Aga Khan University Examination Board

Notes from E-Marking Centre on SSC-I General Mathematics Examination April/ May 2019

Introduction

This document has been produced for the teachers and candidates of Secondary School Certificate (SSC-I) General Mathematics. It contains comments on candidates' responses to the 2019 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 require 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

Generally it is noted that weaker candidates are not well-versed with the hierarchy of arithmetical, algebraic operations, appropriate formulae and its application. This is generally obstructing their performance in overall paper of mathematics.

Detailed Comments:

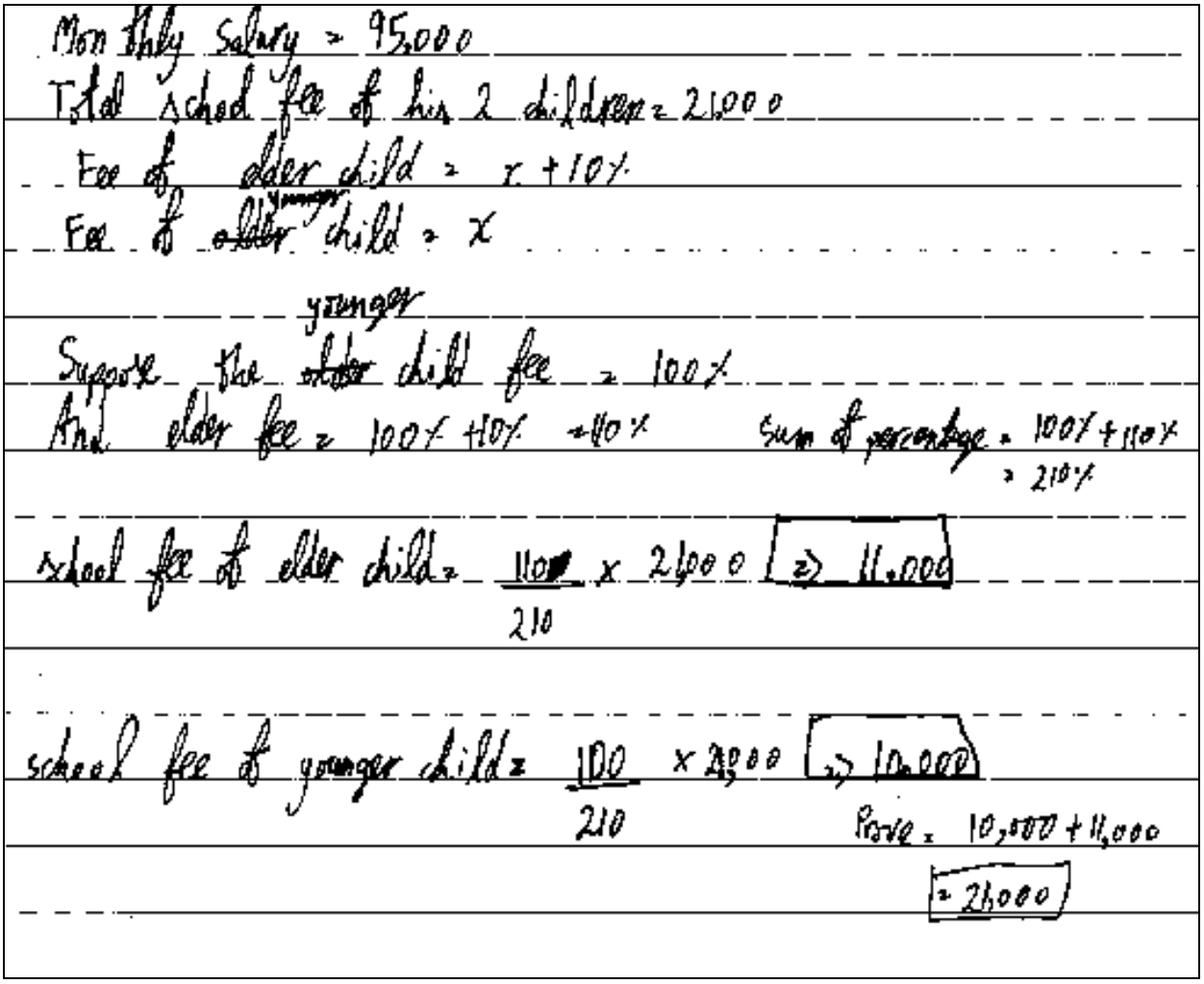
Constructed Response Questions (CRQs)

Question 1:

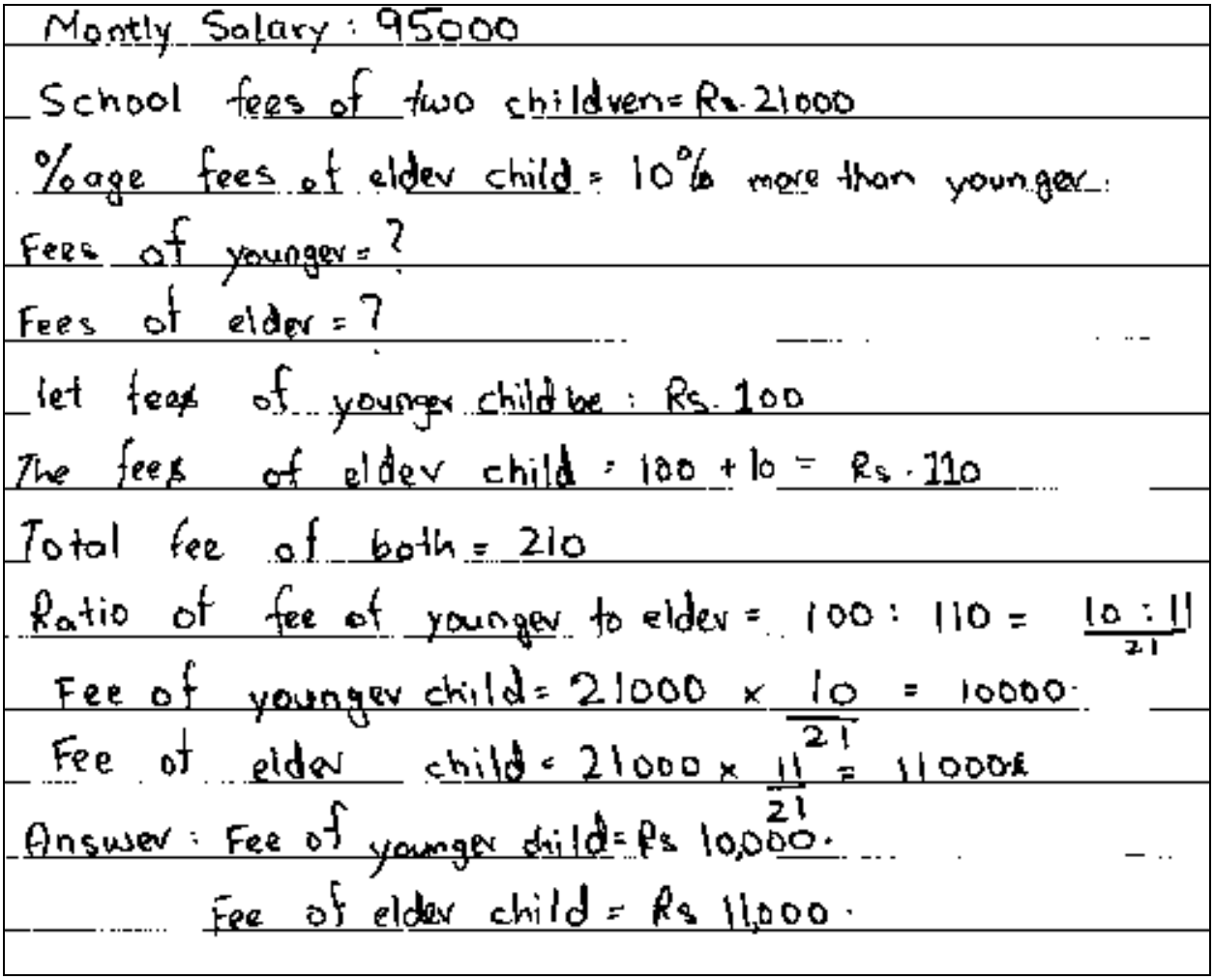
Salman has a monthly salary of Rs 95,000. He pays Rs 21,000 as school fees of his two children. The fee of the elder child is 10% more than the fee of the younger child. Find the fee of both the children separately.

Better responses indicated that candidates understood the question clearly and applied the concepts of percentage and ratio to find the fees of each child separately. They assumed the fee of the younger child and based on assumption found the fees of the elder child. Consequently, they wrote correct equation to fulfill the requirement of the question.

Example 1:



Example 2:



Weaker responses showed that candidates have lack of understanding of the concepts of percentage and ratio. They divided the total fees by 2 and then deduce 10% of the fee to find the required fees, obviously it is not correct. In few other responses, it was noted that candidates first calculated 10 % of 21,000 and subtracted the amount from 21,000 and divided the result by 2 to get required fees.

Example 1:

Rs. 21,000 × 10/100 = Rs. 2,100

21,000 − 2,100 = Rs. 18,900

~~fee of elder child~~

fee of children = 18,900/2 = Rs. 9,450

fee of elder child = 9,450 + 2,100 = Rs. 11,550

fee of younger child = Rs. 9,450

Example 2:

Montly salary = 95000

school fees = 21000

elder child fees = 10% more than younger

younger child = 21000/2

= 10500 × 10% = 1050

= 10500 − 1050

fees of younger child = 9450

elder child = 21000/2

= 10500 × 10% = 1050

= 10500 + 1050

fees of elder child = Rs 11550

Question 2a:

Saima has annual savings of Rs 600,000 and jewellery of worth Rs 350,000. She mistakenly paid *zakat* at the rate of 2% but later on she realised her mistake.

(**Note:** Rate of *zakat* is 2.5 %)

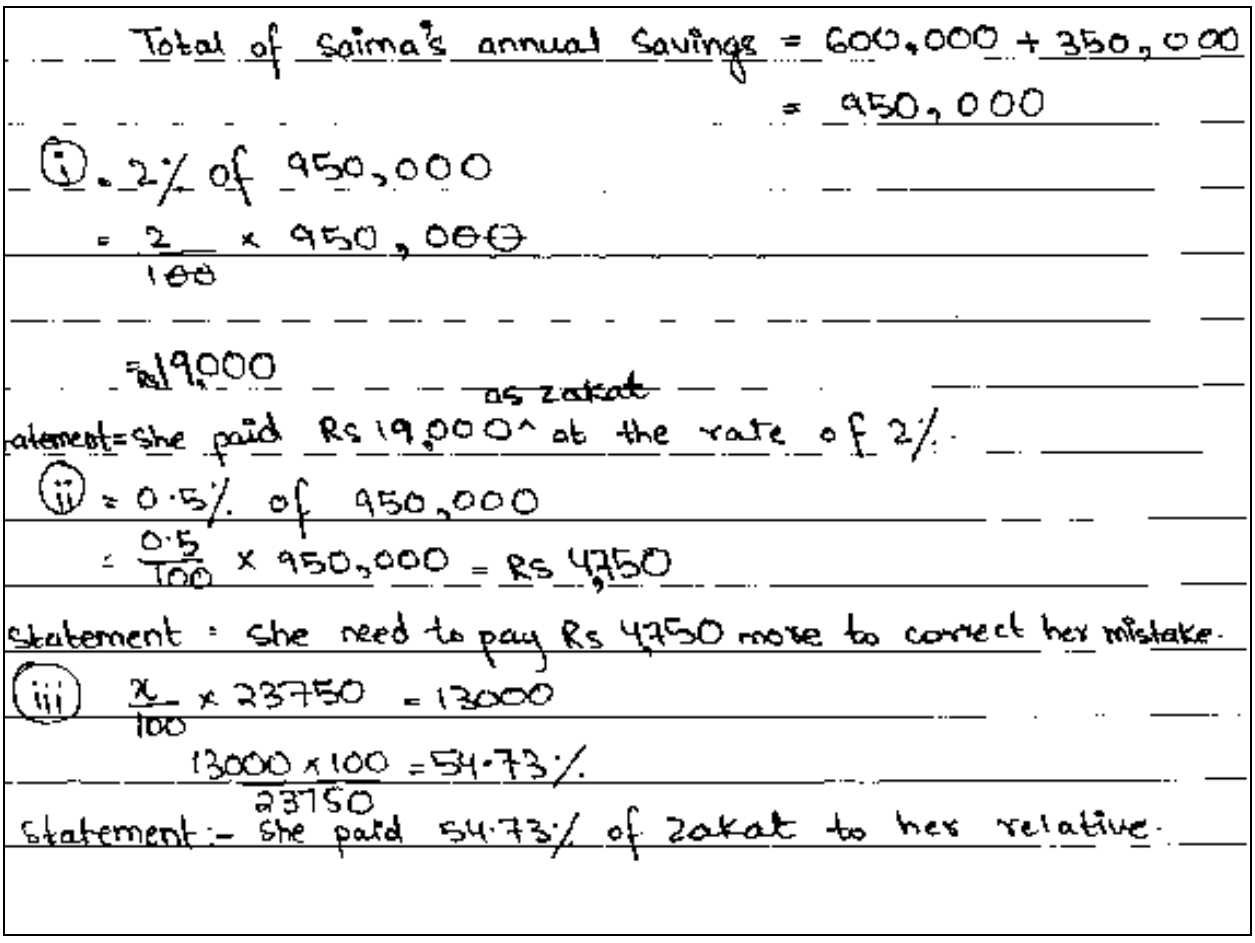
i. Calculate the *zakat* she paid at the rate of 2%.

ii. How much more amount she should pay to correct her mistake?

iii. She paid *zakat* of Rs 13,000 to her needy relative. What percentage of *zakat* did she pay to her relative?

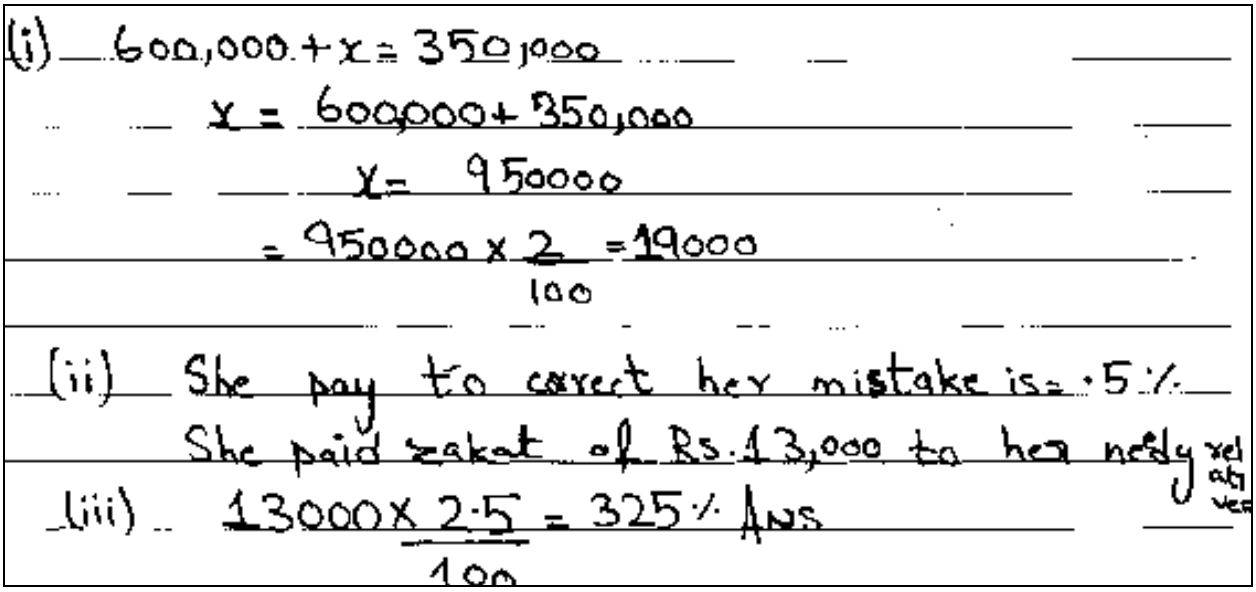
Better responses informed that candidates comprehended the question well and they applied the correct process of percentage to find the *zakat* due. They also calculated the amount to rectify the mistake in calculation of *zakat* and the percentage of *zakat* Saima paid to her relatives.

Example:



Weaker responses reflected that candidates failed to understand the given information and hence unable to find the amount of *zakat* and corrected amount to rectify mistake made by Saima. It is evident from the given examples that they found the total amount and 2% of it but unable to find the corrected amount and percentage of zakat for Rs 13,000.

Example 1:


(i) 600,000 + x = 350,000

x = 600000 + 350,000

x = 950000

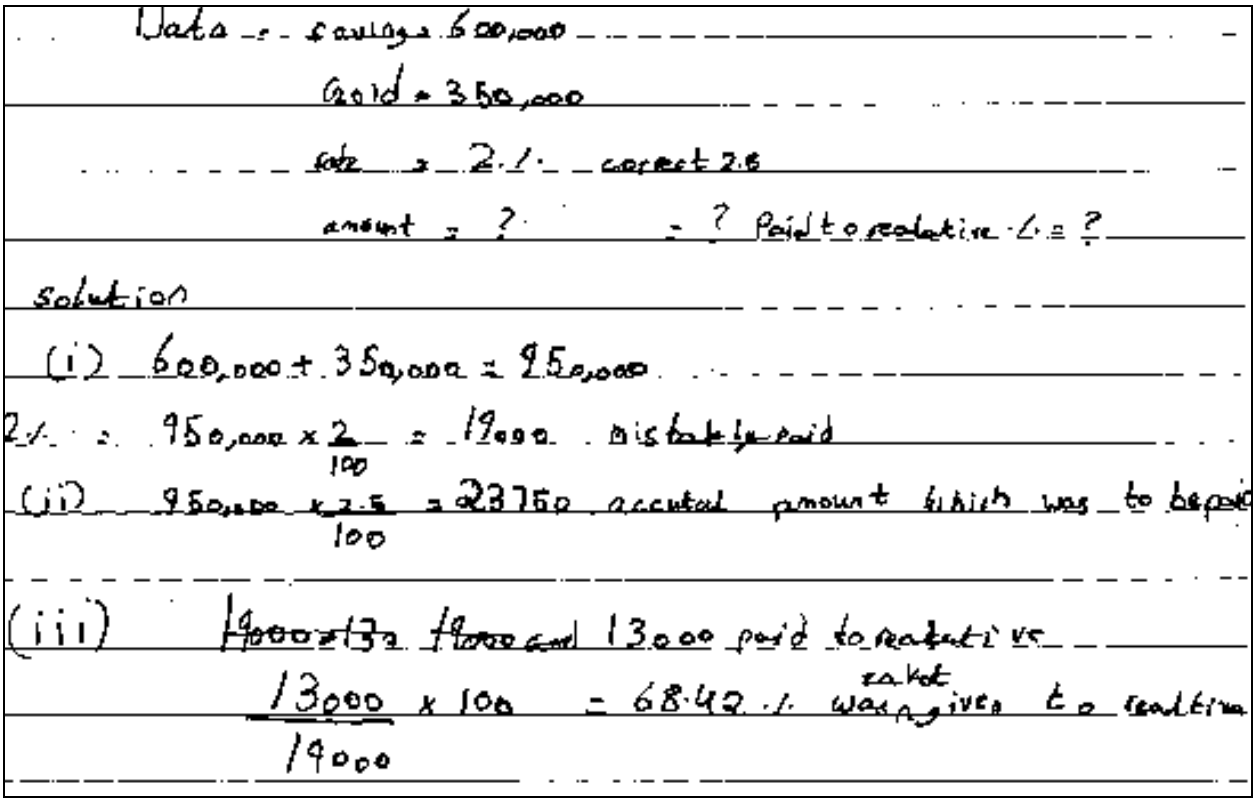
= 950000 × 2/100 = 19000

(ii) She pay to correct her mistake is = 5%

She paid zakat of Rs. 13,000 to her needy rel

(iii) 13000 × 2.5/100 = 325% Ans

Example 2:


Data :- savings 600,000

Gold = 350,000

rate = 2.1% correct 2.5

amount = ? = ? Paid to relative = ?

solution

(i) 600,000 + 350,000 = 950,000

2% = 950,000 × 2/100 = 19000 mistake paid

(ii) 950,000 × 2.5/100 = 23750 accutal amount which was to be paid

(iii) 19000 = 13 19000 and 13000 paid to relative

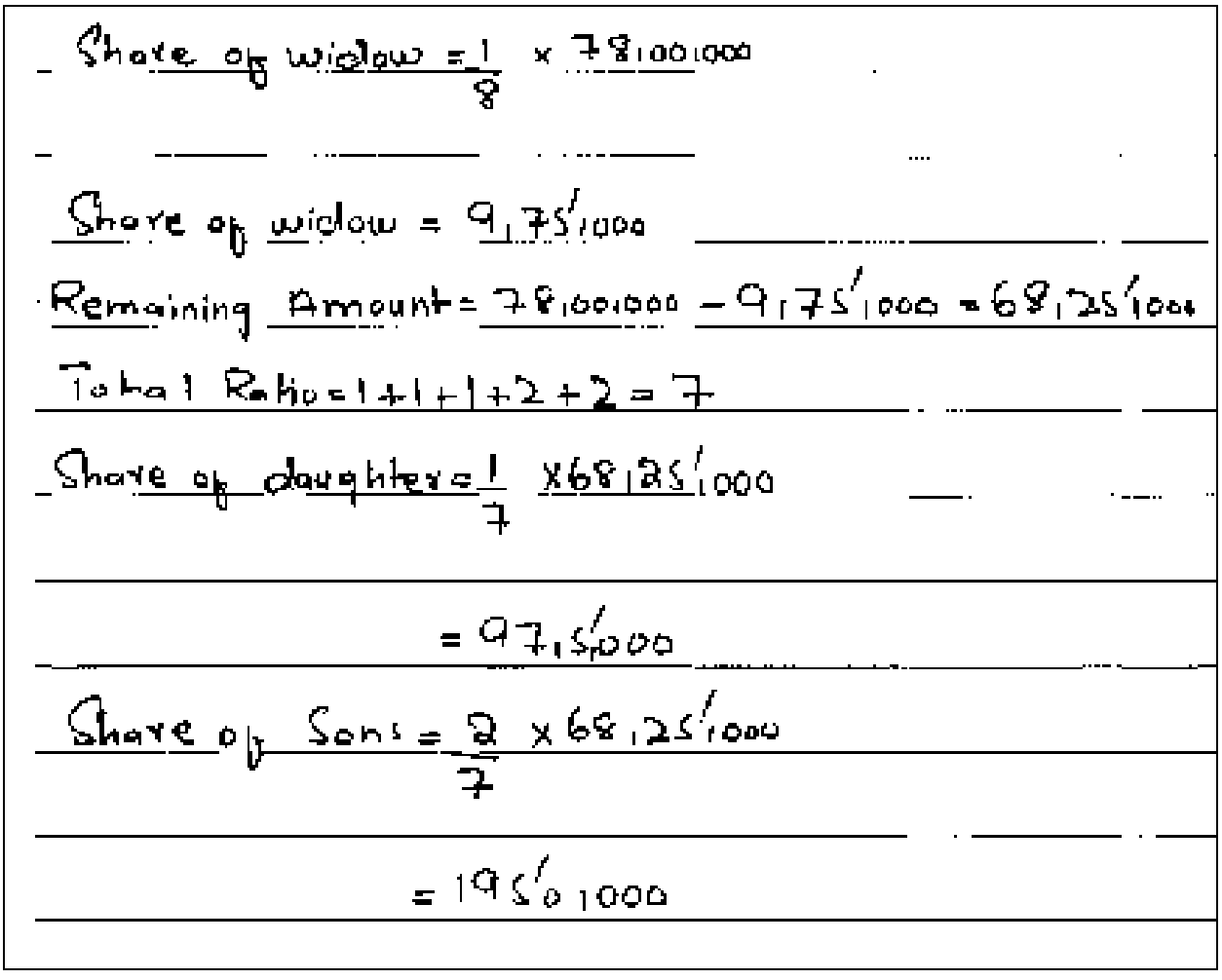
13000/19000 × 100 = 68.42% zakat was given to relative

Question 2b:

Mr Hashim left a property of Rs 7,800,000 as his inheritance. His legal heirs consist of a widow, three daughters and two sons. The share of widow is $\frac{1}{8}th$ of the total property. The remaining property will be divided among his children. A son received twice as much as a daughter. Find the share of each legal heir.

