

Aga Khan University Examination Board
Notes from E-Marking Center on SSC II Mathematics Examination
May 2012

Introduction

This document has been produced for the teachers and candidates of the SSC Part II (Class X) course in Mathematics. It contains comments on candidates' responses to the 2012 Secondary School Certificate (SSC II) Examination, indicating the quality of the responses and highlighting their relative strengths and weaknesses.

This document should be read along with the AKU-EB Mathematics syllabus based on the National Curriculum (2006).

General Comments

Teachers and candidates should be aware that examiners may ask questions that address the Students Learning Outcomes (SLOs) in a manner that requires candidates to respond by integrating knowledge, understanding and application skills they have developed through studying the course.

Candidates need to be aware that the marks allocated to the question 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. Writing far beyond the indicated space may reduce the time available for answering other questions.

Candidates need to be familiar with the command words in the Student Learning Outcomes 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. Questions such as 'how?', 'why?' or 'to what extent?' may be used.

Candidates are recommended to read the questions carefully and write all essential steps clearly. Generally, candidates who write all necessary steps, make fewer mistakes. It is also recommended that rough work related to a particular question should be included in the answer booklet because it enables insight of the candidates' thinking process leading to true assessment.

Detailed Comments

Question 1

The choices were given between part a and part b. Most of the candidates attempted part a.

Question 1ai

The question was based on the concept of the simplification of an algebraic expression.

Better responses exhibited that the candidates did well to solve the question in order to get the required answer.

Average responses exhibited that the candidates converted the division sign into multiplication sign but did not take (-1) as common so that they were unable to reach the required answer.

Weaker responses exhibited that few candidates did the multiplication of numerator and denominator and wrote in single fraction. It was also seen that some of them cancelled the term without converting the division sign (\div) into multiplication sign (\times) .

Question 1aai

The question was based on the concept of factorization and simplification of an algebraic expression. It was seen that majority of the candidates did well to solve the question.

Better responses exhibited that the candidates understood the question and used the formula of $a^2 - b^2$ and then cancelled the term in order to get the required answer. It was noticed that some of the candidates first took the LCM of numerator then found the factors and simplified it, so that they were able to get the required result.

Average responses exhibited that the candidates even though took the LCM but could not find the factors and thus they could not get the answer.

Weaker responses exhibited that the candidates cancelled $\frac{1}{a^2}$ in the numerator with $\frac{1}{a}$ in the denominator which showed the lack of understanding of BIDMAS rule.

Question 1bi

The question was based on the square root of an algebraic expression.

Better responses exhibited that the candidates first simplified the term $\frac{2a^{10}}{a^4}$ and then added with $2a^6$ so that they were able to take the square root which indicated the understanding of laws of exponents.

Average responses exhibited that few candidates first took the LCM but were unable to take the square root and thus they could not reach the required answer.

Weaker responses exhibited that the candidates did not have the concept of taking the square root of an algebraic expression.

Question 1bii

The question was based on the square root of an algebraic expression.

Better responses exhibited that the candidates did well to understand the question and thus they were able to get the required answer.

Average responses exhibited that few candidates even though changed the negative exponent into positive exponent, did not take square root in order to get the required answer.

Weaker responses exhibited that the candidates directly took the square root with the negative exponent but were unable to convert the negative exponent into positive exponent by shifting the terms from denominator to numerator.

Question 2

The question was based on partial fraction. Majority of the candidates attempted the question very well.

Better responses exhibited that the candidates understood the question well and knew which factors make it equal to zero to calculate the value of A .

Average responses exhibited that the candidates took the LCM correctly but further on they were unable to find the correct value of A .

Weaker responses exhibited that few candidates did not have any idea how to solve the question.

Question 3

The question was based on the concept of algebraic sentences and the choices were given between part a and part b.

Question 3a

The question was based on the concept of the solution of linear algebraic equation and candidates were expected to get the value of x . Most of the candidates attempted part a.

Better responses exhibited that the candidates took the LCM correctly and then formed a linear equation in simplified form in order to get the value of x .

Average responses exhibited that the candidates took the LCM but made a common mistake in simplifying and wrote $\left(\frac{4x-6-3x}{12}\right)$ instead of $\frac{4x-6+3x}{12}$, so due to the use of incorrect signs, they could not get the required answer although after committing this mistake the rest of the solution was correct.

