



GOVERNMENT OF SAMOA

STUDENT EDUCATION NUMBER									

Samoa Secondary Leaving Certificate

MATHEMATICS

2023

QUESTION and ANSWER BOOKLET

Time allowed: 3 Hours & 10 minutes

INSTRUCTIONS

1. You have 10 minutes to read **before** you start the exam.
2. Write your **Student Education Number (SEN)** in the space provided on the top right-hand corner of this page.
3. **Answer ALL QUESTIONS.** Write your answers in the spaces provided in this booklet.
4. If you need more paper to write your answers, ask the Supervisor for extra paper. Write your SEN on all extra sheets used and clearly number the questions. Attach the extra sheets to the appropriate places in this booklet.

STRANDS		Pages	Time (min)	Weighting
STRAND 1	ALGEBRA	2 – 4	32	18
STRAND 2	COORDINATE GEOMETRY	5 – 7	25	14
STRAND 3	GRAPHS & FUNCTIONS	8 – 10	25	14
STRAND 4	SEQUENCES & SERIES	11	12	6
STRAND 6	PROBABILITY	12 – 14	25	14
STRAND 7	CALCULUS	15 – 18	36	20
STRAND 8	TRIGONOMETRY	19 – 21	25	14
TOTAL			180	100

Check that this booklet contains pages 2 - 23 in the correct order and that none of these pages are blank.

HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

For Questions 1 and 2, choose and write the LETTER of the correct answer in the box provided.

1. Which of the following is an example of a **linear inequation**?

A. $3 - 8x = 15$

B. $7x \leq 3x + 4$

C. $y = x - 2$

D. $y = (x + 2)^3$

SL 1

2. The formula $V = \pi r^2 h$ relates the radius r and the height h of a cylinder with the cylinder's volume V . Which of the following is the subject of this formula?

A. V

B. π

C. r

D. h

SL 1

3. Solve for x in $10(x + 7) \leq 15(x - 3)$

SL 3

4. Briefly describe the main difference between **linear equation** and a **linear inequation**.

SL 2

5. The amount A in dollars in a bank account at the end of any month, m , can be found using the equation $A = 150m + 400$

How many months would it take to have a balance of \$1750 in the bank account?

SL 2

6. Expand and simplify the quadratic expression $(3x + \sqrt{2})(4x - \sqrt{2})$

SL 2

7. Solve the quadratic equation $(x - 6)^2 + 5(x - 6) + 6 = 0$ using the substitution method.

SL 3

8. If P dollars is invested into an account that earns interest at a rate of r for t years and the interest is compounded continuously, then $A = Pe^{rt}$, where A is the accumulated dollars.

A deposit of \$6000 is invested at the ANZ bank, and \$9000 is invested at the Samoa Commercial Bank at the same time. ANZ offers compound interest continuously at a nominal rate of 6% per annum, whereas the Samoa Commercial Bank offers compound interest continuously at a nominal rate of 5% per annum.

In how many years (t), correct to 1 decimal place, will the two investments be the same?

Hint: *Equate the two banks' investment equations and solve for t .*

SL 4

For Question 9, choose and write the LETTER of the correct answer in the box provided.

9. Which of the below is an equation of a straight line?

A. $y = 3x - 3$

B. $x = y^2 - 3$

C. $y = x^3 - 3$

D. $x = \frac{1}{y} - 3$

SL 1

For a line AB, the coordinates of A and B are (2, -1) and (3, 6) respectively.

10. Calculate the distance between points A and B.

SL 2

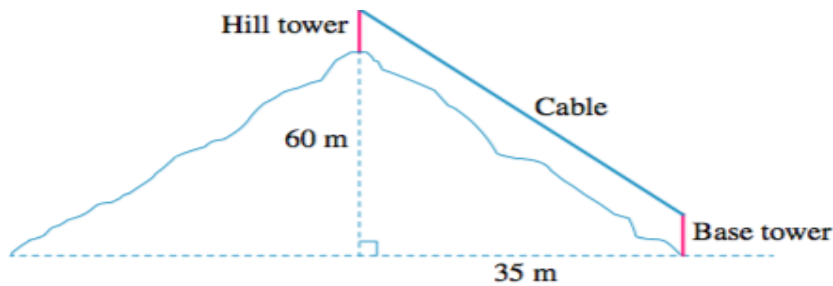
11. Calculate the midpoint of the line AB.

SL 2

12. Two lines are given as $x - 3y = 2$ and $4x + y = 21$. Show that these two lines meet at only ONE point.

SL 3

13. A cable joins the top of two vertical towers that are 12 metres high. One of the towers is at the bottom of a hill and the other is at the top. The horizontal distance between the towers is 35 metres and the vertical height of the base of the upper tower is 60 metres above ground level.



What is the minimum length of cable required to join the top of the towers? Give your answer correct to 2 decimal places.