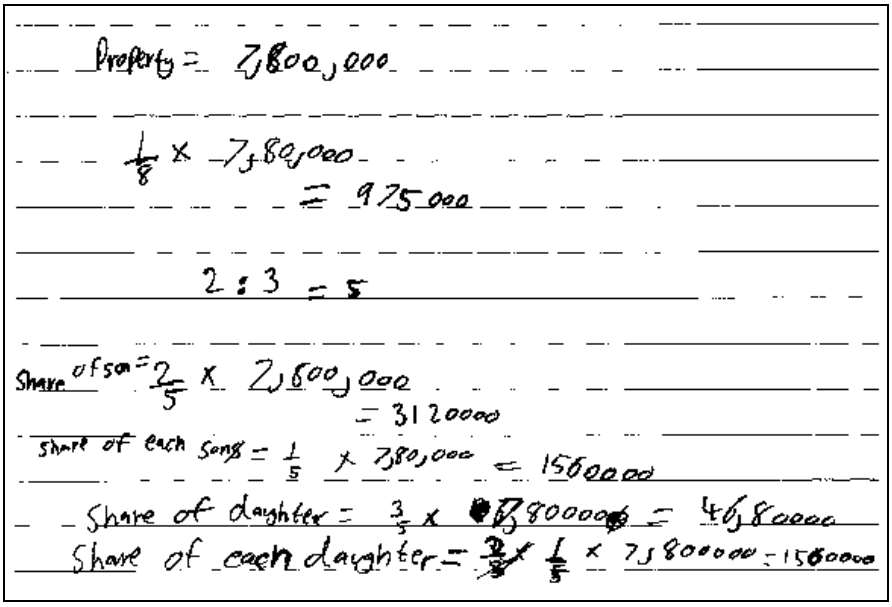
Better responses exhibited that the candidates comprehended the given situation well and calculated the share of each legal heir. The first calculated the share of the widow and then subtracted the amount from value of the property. In the end, they correctly found the share of son and daughter by aptly applying the concept of ratio.

Example:

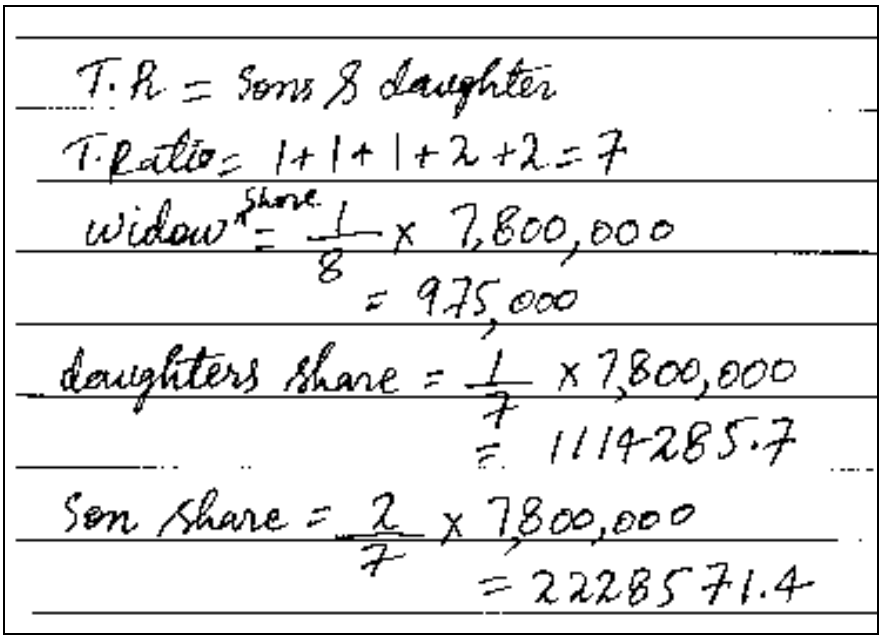


Weaker responses revealed that candidates made different types of mistakes, which included incorrect calculation of widow's share, wrong ratio of share among legal heirs. In a few other responses, it was noted that candidates having no concepts of ratio and the find the share of son and daughter without subtracting the share of widow.

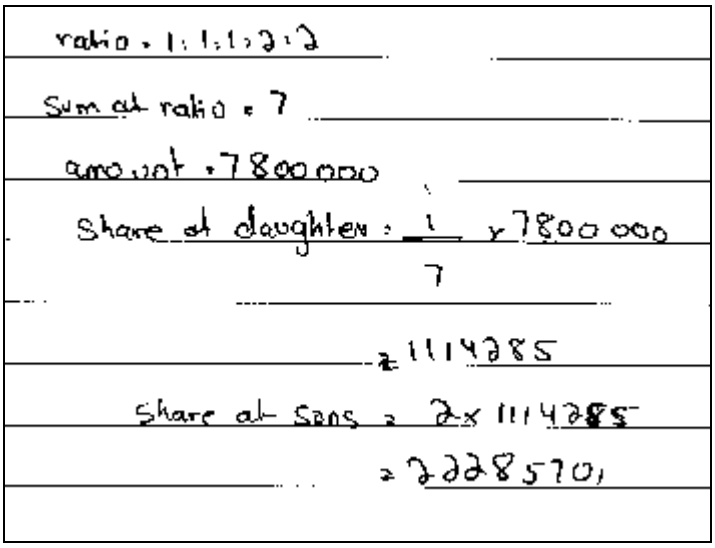
Example 1:



Example 2:



Example 3:



Question 3a:

A fruit vendor bought 100 kg apples for Rs 9,000, 30 dozen bananas for Rs 1,800 and 50 kg grapes for Rs 6,000. He spent Rs 900 on transportation and sold all the fruits as per the given rates.

- Apples at Rs 140 per kg
- Bananas at Rs 75 per dozen
- Grapes at Rs 150 per kg

i. Find his net profit on the sale of these fruits.

ii. If 3 dozen bananas were rotten, then find his profit or loss on the sale of bananas.

This generally a well attempted question.

Better responses exhibited that the candidates were well versed in the concepts of selling price and cost price. They correctly calculated selling price and cost price to find the net profit. They also calculated profit on banana sale systematically.

Example:

Total Amount of Fruits = 9000 + 1800 + 6,000

= 16,800

Transportation Charger = 900 + 16,800 Total Amount = 17,700

Apples = 140 x 100 Bananas = 75 x 30 Graphs = 150 x 50

Selling = 14000 + 2,250 + 7500 = 23750

Net Profit = 23750 − 17,700 = 6050 Net Profit

ii. If 3 dozen bananas were rotten. then find his profit or loss on the sale of bananas.

(2 Marks)

30 dozen = 1800

1 dozen = $\frac{1800}{30}$

1 dozen = 60

Rotten = 3 x 60 = 180

Bananas = 2250 − 180

= 2070

Profit = 2070 − 1800

= 270

Weaker responses revealed that candidates were unable to calculate selling price and cost price, which is indicative of the fact that they failed to comprehend or complete the demand of the question or made calculation error as evident from the following examples.

Example 1:

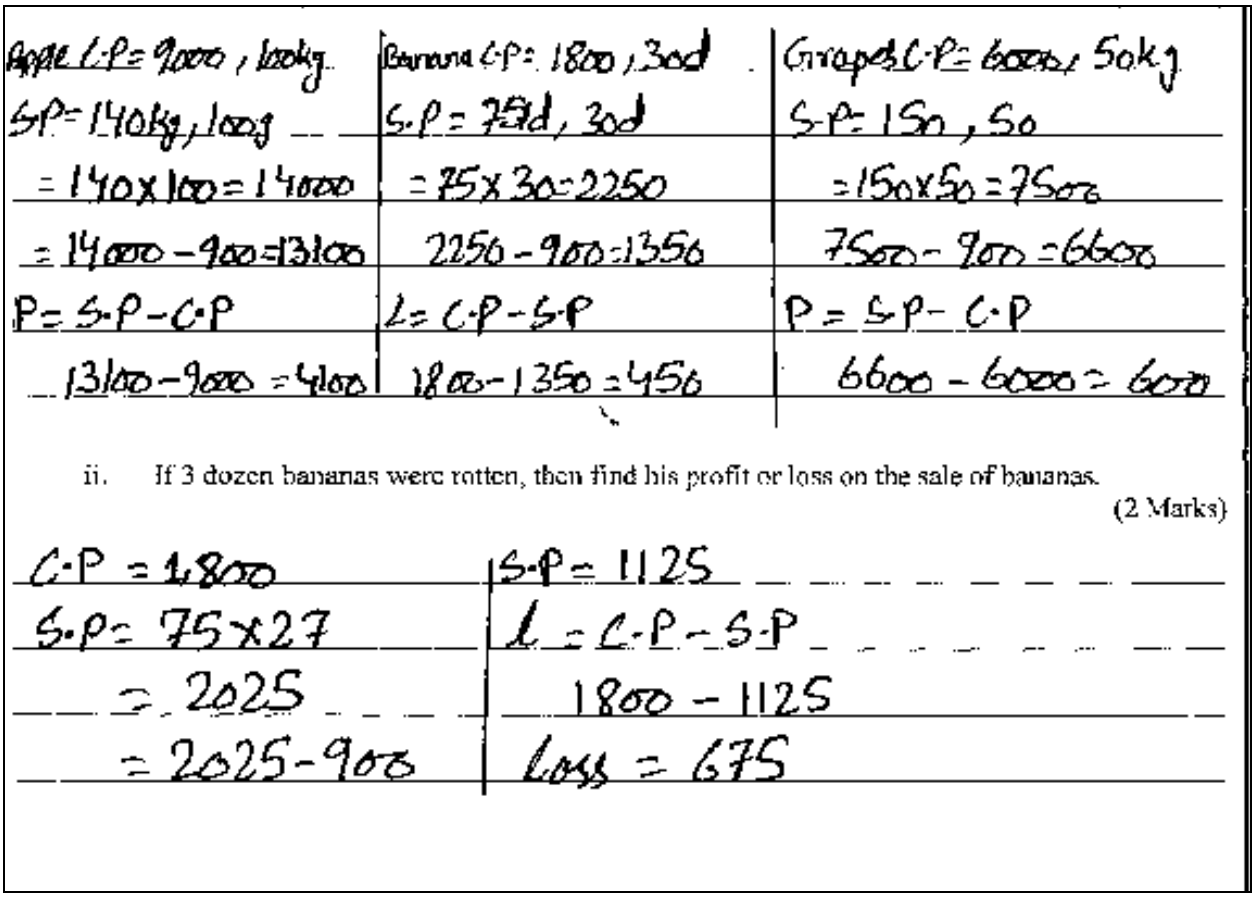
CP per kg	SP per kg
Apples = 9000 ÷ 100 = Rs 90/kg	140 + 75 + 150 = Rs. 365 + 900
Bananas = 1800 ÷ 30 = Rs. 60/kg	Rs 1265
Grapes = 6000 ÷ 50 = Rs 120/kg.	P = SP − CP = 1265 − 1170
Sum of actual = CP	= Rs. 95.
= 90 + 60 + 120 = Rs. 270 + 900 = 1170	(Rs. 900 are to be added before subtraction)

ii. If 3 dozen bananas were rotten, then find his profit or loss on the sale of bananas.

(2 Marks)

SP of 3 dozen bananas	Cost of 30 dozen bananas − cost of 30 dozen bananas.
75 × 3 = Rs. 225	2250 − 225 = Rs. 2025
SP of 30 dozen bananas	loss occured to the vendor.
75 × 30 = Rs. 2250	

Example 2:



Apple C.P = 9000, 100kg	Banana C.P = 1800, 30d	Grapes C.P = 6000, 50kg
S.P = 140kg, 100g	S.P = 75d, 30d	S.P = 150, 50
= 140 × 100 = 14000	= 75 × 30 = 2250	= 150 × 50 = 7500
= 14000 − 900 = 13100	2250 − 900 = 1350	7500 − 900 = 6600
P = S.P − C.P	L = C.P − S.P	P = S.P − C.P
13100 − 9000 = 4100	1800 − 1350 = 450	6600 − 6000 = 600

ii. If 3 dozen bananas were rotten, then find his profit or loss on the sale of bananas.

(2 Marks)

C.P = 1800	S.P = 1125
S.P = 75 × 27	L = C.P − S.P
= 2025	1800 − 1125
= 2025 − 900	Loss = 675

Question 3b:

A superstore offers a discount of 15% on marked price of its items. However, it still makes a profit of 20% on its items. Samia bought the following items from the superstore.

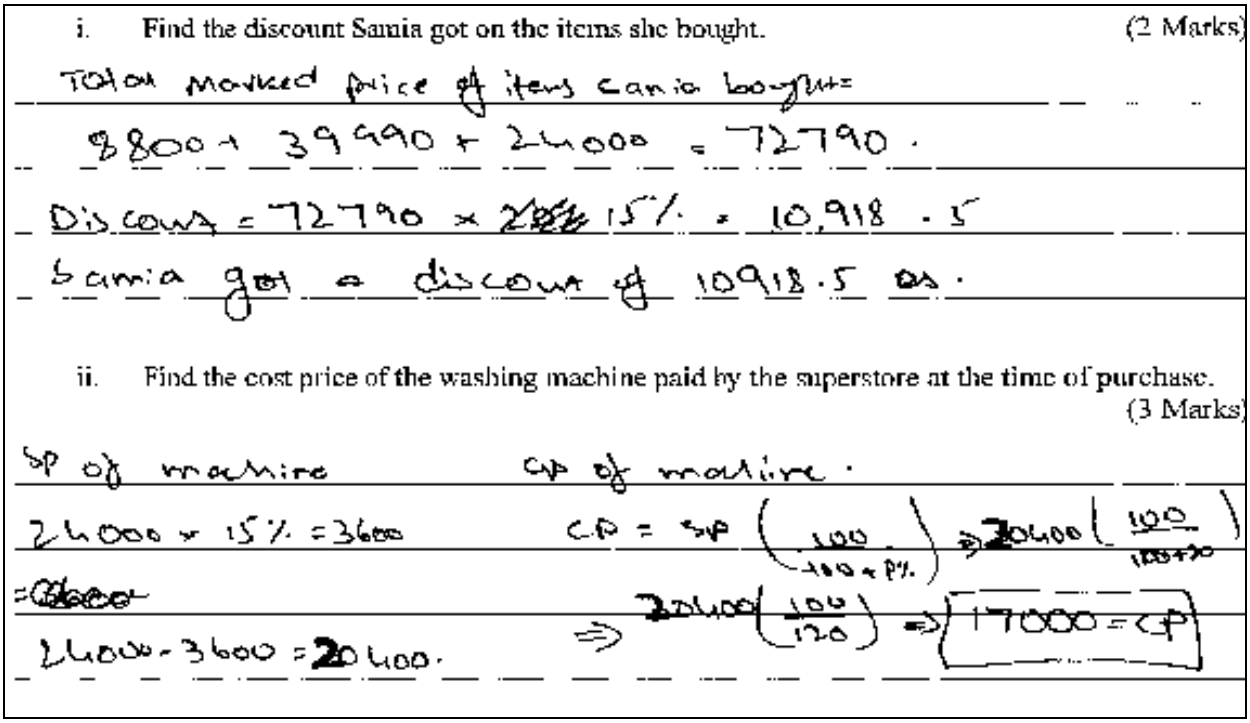
Item Bought	Marked Price (Rs)
Dinner set	8,800
TV set	39,990
Washing machine	24,000

i. Find the discount Samia got on the items she bought.

ii. Find the cost price of the washing machine paid by the superstore at the time of purchase.

Better responses displayed that candidates systematically solved the question to find the discount on the items and cost price of the washing machine using correct mathematical steps. The candidates were able to apply the formula or unitary method properly to get the correct answer.

Example:


i. Find the discount Samia got on the items she bought. (2 Marks)

Total marked price of items Samia bought=

8800 + 39990 + 24000 = 72790.

Discount = 72790 × 15% = 10,918.5

Samia got a discount of 10918.5 Rs.

ii. Find the cost price of the washing machine paid by the superstore at the time of purchase. (3 Marks)

SP of machine

24000 × 15% = 3600

24000 - 3600 = 20400.

CP of machine.

$CP = SP\left(\frac{100}{100+P\%}\right) \Rightarrow 20400\left(\frac{100}{100+20}\right)$

$\Rightarrow 20400\left(\frac{100}{120}\right) \Rightarrow$ 17000 = CP

Weaker responses exhibited that candidates failed to comprehend the question, particularly the part ii. of the question. In some responses, the candidates applied wrong formula or failed to apply unitary method appropriately to find the cost price of the washing machine. Few other mistakes have been presented in the following examples.

Example 1:

Discount = $\frac{MP}{100+d\%}$ = $\frac{8,800}{100+15\%}$ = $\frac{8,800}{115}$ = 76.52 discount dinner set

Discount = $\frac{MP}{100+d\%}$ = $\frac{39,990}{100+15\%}$ = $\frac{39,990}{115}$ = 347.73 discount of TV set

Discount = $\frac{MP}{100+d\%}$ = $\frac{24000}{100+15\%}$ = $\frac{24000}{115}$ = 208.69 discount on washing machine

ii. Find the cost price of the washing machine paid by the superstore at the time of purchase. (3 Marks)

$CP = SP \times \frac{100+P\%}{100}$

$= 24000 \times \frac{100+20\%}{100}$

$= 24000 \times \frac{120}{100}$

$= 24000 \times 1.2$

$= 28800$ is the Cost Price of the washing machine paid by the Superstore at the ~~time~~ time of Purchase.

