore ideas, justify their reasoning, and discover knowledge through a process of inquiry.
Example: In an Ethics class, the instructor uses the Socratic approach to lead a discussion on the meaning of justice. By asking a series of probing questions, the students engage in a deeper exploration of ethical principles and societal values.

Pedagogy: Practical Demonstration
Description: A hands-on approach where learners observe real-life applications of theories or skills. Practical demonstrations enhance comprehension, skill acquisition, and problem-solving abilities by bridging theoretical concepts with real-world scenarios.
Example: In a Food and Nutrition class, the instructor demonstrates the proper technique for filleting a fish. Students observe and then practice the skill themselves, learning the practical application of knife skills and culinary precision.

(**Note:** The examples provided in this annexure serve as illustrations of various pedagogies. It is important to understand that these pedagogies are versatile and can be applied across subjects in numerous ways. Feel free to adapt and explore these techniques creatively to enhance learning outcomes in your specific context.)

Acknowledgements

The Aga Khan University Examination Board (AKU-EB) acknowledges with gratitude the invaluable contributions of all the dedicated individuals who have played a pivotal role in the development of the Mathematics SSC-I E-Marking Notes.

We extend our sincere appreciation to Ms Shahneel Jawaid and Mr Muhammad Kasshaf, Specialists in Mathematics at AKU-EB, for taking subject lead during the entire process of e-marking.

We particularly thank to Ms Shahnila Mohammad, Principal Marker, Habib Public School, Karachi, for evaluating each question's performances, delineating strengths and weaknesses in candidates' responses, and highlighting instructional approaches along with recommendations for better performance.

Additionally, we express our gratitude to the esteemed team of reviewers for their constructive feedback on overall performance, better and weaker responses, and validating teaching pedagogies along with suggestions for improvement.

These contributors include:

- Mahrukh Amin Jiwa, Specialist, MSP, AKU-EB
- Zain Muluk, Manager, Examination Development, AKU-EB
- Raabia Hirani, Manager, Curriculum Development, AKU-EB
- Dr Naveed Yousuf, CEO, AKU-EB