Weaker responses indicated that the candidates were unable to take the LCM correctly. It was also seen that they made mistakes in simplification and subtracted the variable from constant as well.

Question 3b

The question was based on the concept of absolute value of inequalities.

Better responses exhibited that the candidates did well to use the reflexive property of inequality also known as the possibilities of absolute valued inequalities.

Average responses exhibited that the candidates changed the sign of inequality in the first step but later on they forgotten or some of them did not consider the condition $x \in N$ and wrote 3 and 4 in the solution set.

Weaker responses exhibited that the candidates were unable to handle the multiplication of inequality with a negative sign. They also did not change the sign of inequality $2x-7 > -1$, some wrote $-(2x-7) < 1$ as $-2x-7 < 1$ which resulted the incorrect solution.

Question 4

The question was based on the concept of linear graph and its application. In this question candidates had to draw the graph and also estimate the value.

Better responses exhibited that the candidates located the points correctly on the given graph paper and found the exact value of -10°C from the graph which showed the skills of graph reading.

Average responses exhibited that the candidates located the points correctly but were unable to find the corresponding value of -10°C and wrote $-10^{\circ}\text{C} = -50^{\circ}\text{F}$ because in the table $50^{\circ}\text{F} = 10^{\circ}\text{C}$ is given.

Weaker responses indicated that the candidates did not have the idea to draw and even the corresponding value of 50°F was given, they were unable to respond.

Question 5

The question was based on solving the quadratic equation after simplification of given equation.

Better responses exhibited that the candidates did simplified the equation by taking LCM and then used any method of solving quadratic equation (factorization, completing square or quadratic formula).

Average responses exhibited that the candidates simplified the equation correctly till $m^2 - 2m = 0$. After that they changed it into linear equation by cancelling variable as $m^2 = 2m \therefore m = 2$ which led towards the misconception.

Weaker responses exhibited that the candidates not only made mistakes in taking LCM but also did not cancel the factor in the denominator. They did the cross multiplication and made mistakes and then made it equal to zero; this became a 4th degree equation which they were unable to solve further.

Question 6

The question offered a choice between part a and part b of the question. The question was based on the concept of coordinate geometry.

Question 6a

The question was based on the application of mid-point formula in which they had to calculate the value of unknowns.

Better responses exhibited that the candidates used the mid-point formula correctly and found the values by equating x – coordinates and y – coordinates correctly as $x = 1$ and $4 = \frac{K}{4}$.

Average responses exhibited that the candidates made some mistakes in finding the value of K as they were unable to equate x – coordinates and y – coordinates correctly.

Weaker responses exhibited that the candidates made mistakes in using signs correctly in the formula and some of them made mistakes in substituting the values even though they wrote the formula correctly.

Question 6b

The question was based on the application of distance formula. Although this was an easy question but most of the candidates preferred to attempt part a.

Better responses exhibited that the candidates did well to use the correct distance formula in order to find the value of b .

Average responses exhibited that the candidates used the correct distance formula but made mistakes in squaring the equation $\sqrt{b^2 + 9} = 5$ as $b + 3 = 5$ which lead to the incorrect solution so that they could not get the required value of b .

Weaker responses exhibited that the candidates either wrote an incorrect formula or made mistakes in substitution of values. It was also seen that fewer candidates made mistakes in squaring for example they wrote $b^2 + 9 = 5$ instead of $b^2 + 9 = 25$ which led to the incorrect value of b .

Question 7

The question offered a choice between part a and part b

Question 7a

The question was based on the use of trigonometric identities to prove $\sin \theta = \pm 1$.

It was seen that candidates solved this question in different ways.

Better responses exhibited that the candidates did well to use the given trigonometric equation in order to prove the relation.

Average responses exhibited that the candidates used the correct identity but made mistakes in simplification and $3(1 - \sin^2 \theta) + 5 \sin^2 \theta \Rightarrow 3 - \sin^2 \theta + 5 \sin^2 \theta = 5$, so that they were unable to prove the relation.

Weaker responses exhibited that some candidates either could not attempt it or few of them took $\theta = 45^\circ$ in order to prove the required relation. It was also seen that some candidates used the incorrect identity so that they were unable to reach the required solution.