Example 2:

Total price of items = 8800 + 39990 + 34000 = 82790

formula = D% = $\frac{D \times 100}{MP}$

15% = $\frac{x \times 100}{82790}$

15 × 82790 = 100x

124850 = 100x

12418.5 = x

Discounted price = 12418.5 Rs

ii. Find the cost price of the washing machine paid by the superstore at the time of purchase. (3 Marks)

Price of washing machin = Rs 24000

R% = $\frac{P \times 100}{Cp}$ = 20 = $\frac{P \times 100}{24000}$ = 4800

24000 − 4800 = 19200

* Superstore purchase it at Rs 19200

Example 3:

Dinner set- Tv set- Washing Machine

$\frac{8,800 \times 15}{100}$ $\frac{39,990 \times 15}{100}$ $\frac{24,000 \times 15}{100}$

= 1,320 Discount = 5,998.5 Discount = 3600 Discount she get-

Question 4:

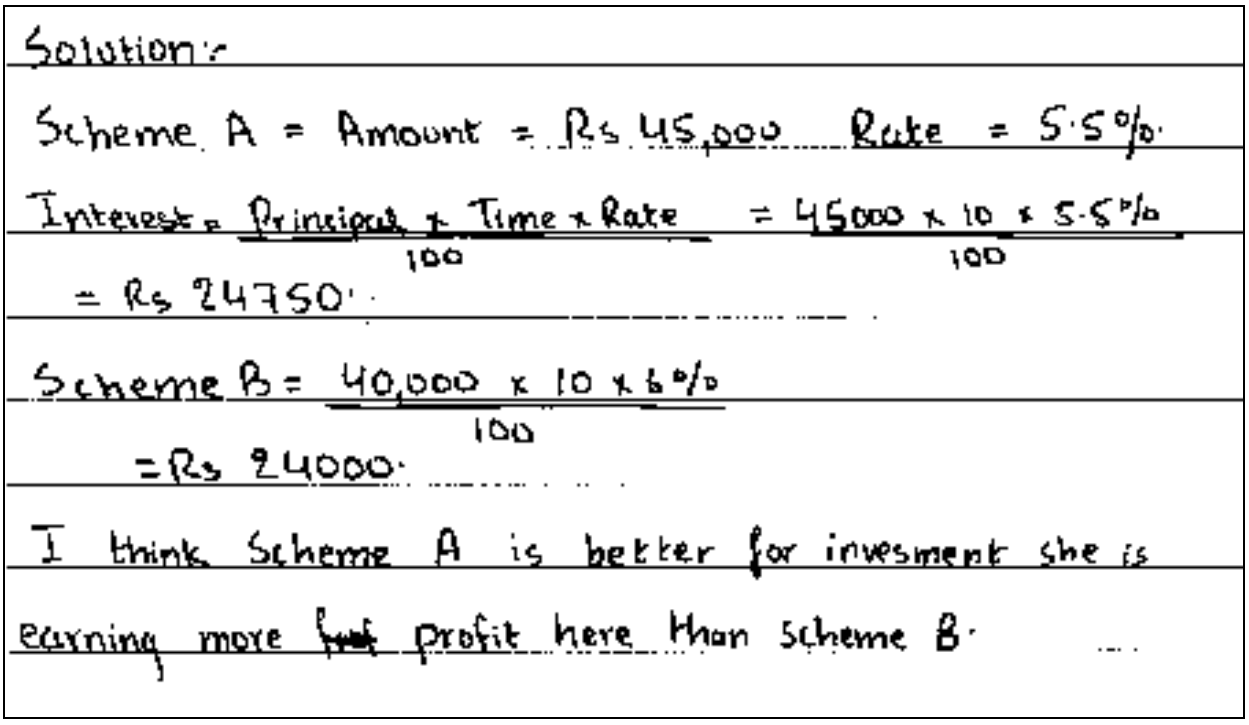
Sarvat invested in two schemes for a period of 10 years. The details of these schemes are shown in the given table.

Scheme	Amount Invested (Rs)	Simple Interest Rate/ Annum
A	45, 000	5.5%
B	40,000	6%

Which scheme is better for investment? Justify your answer with the necessary calculations.

Better responses showed that candidates correctly applied the steps to solve the question based on the concept of simple interest. The better responses reported that candidates calculated the simple interest on the given two schemes and decided about the better scheme based on the profit earned to fulfill the requirement of the question.

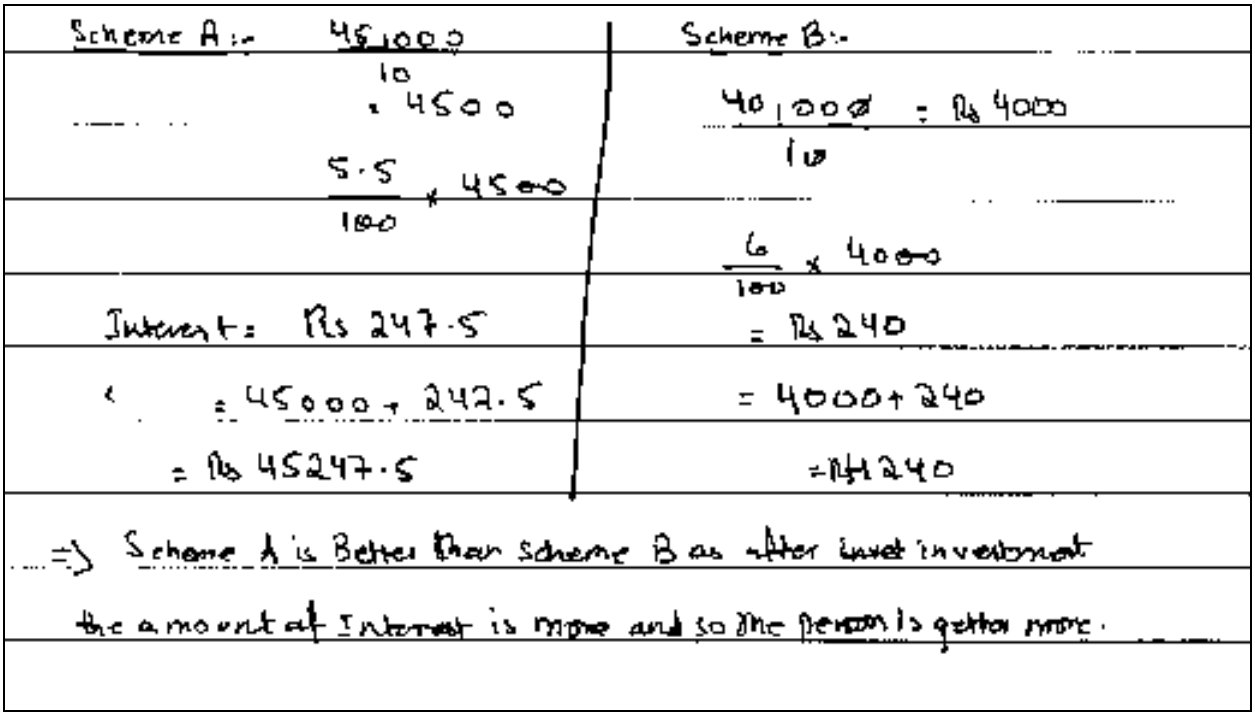
Example:



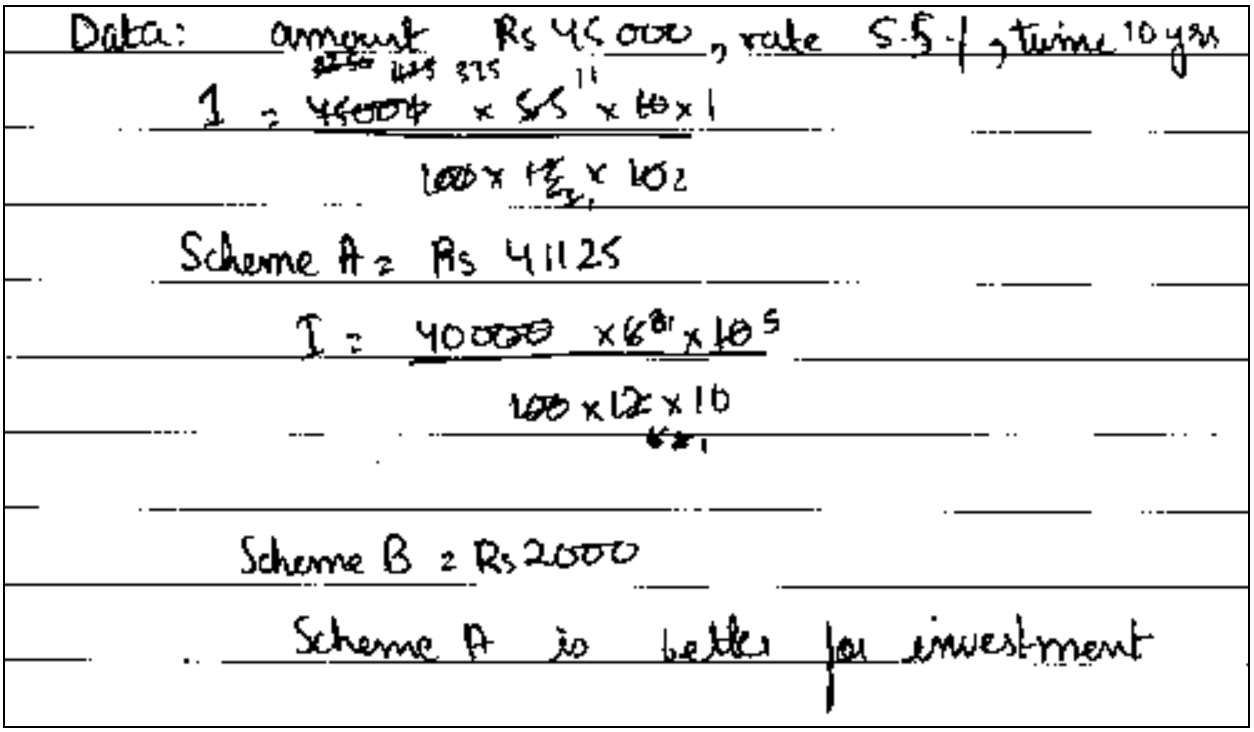
Weaker responses displayed that candidates were confused in solving problem based on simple interest. The weaker responses also showed mistakes in performing required arithmetic operations to calculate interest.

Few other mistakes have been noted in the following cited examples.

Example 1:



Example 2:



Question 5:

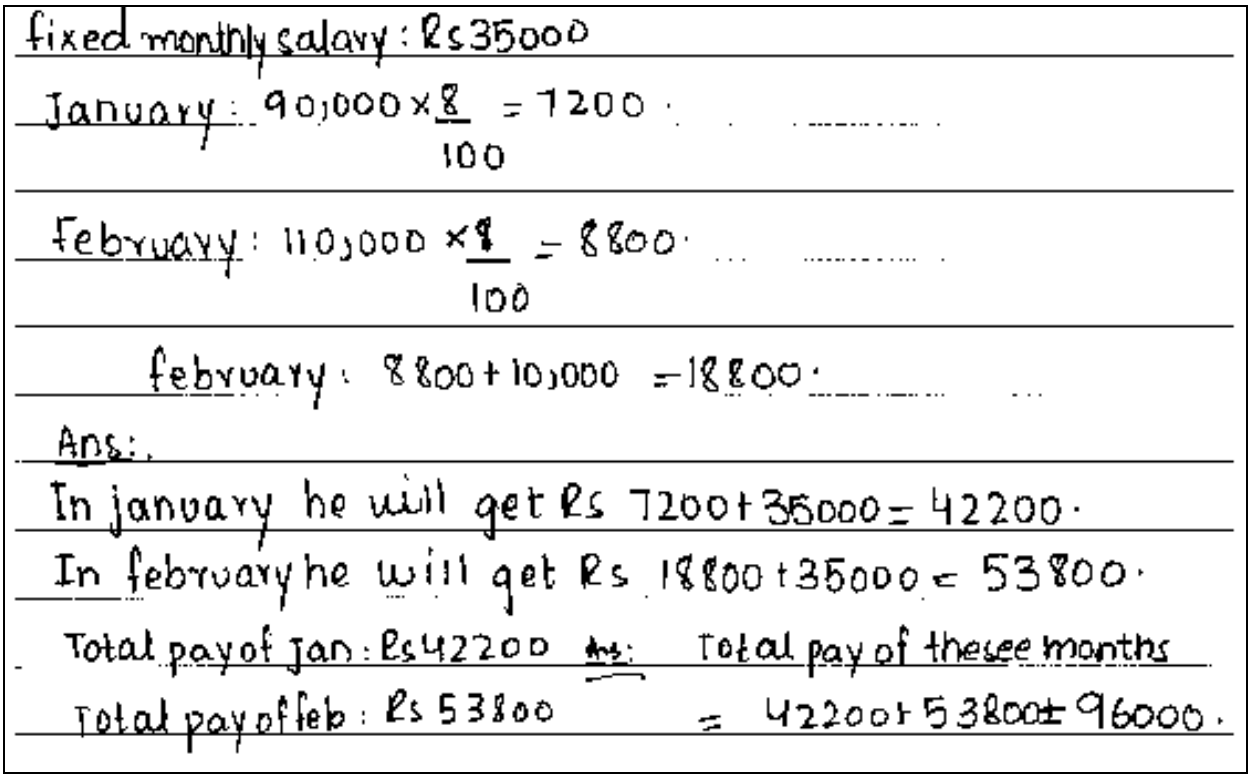
Adil receives a fixed monthly salary of Rs 35,000 and commissions on sales as per the following schedule.

Sale (Rs)	Monthly Commission
Up to 50,000	6% of the total sale
More than 50,000 up to 100,000	8% of the total sale
More than 100,000	Rs 10,000 + 8% of the total sale

His sales of January and February are Rs 90,000 and Rs 110,000 respectively. Find his total salary for these months.

Better responses displayed that candidates skillfully found the salary as per given schedule of commission. They made the correct choice of monthly commission and calculated total salary for the two given months.

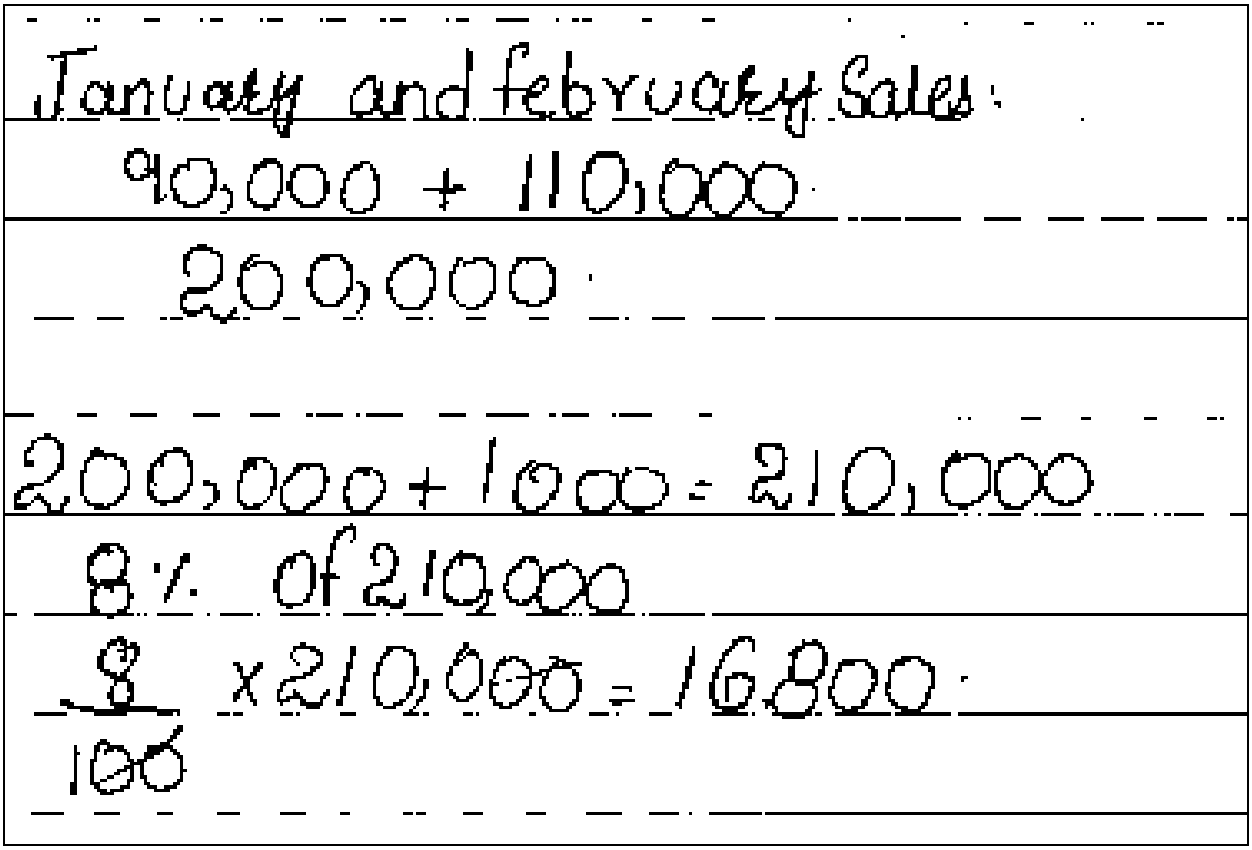
Example:



Weaker responses displayed various types of mistakes. Some common mistakes have been listed below.

- Candidates added the sales of two months and then failed to find the commission.
- Candidates were unable to pick the correct range of monthly commission as per given sale
- The candidate considered the sales as the salary of the person.
- Other misconceptions can be seen in hierarchy of arithmetic operations as shown in the following examples.

Example 1:



Example 2:

DATA:-

Fixed Salary = Rs. 35000 (commission on sales).

His January sales = Rs. 90,000

His February sales = Rs. 110,000.

Total Salary for these two months = ?

SOLUTION:-

JANUARY:- Rs. 90,000 × 8% of commission.

$= \text{Rs. } \frac{90{,}000 \times 8}{100} = \text{Rs. } 7200$

FEBRUARY:-

Rs. 110,000 + Rs. 10,000 = Rs. 120,000.

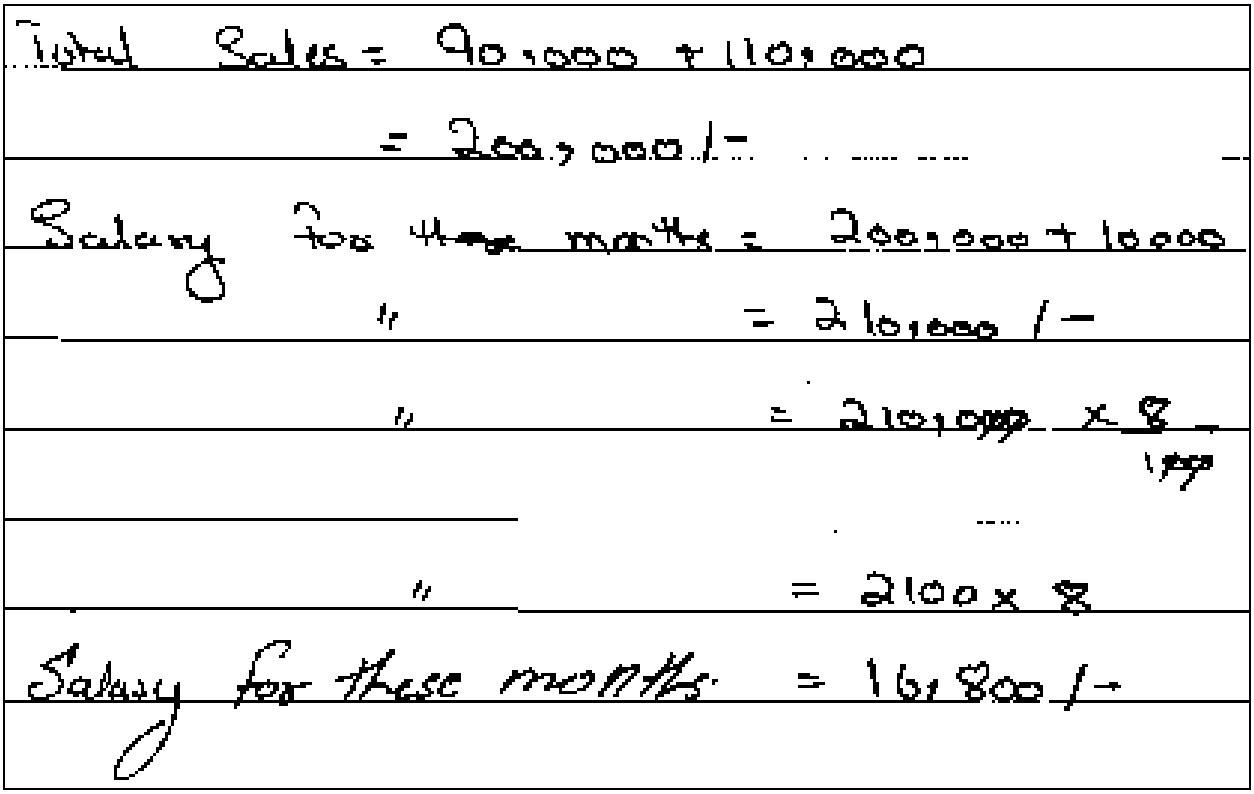
Rs. 120,000 × 8% of total sale

$= \frac{120{,}000 \times 8}{100} = \text{Rs. } 9600.$

TOTAL SALARY FOR TWO MONTHS:-

Rs. 7200 + Rs. 9600 = Rs. 16,800.

Example 3:



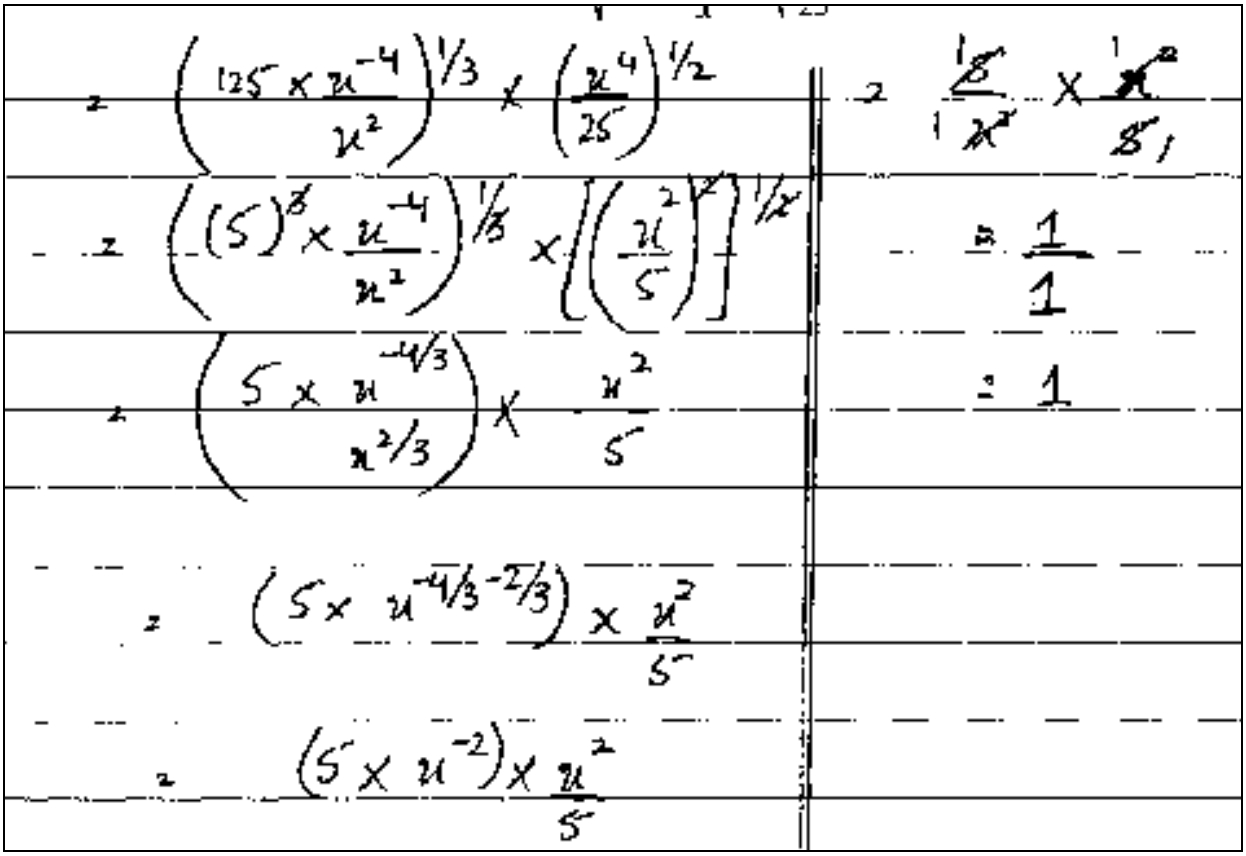
Question 6a:

Apply the laws of exponents to reduce $\sqrt[3]{125\times\frac{x^{-4}}{x^2}}\times\sqrt{\frac{x^4}{25}}$ in its simplest form.

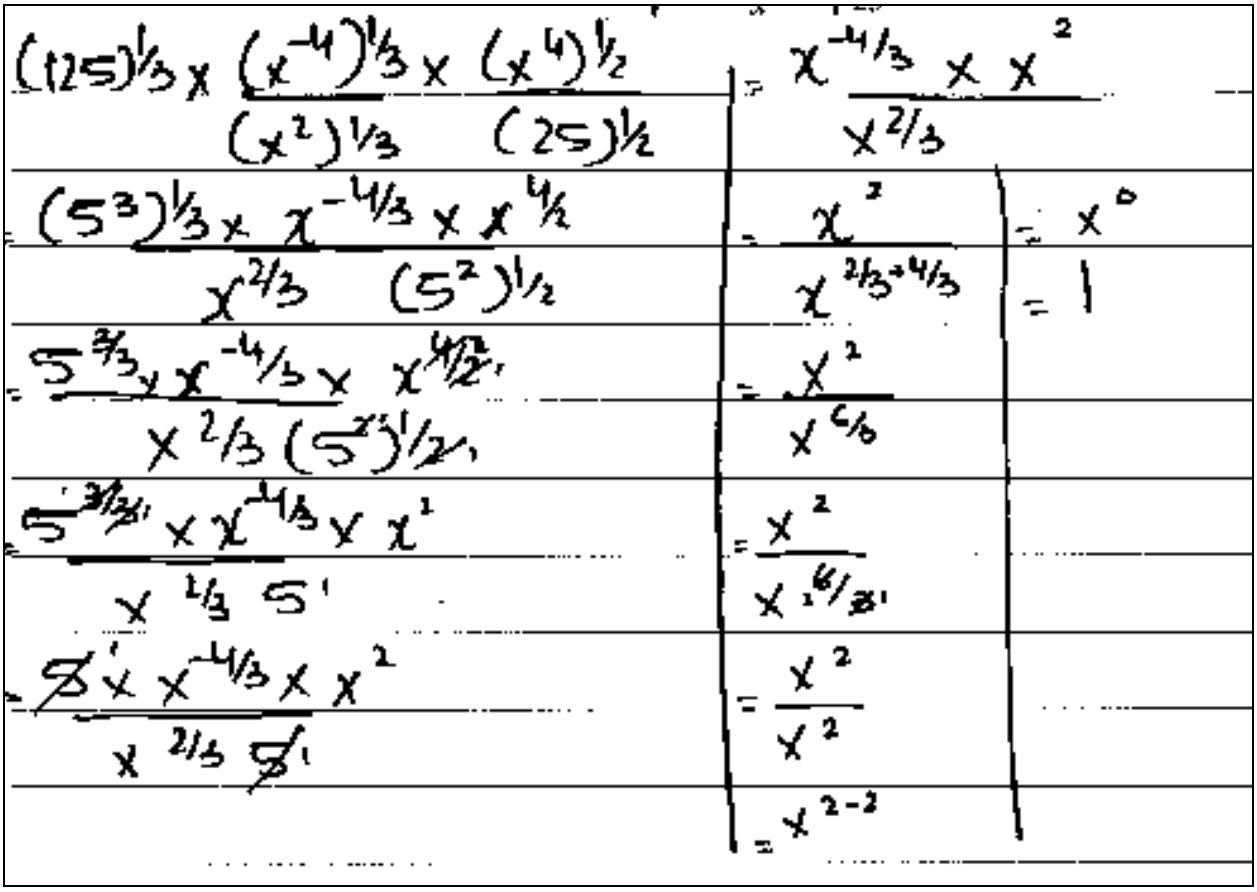
There was a choice between part **a** and **b** of the question. Most of the candidates opted for part **a.** Generally it was a well-attempted question.

Better responses indicated that candidates were clear about the laws of exponents and used the laws skilfully to simplify the given expression. They applied the laws $(a\times b)^m = a^m \times b^m$, $\frac{a^n}{a^m} = a^{n-m}$ and converted radicals to index form.

Example 1:

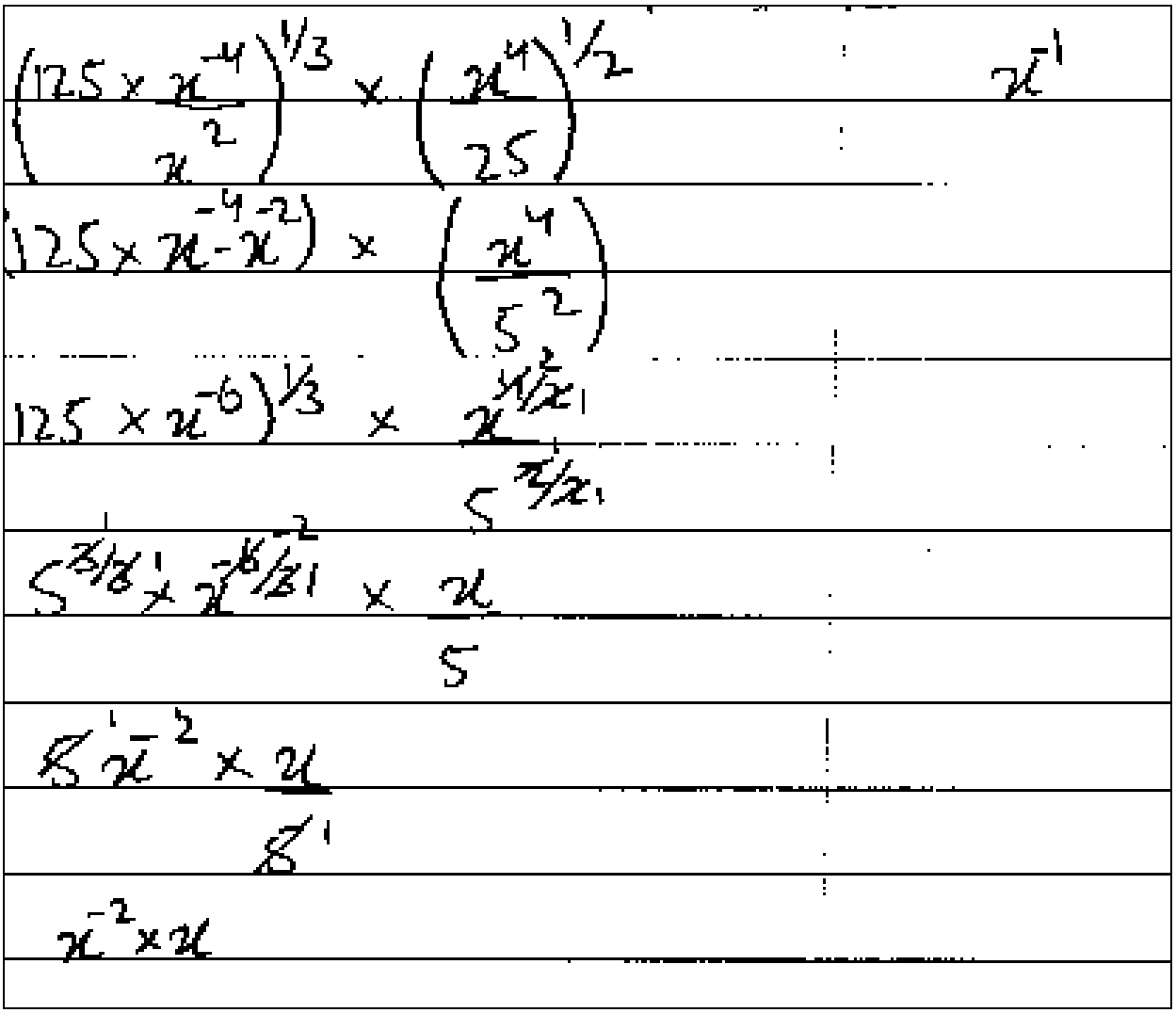

$= \left(\frac{125 \times x^{-4}}{x^2}\right)^{1/3} \times \left(\frac{x^4}{25}\right)^{1/2}$
$= \left((5)^3 \times \frac{x^{-4}}{x^2}\right)^{1/3} \times \left[\left(\frac{x^2}{5}\right)^2\right]^{1/2}$
$= \left(\frac{5 \times x^{-4/3}}{x^{2/3}}\right) \times \frac{x^2}{5}$
$= \left(5 \times x^{-4/3 - 2/3}\right) \times \frac{x^2}{5}$
$= \frac{(5 \times x^{-2}) \times x^2}{5}$
$= \frac{1}{x^2} \times \frac{x^2}{1}$
$= \frac{1}{1}$
$= 1$

Example 2:

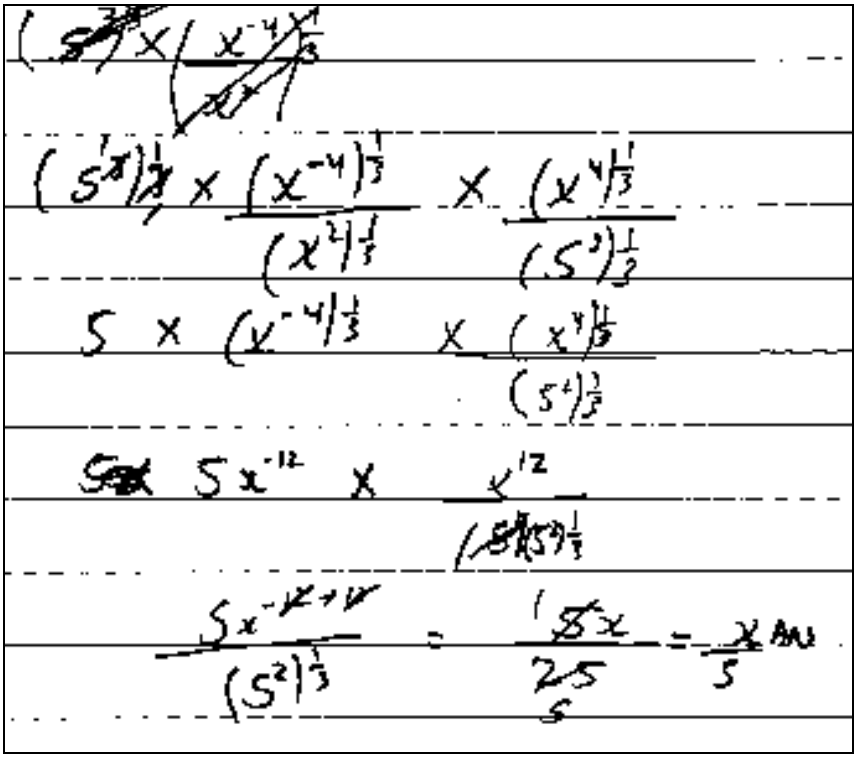

$\frac{(125)^{1/3} \times (x^{-4})^{1/3} \times (x^4)^{1/2}}{(x^2)^{1/3} \quad (25)^{1/2}}$
$= \frac{x^{-4/3} \times x^2}{x^{2/3}}$
$= \frac{(5^3)^{1/3} \times x^{-4/3} \times x^{4/2}}{x^{2/3} \quad (5^2)^{1/2}}$
$= \frac{x^2}{x^{2/3+4/3}}$
$= x^0$
$= 1$
$= \frac{5^{3/3} \times x^{-4/3} \times x^{4/2}}{x^{2/3} (5^2)^{1/2}}$
$= \frac{x^2}{x^{6/3}}$
$= \frac{5^{3/3} \times x^{-4/3} \times x^1}{x^{2/3} \, 5^1}$
$= \frac{x^2}{x^2}$
$= \frac{5^1 x^{-4/3} \times x^2}{x^{2/3} 5^1}$
$= x^{2-2}$

Weaker responses indicated that candidates failed to apply the laws of exponents properly and therefore failed to simplify the given expression $\sqrt[3]{125\times\frac{x^{-4}}{x^2}}\times\sqrt{\frac{x^4}{25}}$. They were unable to convert radicals to indices. Weaker responses also reported that candidates made mistakes in converting – ve exponent to + ve exponent. Few examples are cited below.

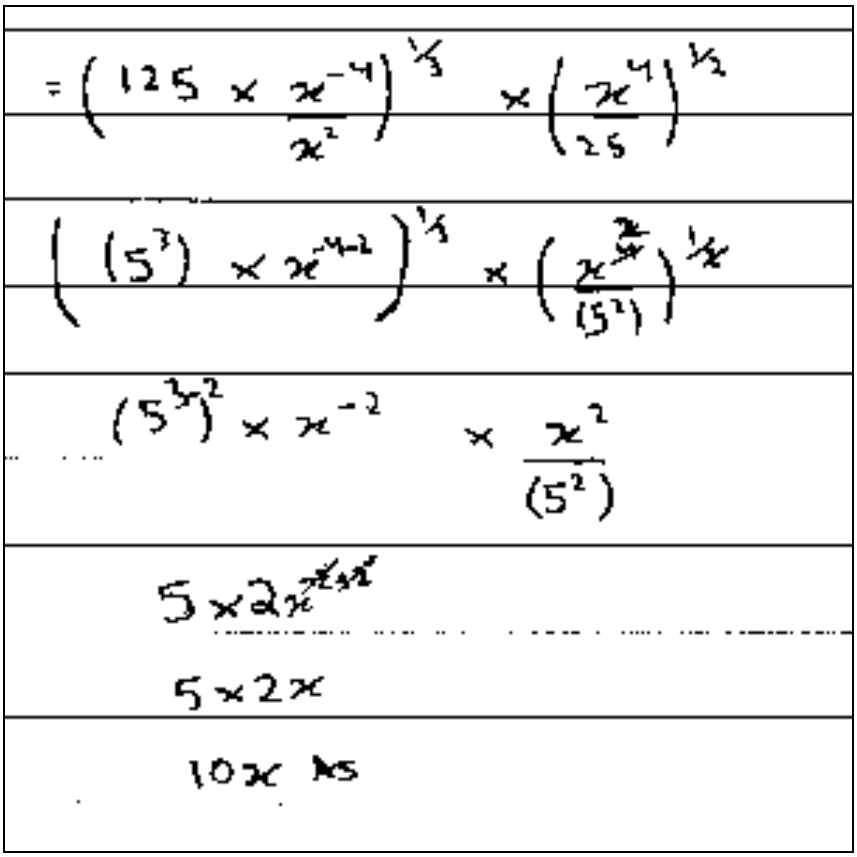
Example 1:



Example 2:



Example 3:

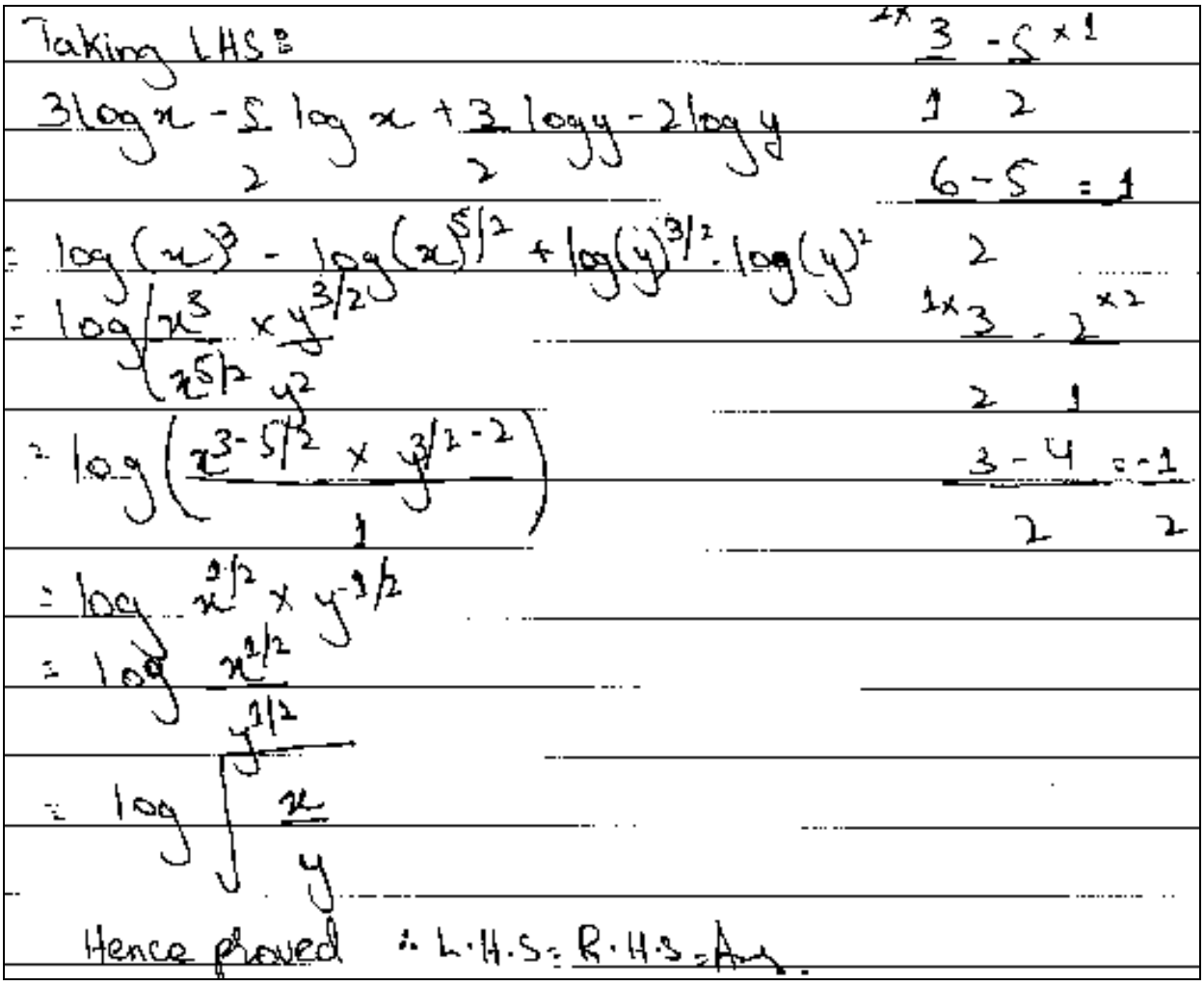


Question 6b:

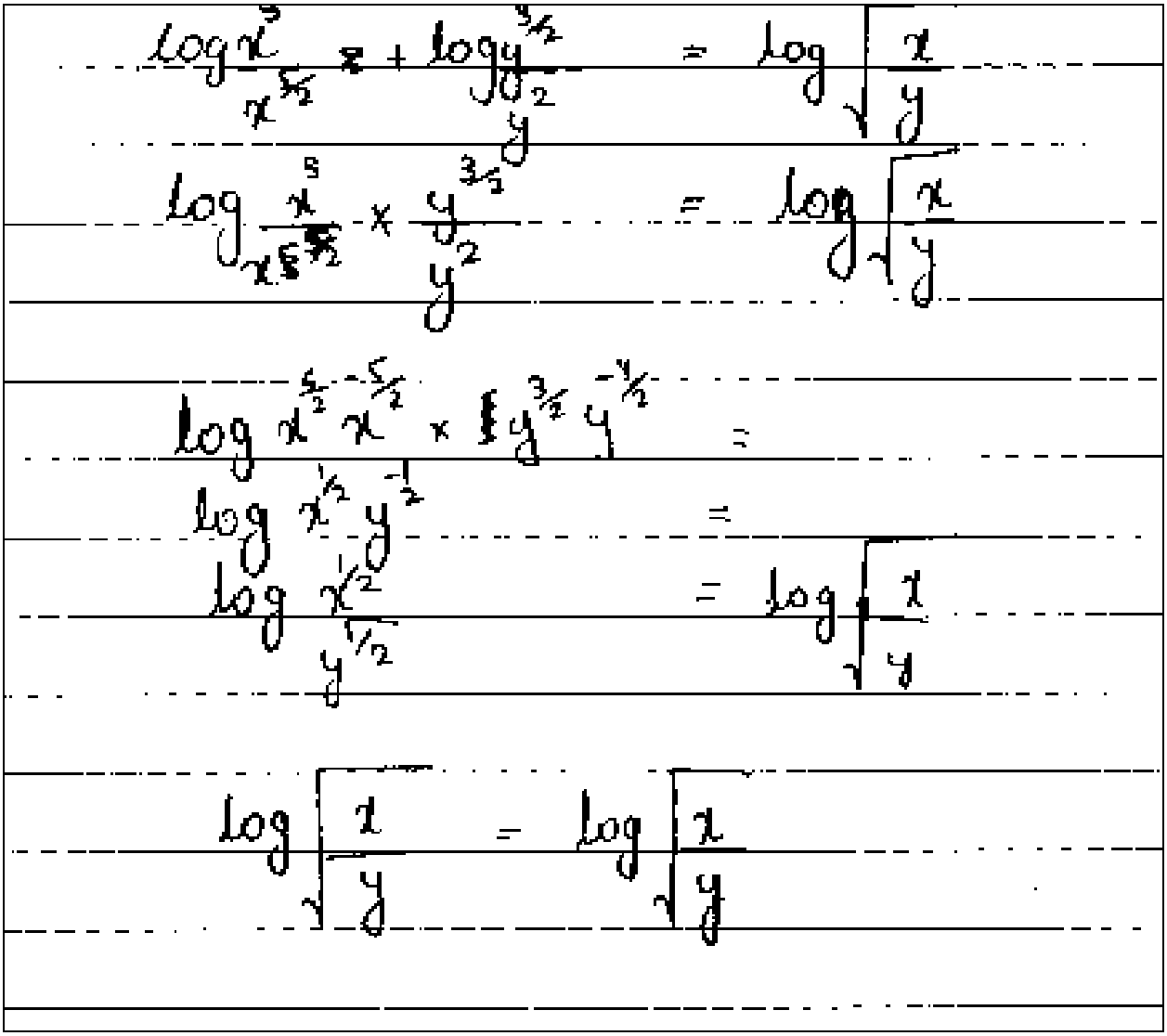
Show that $3\log x - \frac{5}{2}\log x + \frac{3}{2}\log y - 2\log y = \log\sqrt{\frac{x}{y}}$.