Question 7b

The question was based on the concept of arc length. Most of the candidates attempted part b.

Better responses exhibited that the candidates used the correct formula in order to find the value of θ with correct unit (radian).

Average responses exhibited that most of the candidates used the correct formula and also substituted the value correctly but made mistakes in writing the unit as they wrote degree instead of radian.

Weaker responses exhibited that the candidates did not have a clear understanding about the question and made mistakes as they took radius instead of circumference $= 4\pi$ which led to an incorrect solution.

Question 8

The question offered a choice between part a and part b.

Question 8a

The question was based on the Pythagoras theorem in which students needed to identify the hypotenuse and prove it as the sides of a right angled triangle.

Better responses exhibited that the candidates selected the correct value of hypotenuse and also used the correct formula $(a+b)^2$ and $(a-b)^2$. They also squared the term $2\sqrt{ab}$ correctly in order to prove the required result.

Average responses exhibited that the candidates applied the Pythagoras theorem but made mistakes in using the formula of $(a+b)^2$ and $(a-b)^2$ so that they were unable to reach the required proof.

Weaker responses exhibited that the candidates were unable to identify the use of Pythagoras theorem for the proof of right angled triangle. It was also seen that candidates could not identify which side the hypotenuse should be.

Question 8b

The question was based on the concept of area of parallelogram. In this question students were expected to find the length.

Better responses exhibited that the candidates did well to use the formula of area of parallelogram for finding the length of AB and then correctly used the relation $AB = EC$ and $ED + DC = EC$ in order to find the length of DC .

Average responses exhibited that the candidates even though correctly used the formula of area of parallelogram for finding the length of AB but were unable to proceed further as they could not use the relation correctly to find the required length.

Weaker responses exhibited that the candidates could not understand the question and were thus unable to solve the required length.

Question 9

The question was based on the concept of theorems regarding the distance between the centers of two touching circles.

Question 9i

Better responses exhibited that the candidates did well to give a valid reason as AD and AC are the radial segment so that they were able to show that ADC is an isosceles triangle.

Weaker responses exhibited that the candidates were unable to give a valid reason for ADC being an isosceles triangle.

Question 9ii

Better responses exhibited that the candidates clearly mentioned the length of AE and EB and then proved $AB = 10$. They also wrote the correct reason to support their answer.

Average responses exhibited that the candidates just wrote as $AE = 7$ and $EB = 3$ so $AB = 7 + 3$ but did not give a reason. It was also seen that few of them wrote the reason only but didn't calculate the value of AB .

Weaker responses exhibited that the candidates could not understand the question and thus were neither able to find the value of AB nor give a valid reason.

Question 10

The question was based on the properties of quadrilateral enclosed in a circle and isosceles triangle. Candidates were expected to find out the unknowns in the given figure with the help of properties.

Question 10i

Better responses exhibited that candidates correctly used the property of cyclic quadrilateral that the sum of measures of opposite angles of cyclic quadrilateral is 180°

Average responses exhibited that the candidates even though wrote $\hat{KLM} + \hat{KNM} = 180^\circ$ correctly but were unable to write a correct reason.

Weaker responses exhibited that the candidates were unable to understand the question and could not attempt it. It was also seen that fewer candidates attempted and showed $\hat{KLM} = 90^\circ$ which was not required in the question.

Question 10ii

Better responses exhibited that the candidates understood the figure well and knew that the base angles of isosceles triangle are congruent. They were, thus able to calculate the correct measurement of \hat{MKN} .

Average responses exhibited that the candidates had an idea of based angles of a isosceles triangle but they were confused to identify the opposite angles are congruent $\hat{NKM} \cong \hat{KMN} = 70^\circ$

Weaker responses exhibited that the candidates had a lack of understanding in finding the angle and were unable to get the required angle.

Question 11

The question was based on the concept of practical geometry. In this question candidates were expected to draw a circumscribed circle on a given graph which should pass from the given points.

Better responses exhibited that the candidates understood the question very well and drew the correct circle with all the required steps.

Average responses exhibited that the candidates did not join the points and just drew the circle. It was also seen that few students did not show all the steps as per question requirement so that they were unable to draw the correct circle.

Weaker responses exhibited that the candidates were unable to understand the question and made mistakes in locating the points as well, so that they could not draw the correct circle.