Better responses exhibited that the candidates comprehended question well and the affluently applied the laws of logarithms to simplify $3\log x - \frac{5}{2}\log x + \frac{3}{2}\log y - 2\log y$ to $\log\sqrt{\frac{x}{y}}$. They were clear about the laws $m\log x = \log x^m$, $\log xy = \log x + \log y$ and $\log\frac{x}{y} = \log x - \log y$ and simplifid the terms without making any mistakes.

Example 1:



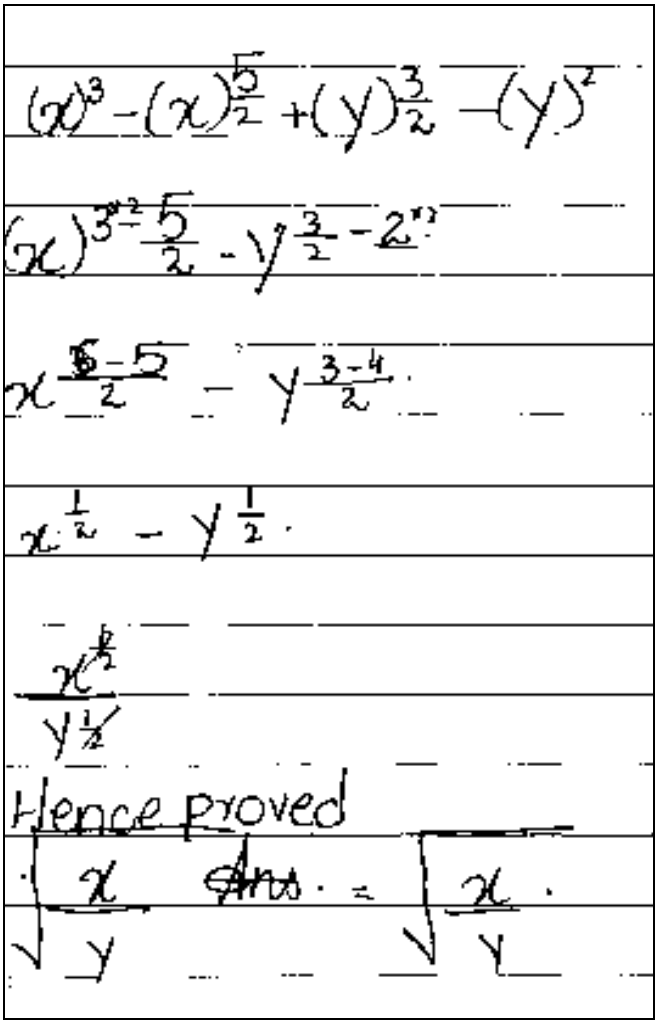
Example 2:



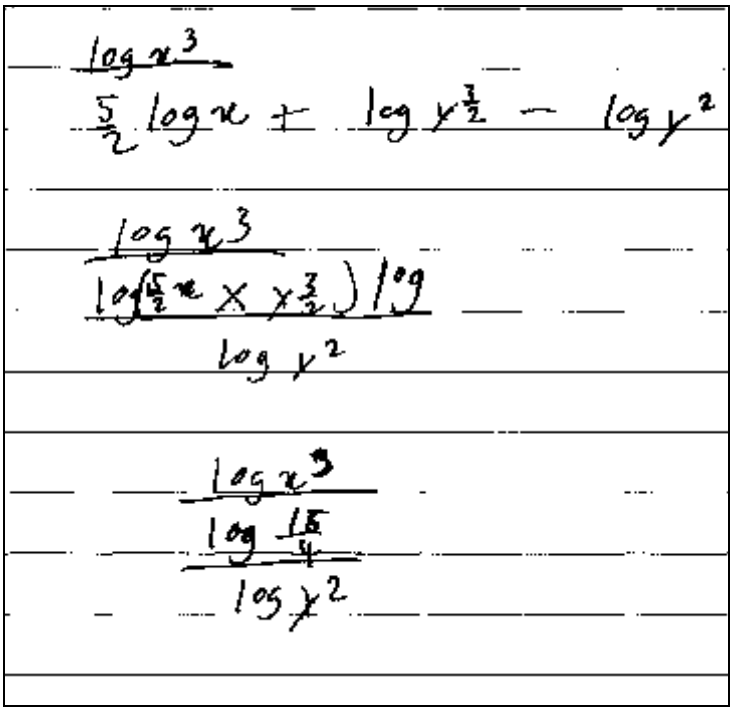
Weaker responses showed that candidates were having confusions in writing and applying the laws of logarithms. They were unable to comprehend the question which resulted in different types of mistakes. Few of those mistakes are as follows.

As cited in **Example 1** the candidate applied the laws of logarithms without writing log. Obviously these laws are not applicable without wring logarithms. They wrote $\log x \times \log y = \log x + \log y$ instead of $\log xy = \log x + \log y$ or similar kind of mistakes.

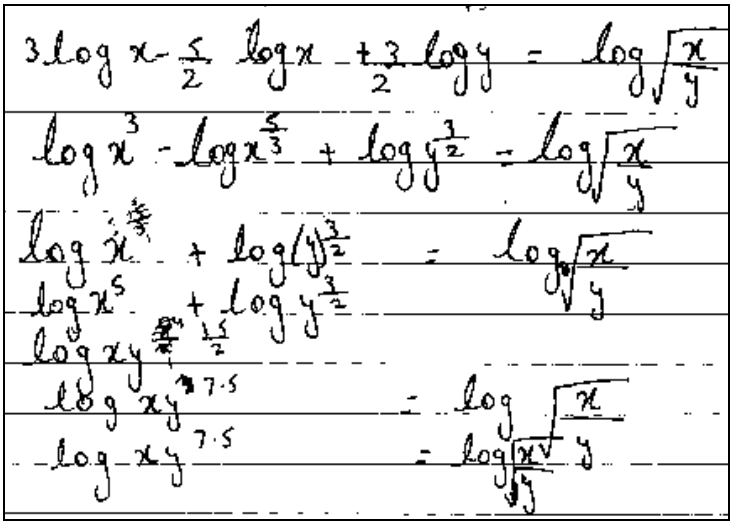
Example 1:


$(x)^3 - (x)^{\frac{5}{2}} + (y)^{\frac{3}{2}} - (y)^2$
$(x)^{3-\frac{5}{2}} - y^{\frac{3}{2}} - 2^{y}$
$x^{\frac{6-5}{2}} - y^{\frac{3-4}{2}}$
$x^{\frac{1}{2}} - y^{\frac{1}{2}}$
$\frac{x^{\frac{1}{2}}}{y^{\frac{1}{2}}}$
Hence proved
$\sqrt{\frac{x}{y}}$ Ans. $= \sqrt{\frac{x}{y}}$

Example 2:



Example 3:



Question 7:

A lecture hall has 15 seats in the first row, 18 seats in the second row, 21 seats in the third row, 24 seats in the fourth row and so on. The lecture hall has total 10 rows of seats.

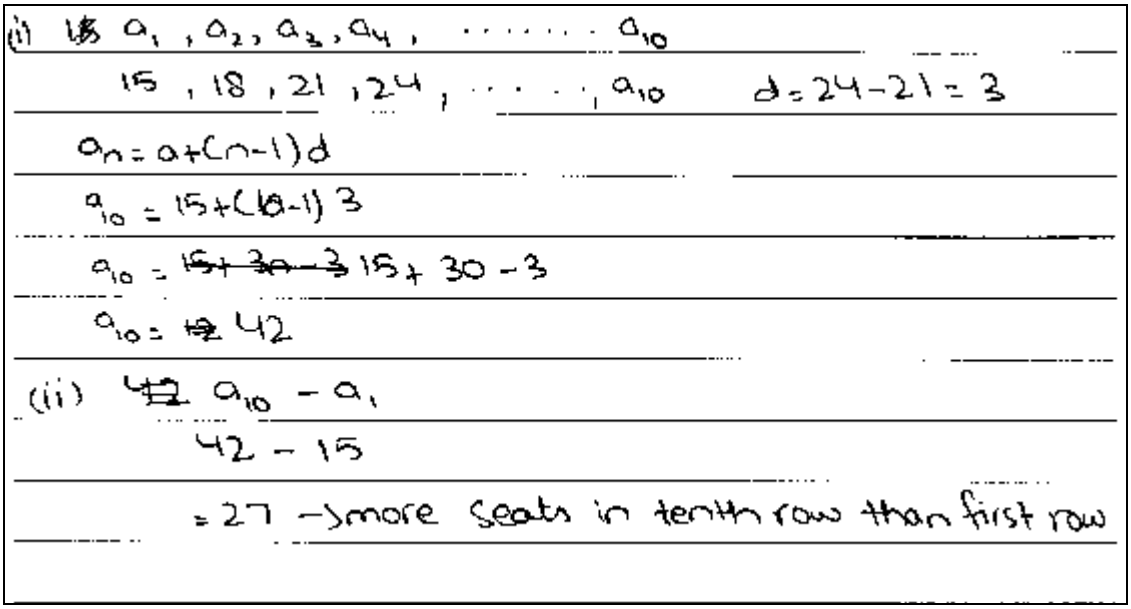
i. Find the number of seats in the tenth row of the lecture hall.

ii. Find how many more seats are in the tenth row than in the first row of the lecture hall.

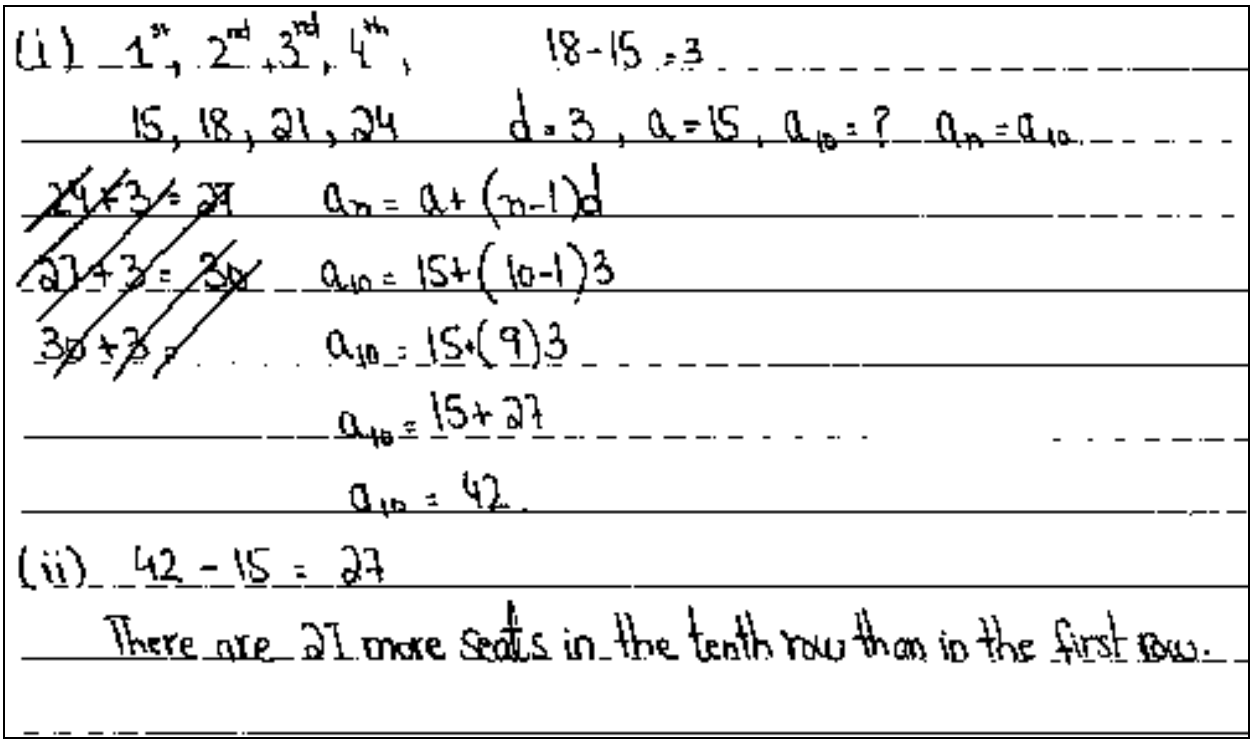
This question was based on arithmetic sequence but many candidates solved this question using simple arithmetical approach and got full credit as question was asking about the number seats in the tenth row.

Better responses indicated that the candidates comprehended the question well and used correct formula, i.e. $T_n = a + (n-1)d$ by finding correct common diffrence and first term or used a correct repeated addition model to reach the 10th term. They also find the difference of number of seats in the first and tenth row to find the more seats in tenth row.

Example 1:



Example 2:


(i) 1st, 2nd, 3rd, 4th, 18 - 15 = 3

15, 18, 21, 24 $d = 3$, $a = 15$, $a_{10} = ?$ $a_n = a_{10}$

~~24 + 3 = 27~~ $a_n = a + (n-1)d$

~~27 + 3 = 30~~ $a_{10} = 15 + (10-1)3$

~~30 + 3~~ $a_{10} = 15 + (9)3$

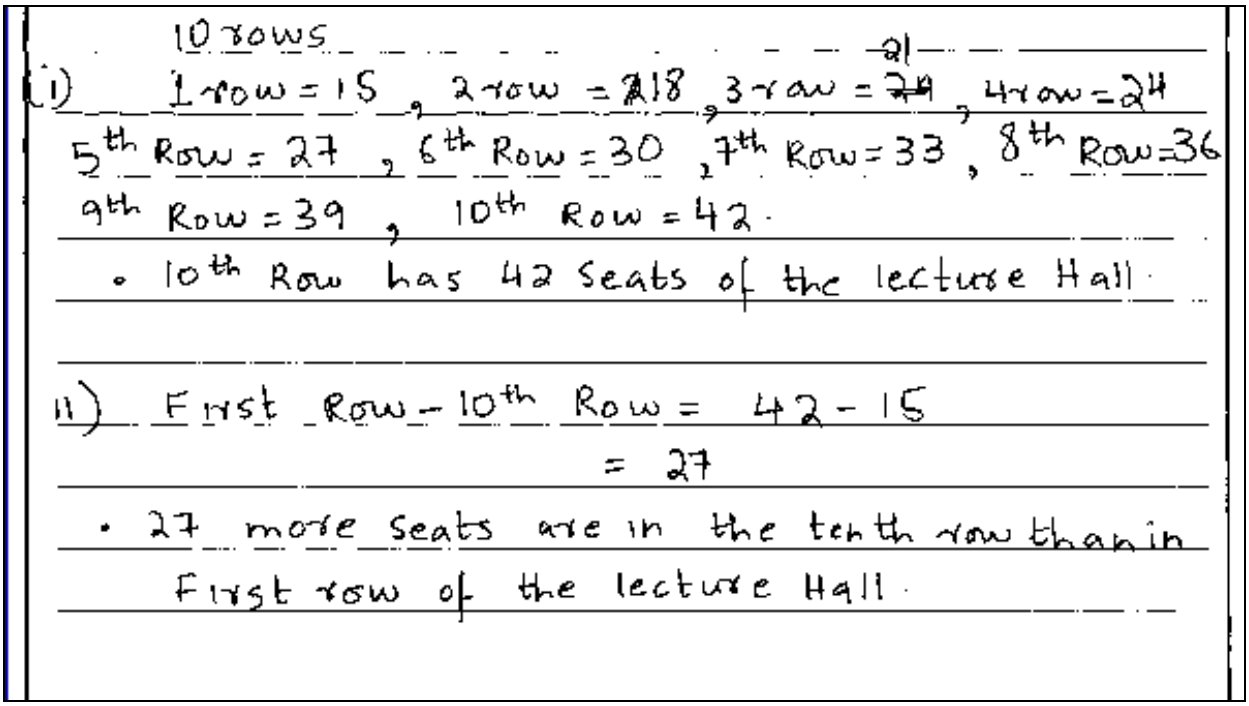
$a_{10} = 15 + 27$

$a_{10} = 42$.

(ii) 42 - 15 = 27

There are 27 more seats in the tenth row than in the first row.

Example 3:


10 rows

i) 1 row = 15, 2 row = 18, 3 row = 21, 4 row = 24
5th Row = 27, 6th Row = 30, 7th Row = 33, 8th Row = 36
9th Row = 39, 10th Row = 42.

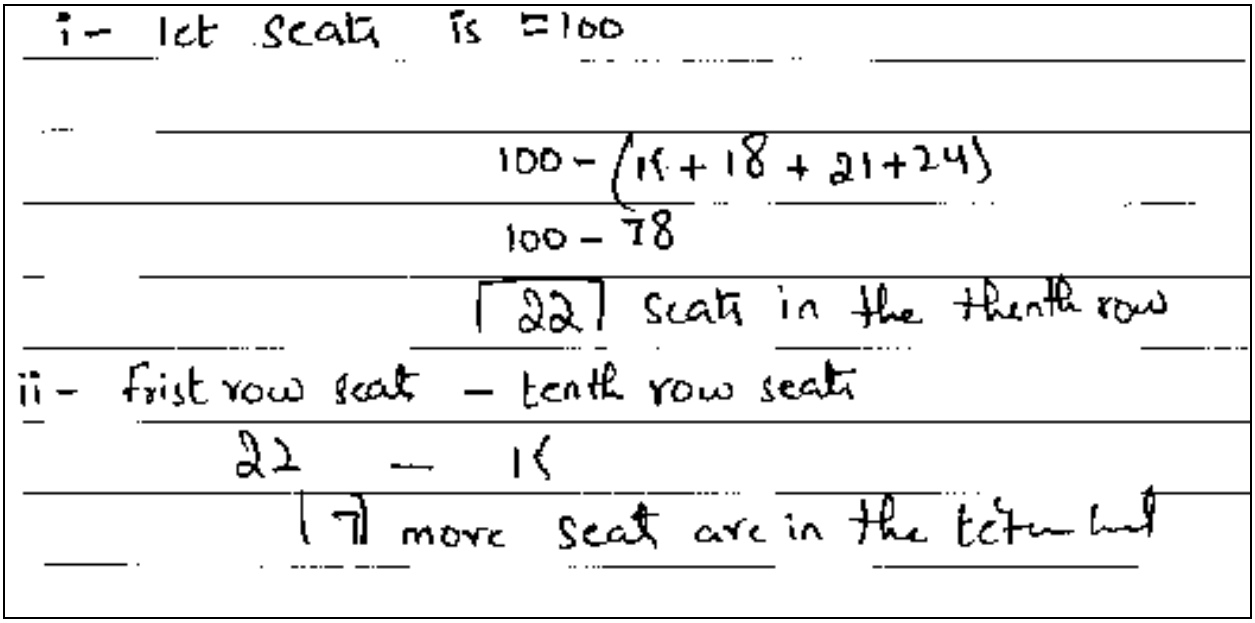
- 10th Row has 42 Seats of the lecture Hall.

ii) First Row - 10th Row = 42 - 15
= 27

- 27 more seats are in the tenth row than in First row of the lecture Hall.

Weaker responses showed that candidates were failed to comprehend the question or applied the formula of arithmetic sequence inappropriately or failed to apply simple additive method. Hence, they failed to find the required number of seats. In some responses, it was noted that candidates applied wrong hierarchy of arithmetical operations.

Example 1:


i- 1st seats is = 100

100 - (15 + 18 + 21 + 24)

100 - 78

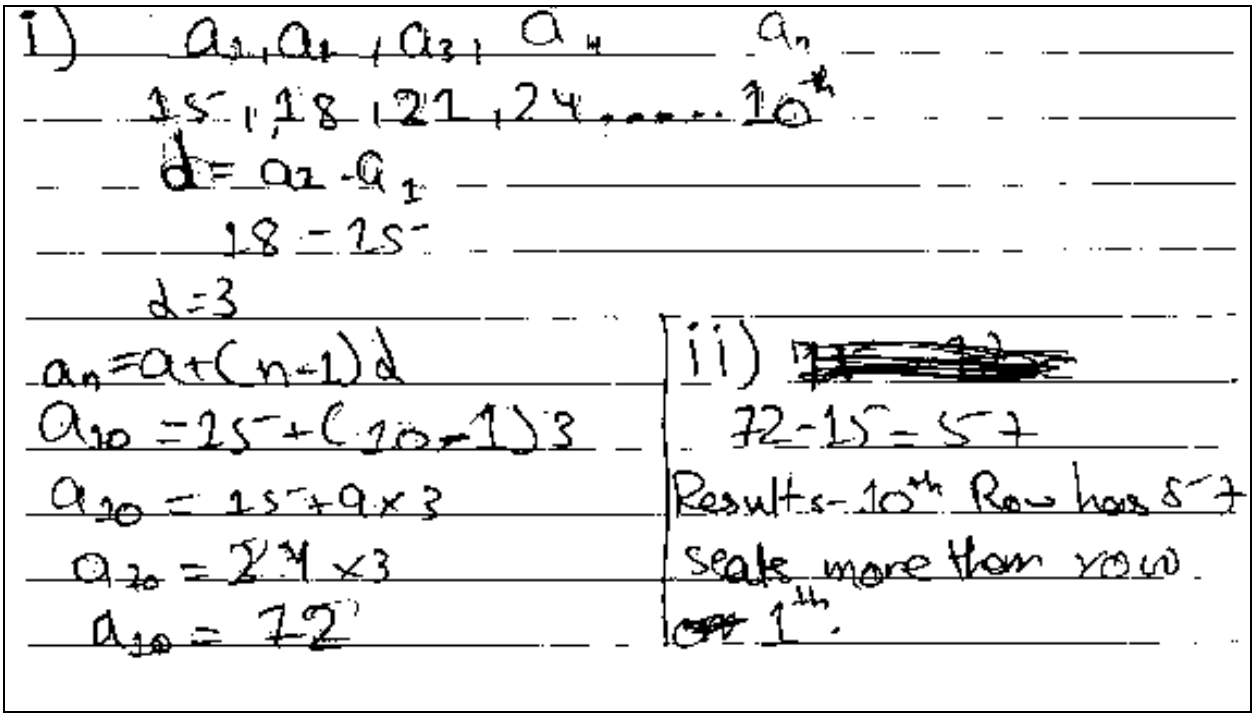
[22] seats in the thenth row

ii- frist row seat - tenth row seats

22 - 15

[7] more seat are in the tetn hut

Example 2:



Question 8a:

a. For the sets $U = \{a, b, c, d, e, f, g, h\}$, $A = \{a, b, c, d, e, f\}$ and $B = \{b, f, h\}$, find

i. $(A \cup B)^C$

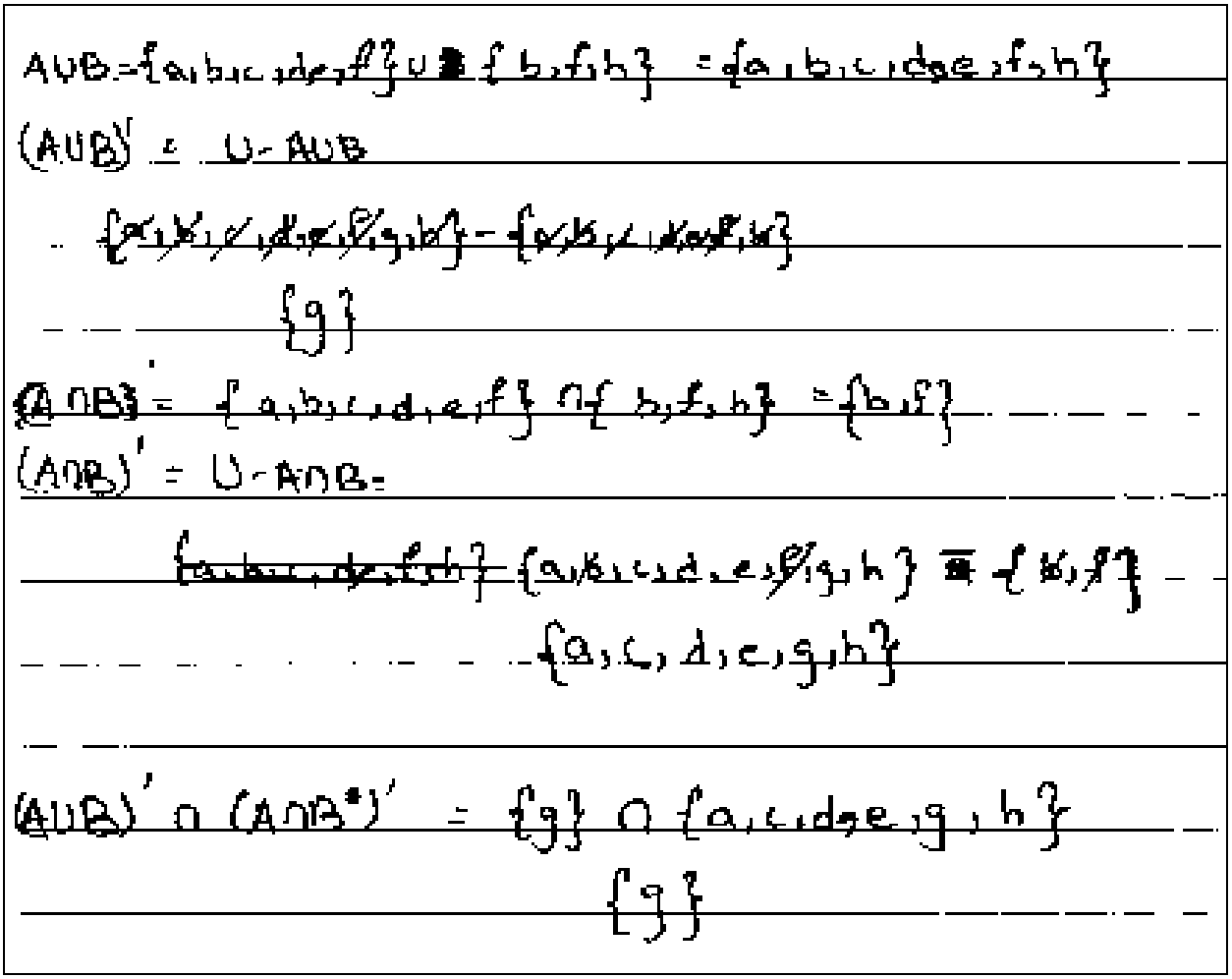
ii. $(A \cap B)^C$

iii. $(A \cup B)^C \cap (A \cap B)^C$

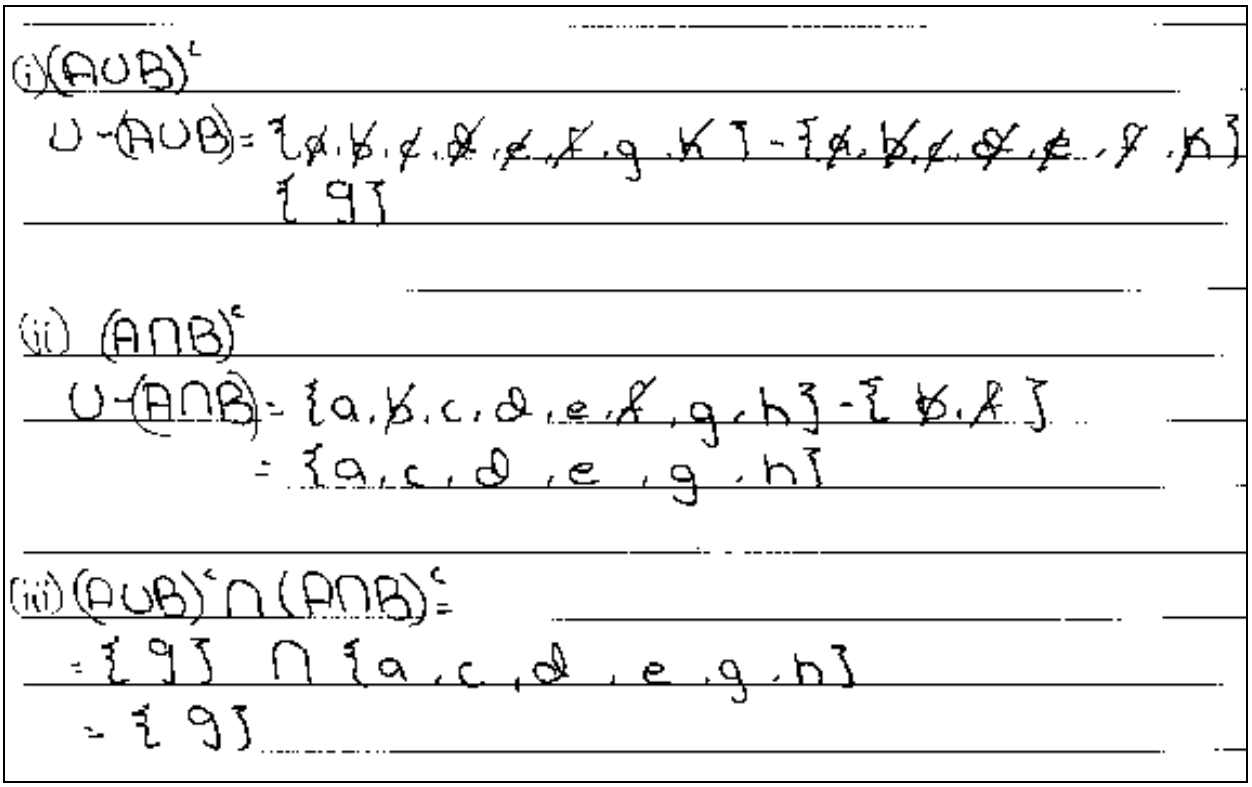
This question offered a choice between part **a** and part **b.** Candidates mostly opted to attempt part **a**. The part **a** was based on the operations on sets, while part **b**., was based on the concept of function and its types. So function and its type seem to be difficult for the candidates.

Better responses showed that candidates were well versed with the concepts of sets and its operations and therefore were able to find $(A \cup B)^C$, $(A \cap B)^C$ and $(A \cup B)^C \cap (A \cap B)^C$

Example 1:

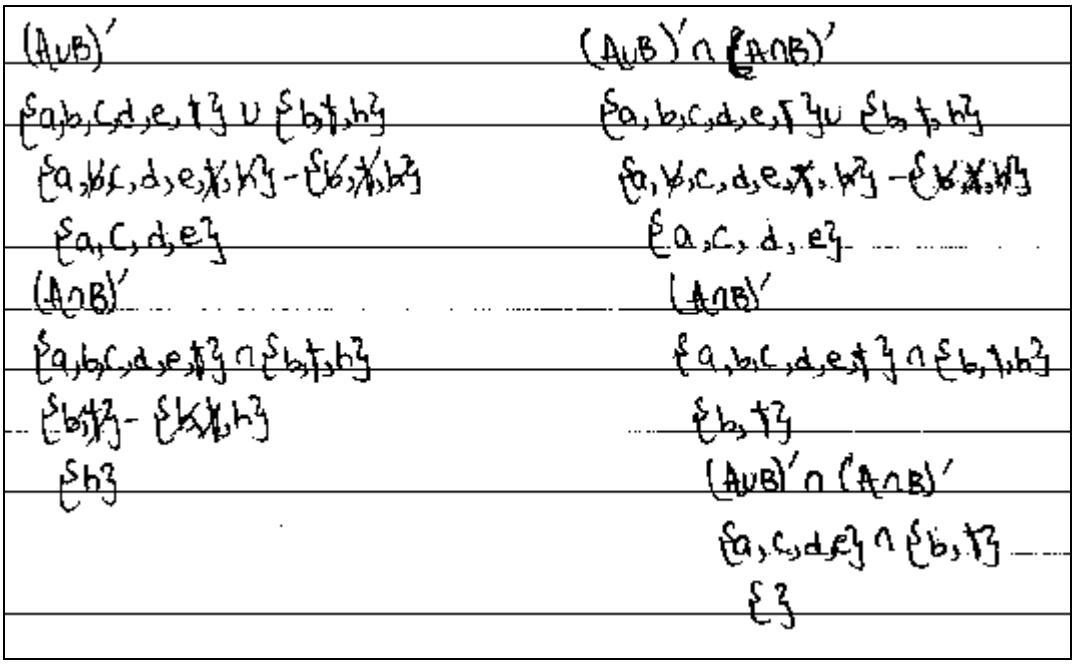

A∪B={a,b,c,d,e,f,g}∪{b,f,h} ={a,b,c,d,e,f,g,h}
(A∪B)' = U-A∪B
{g}
(A∩B)' = {a,b,c,d,e,f}∩{b,f,h} ={b,f}
(A∩B)' = U-A∩B=
{a,c,d,e,g,h}
{a,c,d,e,g,h}
(A∪B)' ∩ (A∩B)' = {g} ∩ {a,c,d,e,g,h}
{g}

Example 2:

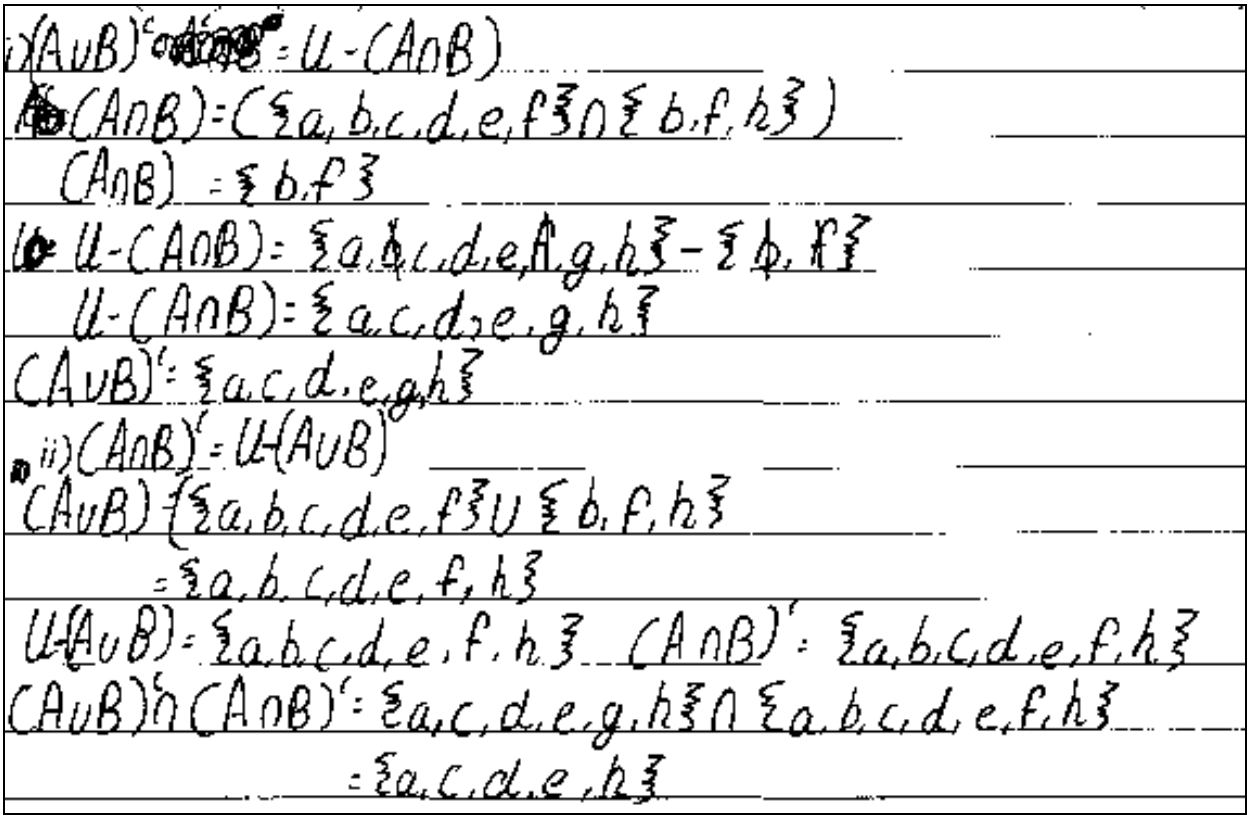


Weaker responses displayed that candidates made various mistakes in finding the value of $(A \cup B)^c$, $(A \cap B)^c$ and $(A \cup B)^C \cap (A \cap B)^c$. They mixed the concept of union and intersection of sets particularly when their compliments were required to be found.

Example 1:



Example 2:



Question 8b:

Two sets are defined as $S = \{1, 2, 3, 4\}$ and $T = \{2, 6, 8\}$.

i. From *S* to *T*, state a/ an

   I. binary relation which is NOT a function.

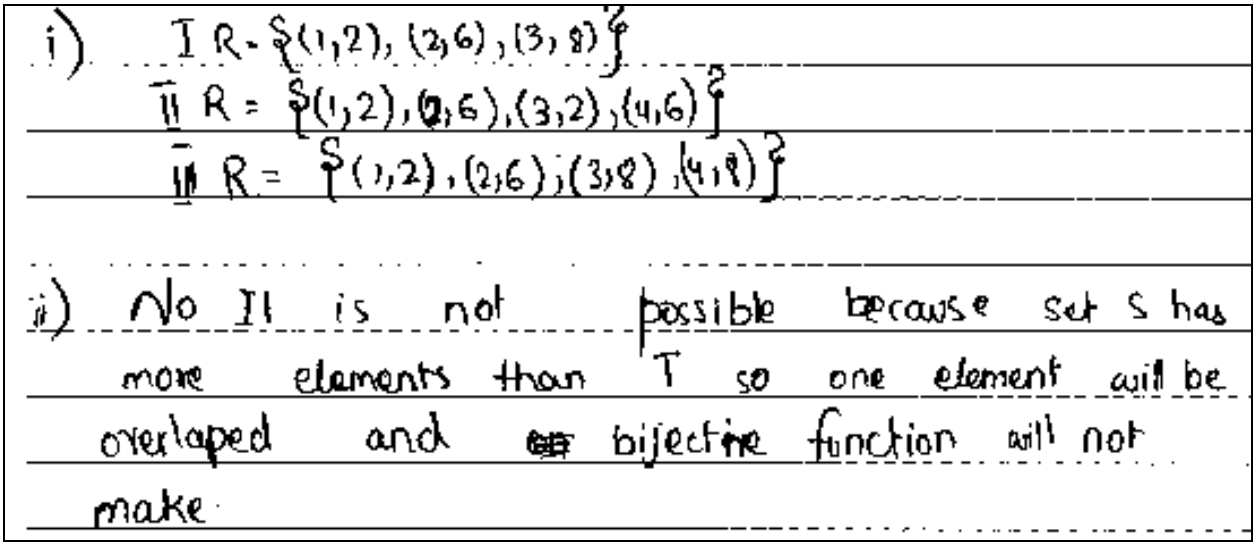
   II. into function.

   III. onto function.

ii. Is it possible to find a one-one and onto function (bijective function) from *S* to *T* ? Justify your answer.

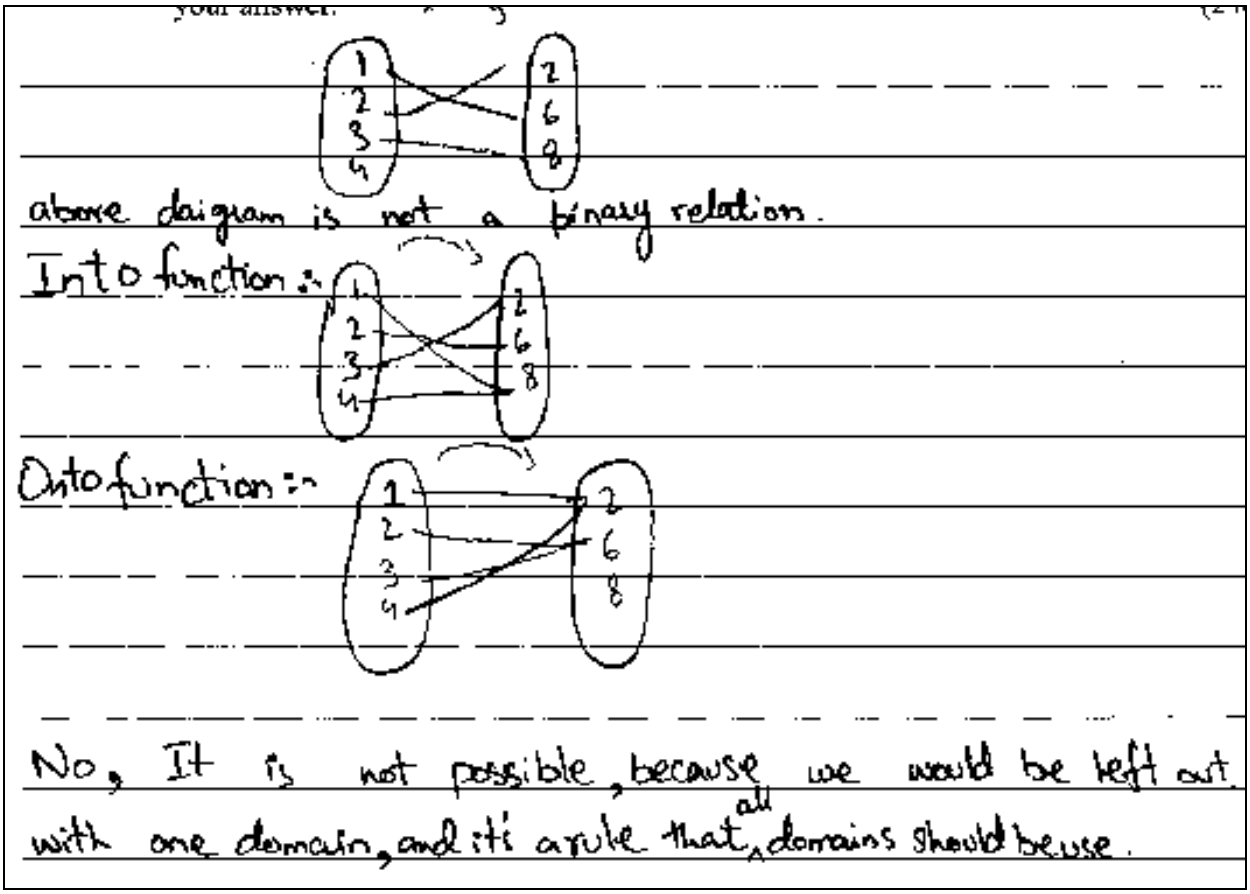
Better responses showed that the candidates had good understanding of the sets and its type.. They systematically found the binary relation and into and onto functions. They clearly mentioned the reason why it is not possible to find a bijective function from *S* to *T*.

Example:

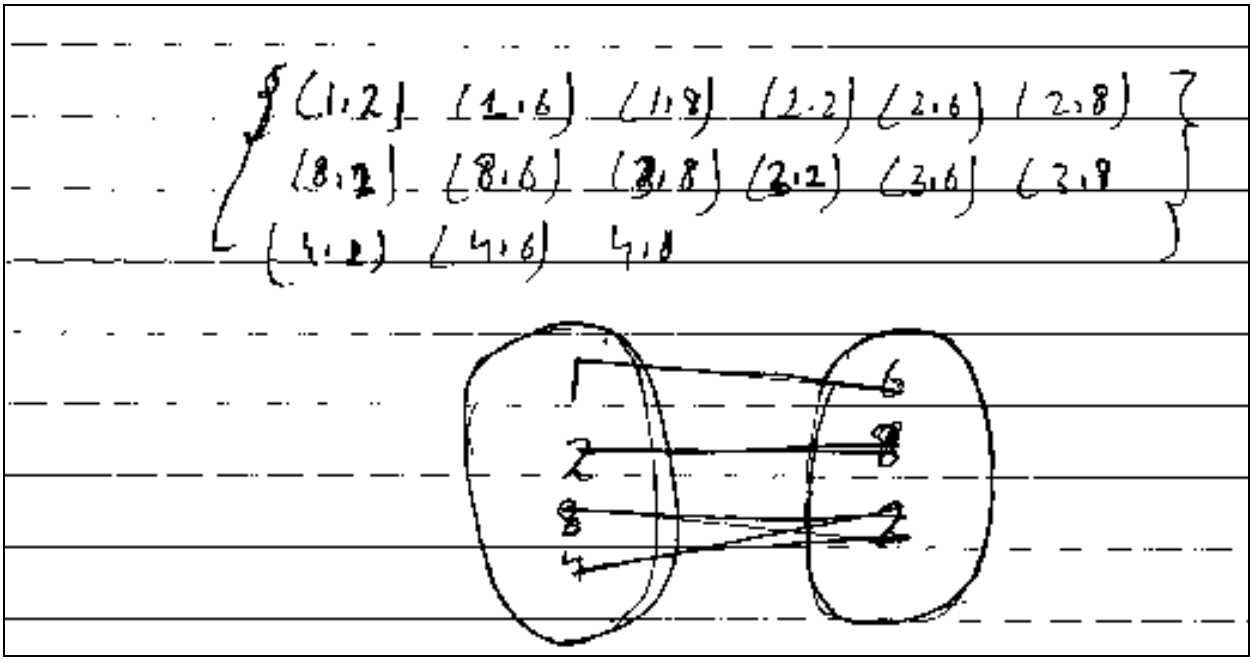


Weaker responses displayed lack of understanding of binary relation, function, into function, onto function and bijective function. They were confused about the domain elements and range elements and therefore were failed to write required function correctly. They were also not sure about the bijective function hence wrote wrong justification of their statement.

Example 1:



Example 2:



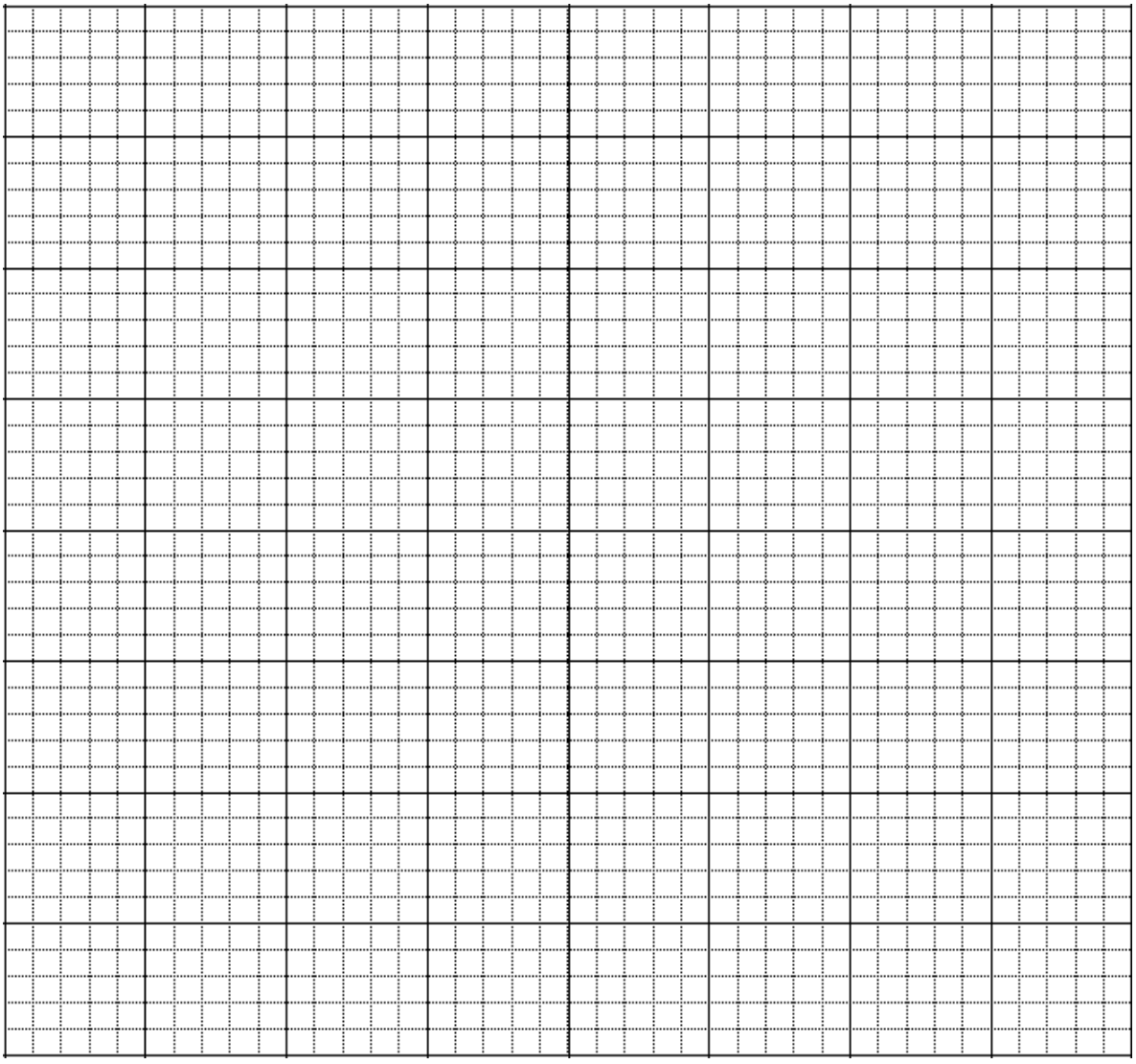
Question 9:

For the linear equation $2x + 3y = 12$,

i. find the missing values of x and y in the given table.

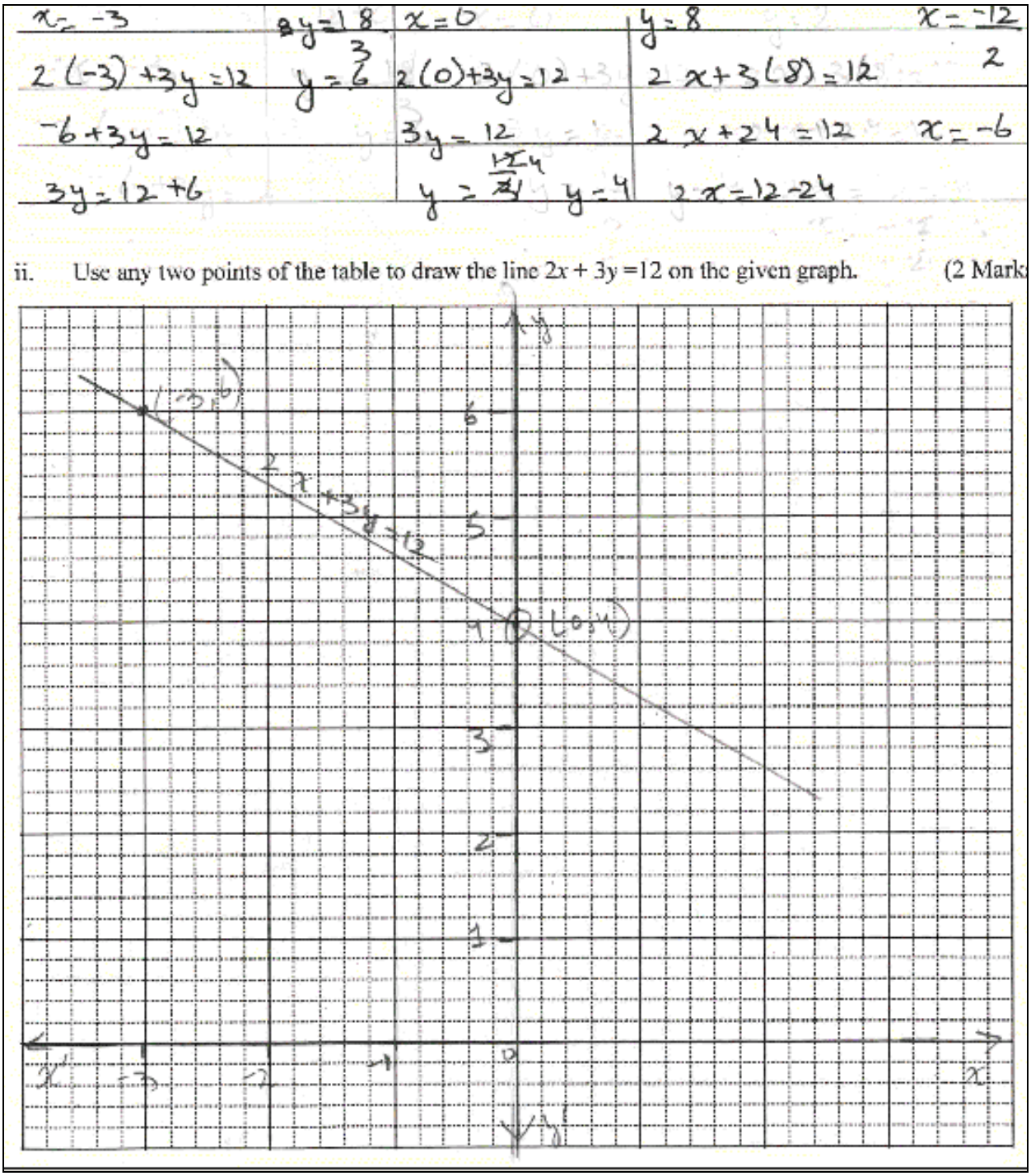
X	-3	0	?
Y	?	?	8

ii. Use any two points of the table to draw the line $2x + 3y = 12$ on the given graph.



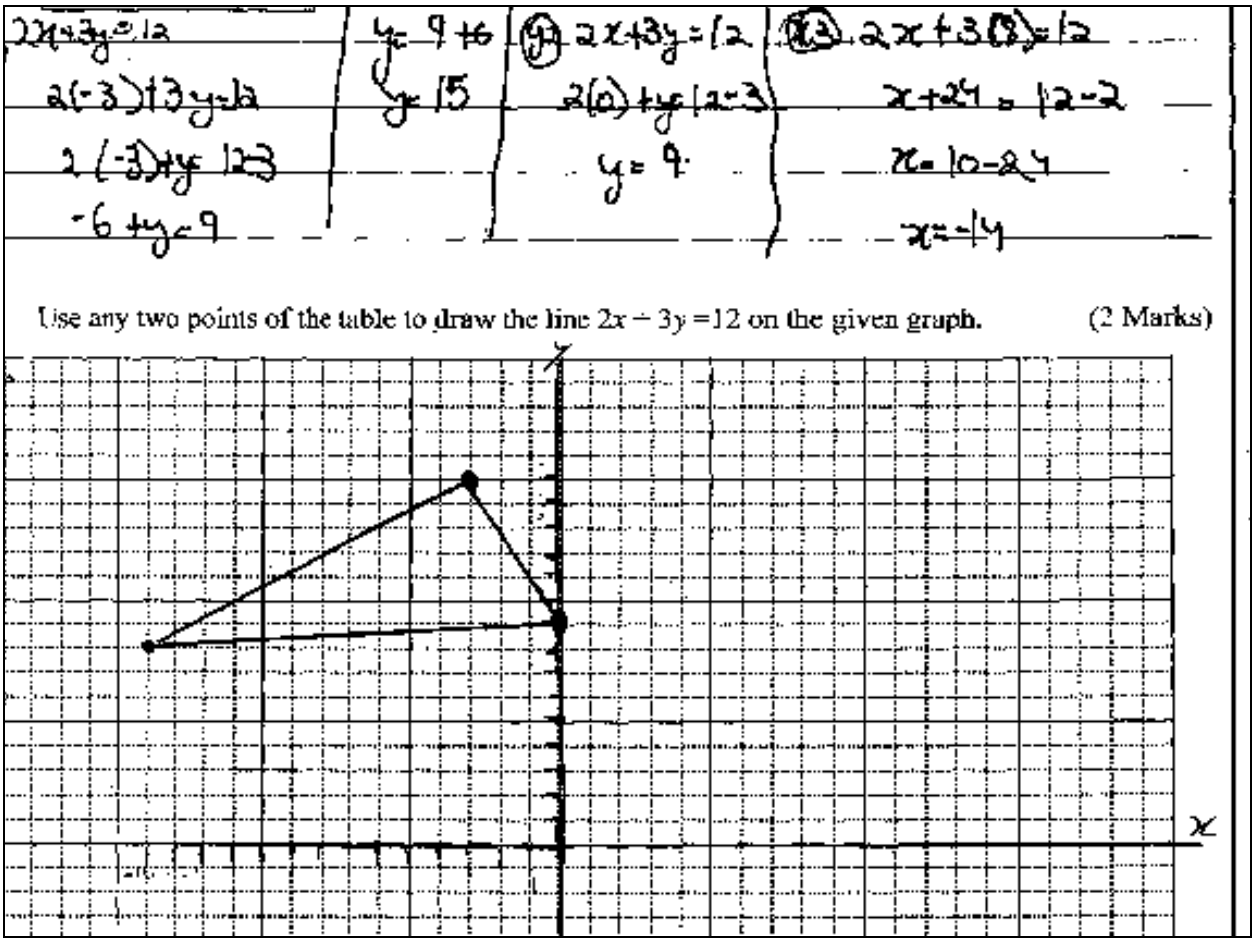
Better responses exhibited that candidates comprehended the question well. They correctly found the missing value for the given linear equation and took a proper scale to plot the liner equation on the given graph paper.

Example:

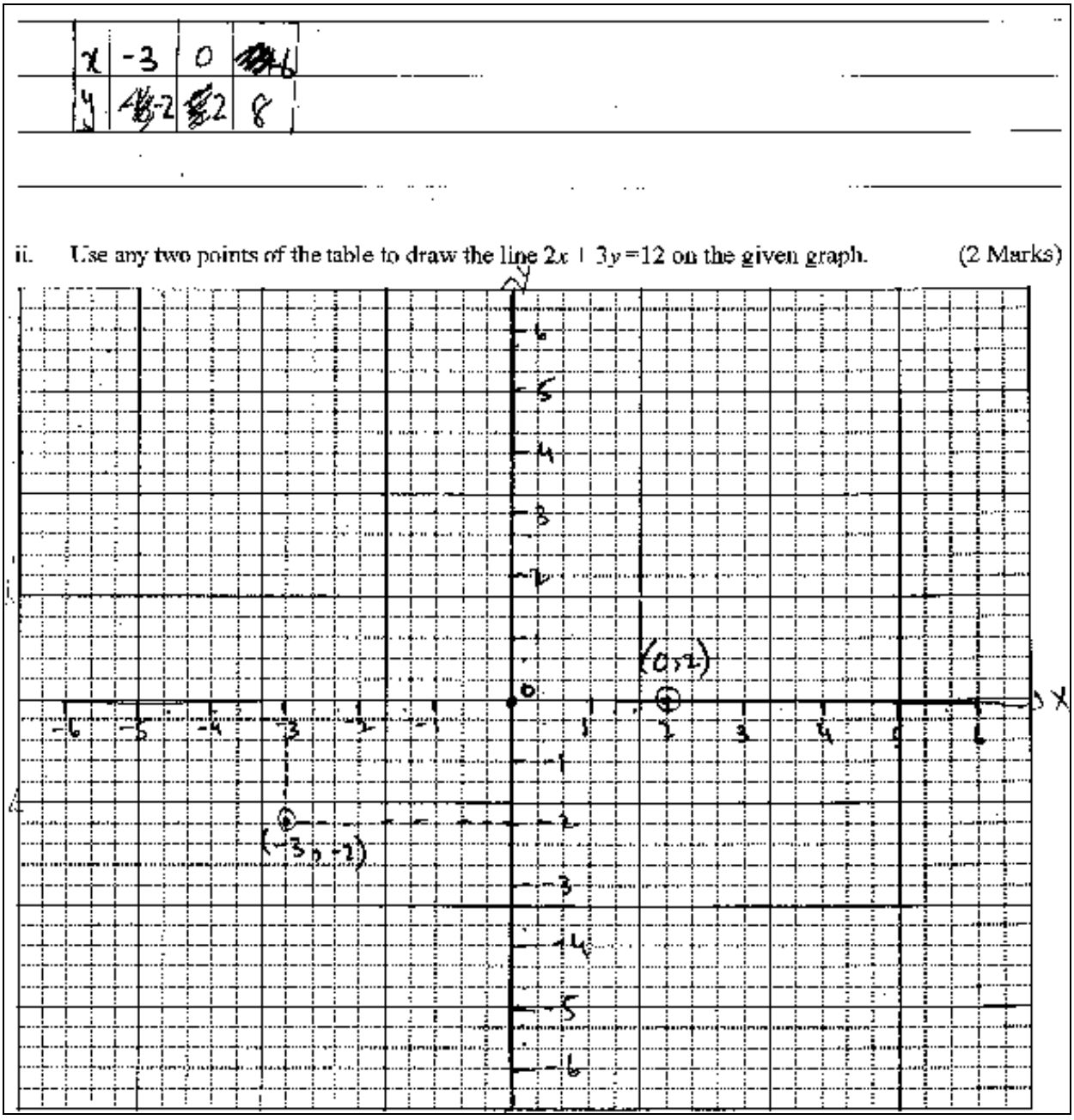


Weaker responses indicated that candidates failed to find the missing values of *x* and *y* or found wrong values due to poor exhibition of arithmetic operation and consequently failed to graph the given linear equation. In some weaker responses it is noted that candidates failed to take proper scale on x-axis and y-axis and failed to draw the graph of the equation. The weaker responses also made mistakes in calculations as evident in the following examples.

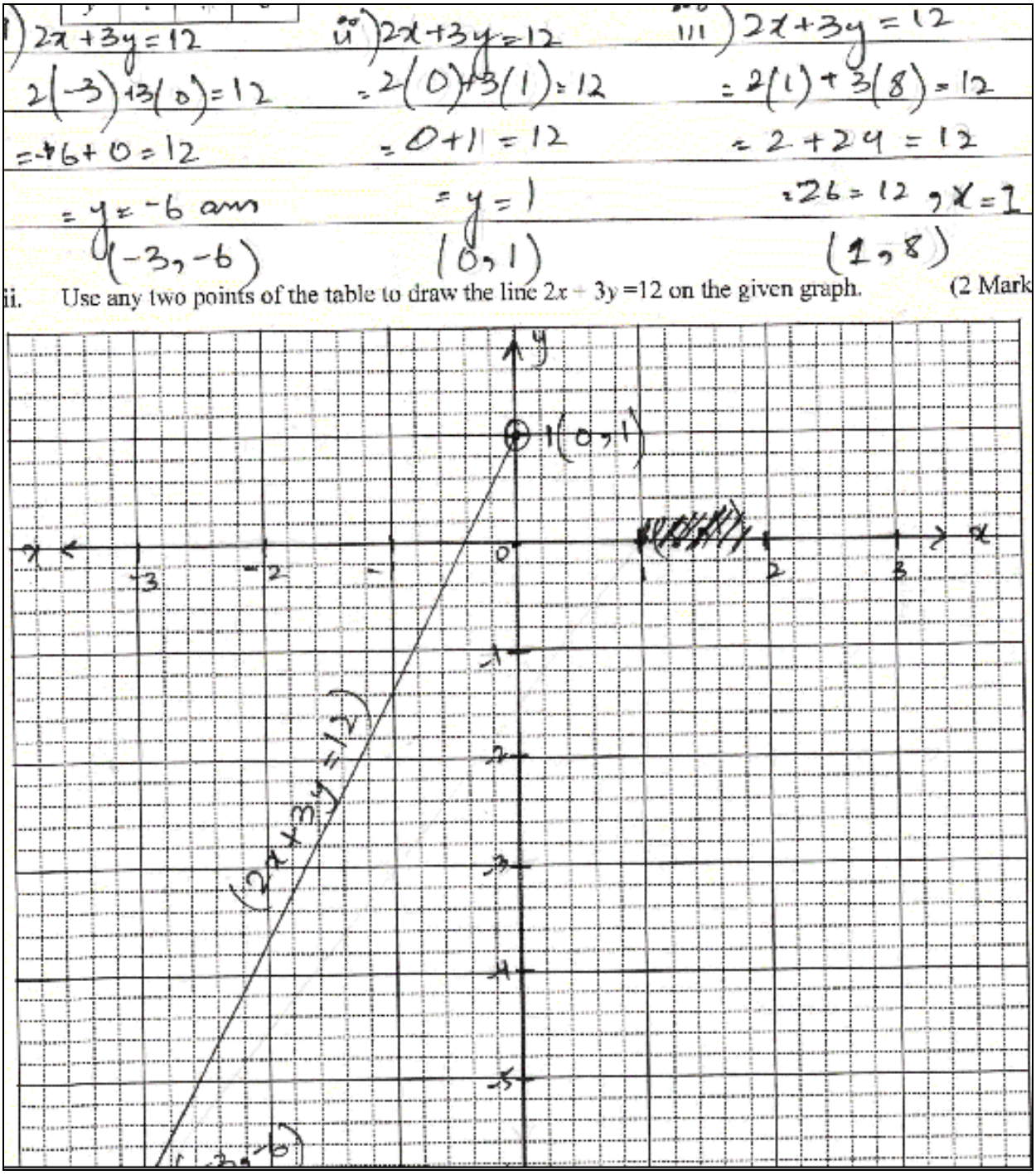
Example 1:



Example 2:


x | -3 | 0 | 4
y | 4 | 2 | 8
ii. Use any two points of the table to draw the line 2x + 3y = 12 on the given graph. (2 Marks)
(0,4)
(-3, 2)
X
Y

Example 3:


i) 2x+3y=12
2(-3)+3(0)=12
=-6+0=12
=y=-6 ans
(-3,-6)
ii) 2x+3y=12
=2(0)+3(1)=12
=0+1=12
=y=1
(0,1)
iii) 2x+3y=12
=2(1)+3(8)=12
=2+24=12
=26=12, x=1
(1,8)
ii. Use any two points of the table to draw the line 2x − 3y =12 on the given graph. (2 Mark
y
x
(0,1)
-3
-2
-1
0
1
2
3
-1
-2
-3
-4
-5

Question 10a:

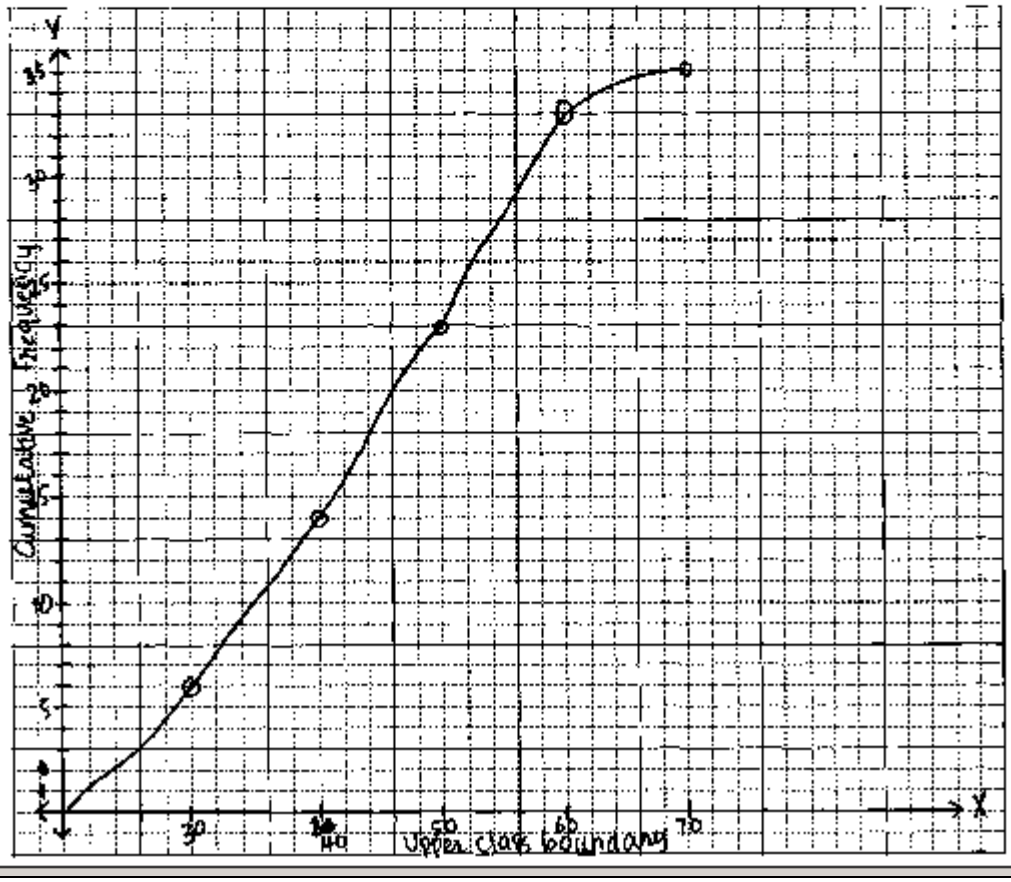
The given data shows the ages (in years) of 35 people working in a department. Complete the table to construct a cumulative frequency curve on the given graph.

Age (year)	Number of People	Cumulative Frequency
20 – 30	6	
30 – 40	8	
40 – 50	9	
50 – 60	10	
60 – 70	2	

Better responses indicated that candidates comprehended the given grouped data very well and systematically found the cumulative frequency, took proper scale on *x*-axis and *y*-axis and were able to draw the cumulative frequency curve skillfully.

Example 1:

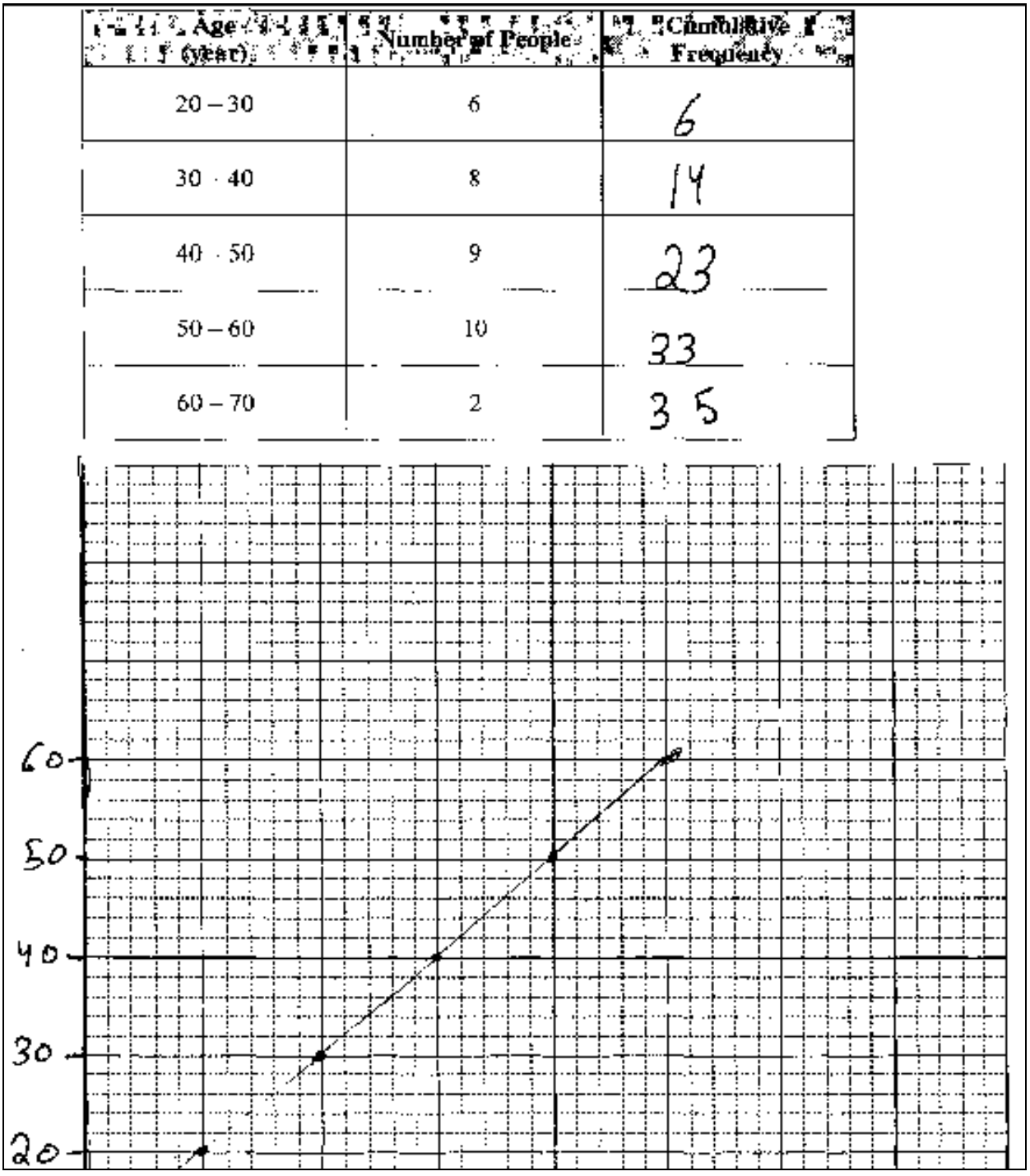
20 – 30	6	6
30 – 40	8	14
40 50	9	23
50 60	10	33
60 – 70	2	35



Weaker responses showed that candidates were unable to comprehend the given question and made different types of mistakes. These mistakes were evident in finding cumulative frequency, selection of scale along *x*-axis and *y*-axis, proper plotting of points and therefore about cumulative frequency curve itself.

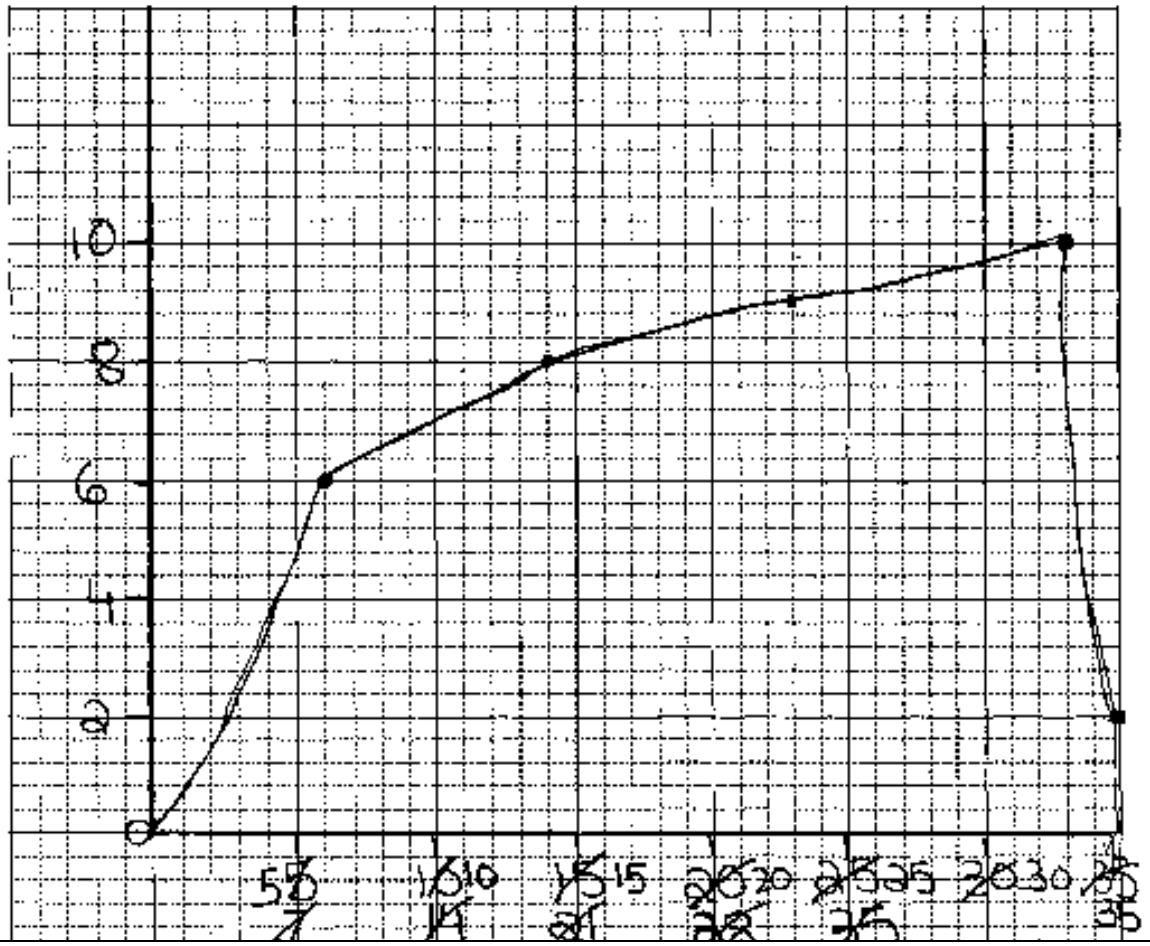
Example 1:

Age (year)	Number of People	Cumulative Frequency
20 – 30	6	6
30 – 40	8	14
40 – 50	9	23
50 – 60	10	33
60 – 70	2	35



Example 2:

20 – 30	6	6
30 – 40	8	14
40 – 50	9	23
50 – 60	10	33
60 – 70	2	35



Question 10 b:

Saima recorded the time taken (in seconds) by 22 people to cover the same distance in a race. The collected data is given in the table.

Time (s)	Frequency	Class Boundary
51 – 55	2	
56 – 60	8	
61 – 65	9	
66 – 70	3	

Find the mode of this data.

This question was based on the mode of grouped data.

Better responses showed that candidates were clear about the process of finding mode of grouped data. They wrote the correct formula and exhibited that they knew the meaning of the each symbols used in formula and therefore identified each element in the formula correctly to find mode.

Example 1:

51 – 55	2	50·5 — 55·5
56 – 60	8	55·5 — 60·5
61 – 65	9	60·5 — 65·5
66 – 70	3	65·5 — 70·5

Find the mode of this data.

Mode

$$L + \frac{h(f_m - f_1)}{(f_m - f_1) + (f_m - f_2)}$$

$$60.5 + \frac{5(9-8)}{(9-8)+(9-3)}$$

$$60.5 + \frac{5(1)}{(1)+(6)}$$

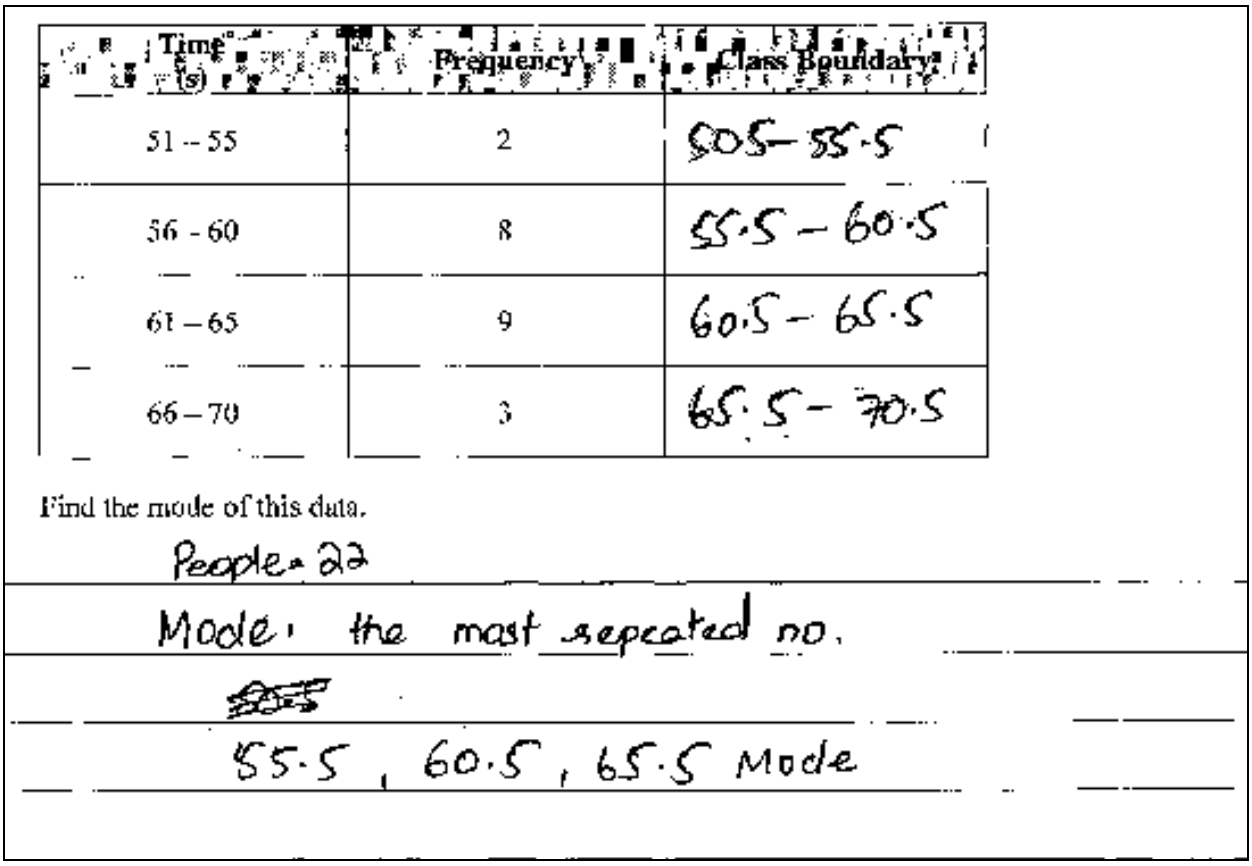
$$60.5 + \frac{5}{7}$$

$$60.5 + 0.71$$

$$61.21$$

Weaker responses indicated that the candidates failed to comprehend the concepts of mode for the grouped data and therefore, were unable to find the mode of the given data. They failed to write correct formula or wrongly identified the elements of the formula. The weaker responses also reported that candidates made arithmetical mistakes in calculation. The examples cited below exhibiting few misconceptions in weaker responses.

Example 1:



Time (s)	Frequency	Class Boundary
51 – 55	2	50.5 – 55.5
56 - 60	8	55.5 – 60.5
61 – 65	9	60.5 – 65.5
66 – 70	3	65.5 – 70.5

Find the mode of this data.

People = 22

Mode: the most repeated no.

55.5 , 60.5 , 65.5 Mode

Example 2:

Time (s)	Frequency	Class Boundary
51 – 55	2	0·5 —— 55·5
56 – 60	8	55·5 —— 60·5
61 – 65	9	60·5 —— 65·5
66 – 70	3	65·5 —— 70·5

Find the mode of this data.

$$\text{mode} = \frac{fm - f1}{(fm - f1) + (fm - f2)}$$

$$= \frac{a - 8}{(a - 8) + (a - 3)}$$

$$= \frac{1}{1 + 6}$$

$$= \frac{1}{7}$$

Example 3:

Time (s)	Frequency	Class Boundary
51 – 55	2	50.5 – 55.5
56 – 60	8	55.5 – 60.5
61 65	9	60.5 – 65.5
66 – 70	3	65.5 – 70.5

Total : 22

Find the mode of this data.

$$\hat{x} = l + \frac{(f_m - f_1)}{(f_m - f_1)(f_m - f_2)} \times h$$

Values : $l = 50.5$, $h = 5$, $f_m = 22$, $f_1 = 0$, $f_2 = 8$

$$= 50.5 + \frac{(22)}{(22-0)(22-8)} \times 5$$

$$= \frac{252.5\ (22)}{(22)\ (14)}$$

$$= \frac{5555}{388}$$

mode $= \hat{x} = 14.3$