SL 3

14. Circular ripples are formed when a water drop hits the surface of a pond. If one ripple is represented by the equation $x^2 + y^2 = 4$ and then 3 seconds later by $x^2 + y^2 = 190$, where the length of measurements are in centimetres:

Calculate the **difference** in radius after 3 seconds, as the ripple moves outwards from one circle form to another.
(correct to 1 decimal place).



SL 3

For Questions 15 and 16, choose and write the LETTER of the correct answer in the box provided.

15. For the function $y = x^3 - 1$, its correct table of values is given by

A.

x	-2	-1	0	1	2
y	-5	-4	-3	-2	0

B.

x	-2	-1	0	1	2
y	-8	-6	-4	0	1

C.

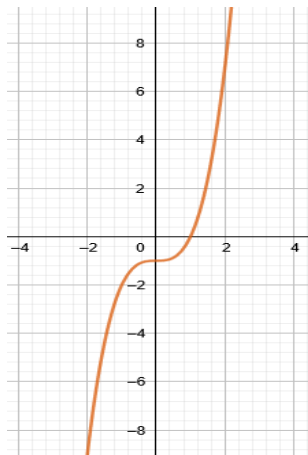
x	-2	-1	0	1	2
y	-9	-2	-1	0	7

D.

x	-2	-1	0	1	2
y	9	2	1	0	-7

SL 1

16. The graph for the function $y = x^3 - 1$ is shown below.



The coordinates of the point of inflection for this function is:

A. (-1, -2)

B. (0, -1)

C. (2, 0)

D. (0, -2)

SL 1


Refer to the function $y = 5x - 4x^2 - x^3$ to answer Questions 17 to 19.

17. Plot the graph of the given function showing clearly all the coordinates of the x and y intercepts



SL 4

18. The given function has **TWO** turning points. Give the coordinates of the two turning points.




SL 2

19. Briefly describe the limit of the given function, as x approaches 0. That is, the limits from both above and below 0.



SL 2

20. Find the y -intercept and x -intercepts of the function $y = 9 - (2x + 1)^2$.



SL 4

For Questions 21 to 23, consider the arithmetic sequence $t_n = 7 + 2(n - 1)$.

21. Determine the first term and the common difference for the arithmetic sequence.

--

SL 1

22. What would be the 15th term of the arithmetic sequence?

--

SL 2

23. Calculate the **sum** of the first 15 terms of the arithmetic sequence.

--

SL 3

For Questions 24 and 25, choose and write the LETTER of the correct answer in the box provided.

24. Equally likely events are:

- A. events that are likely to happen.
- B. events that are unlikely to have the same theoretical probability.
- C. events that have the same theoretical probability of occurring.
- D. events to calculate the mean and standard deviation.

SL 1

25. In the Probability formula, $P(E) = \frac{n(E)}{n(S)}$, what does the letter **S** stand for?

- A. Simple events.
- B. Sample Space.
- C. Single event.
- D. Statistics.

SL 1

For Questions 26 and 27, refer to the details below.

The blood pressure of all students in a school where Sose is a nurse, is approximately normally distributed, with mean 113 mm Hg, and standard deviation 10.3 mm Hg.

26. There are 719 students at Sose's school. How many students would be expected to have blood pressure less than 115 mm Hg?

--

SL 3

27. What percentage of the students, chosen at random from Sose's school, would be expected to have blood pressure between 113 mm Hg and 120 mm Hg?

--

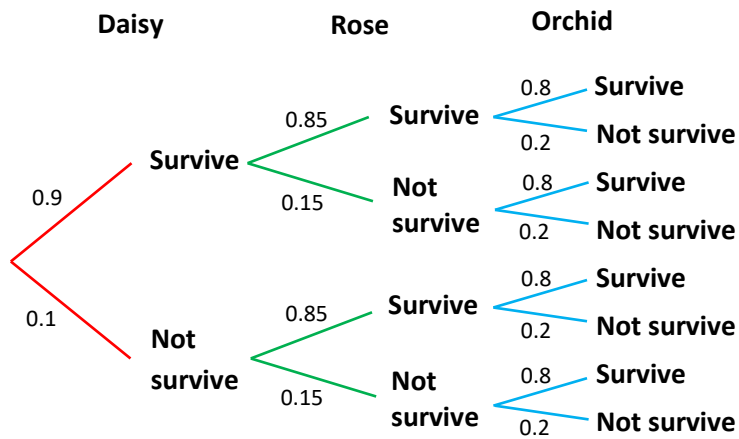
SL 3

28. Christos estimates his chances of passing Maths, Science and English as 0.75, 0.6 and 0.5 respectively. Assuming the events are independent, calculate the probability that Christos passes all three subjects.

--

SL 2

29. Three types of seedling (daisy, rose and orchid) have probabilities of surviving any one week as 0.9, 0.85 and 0.8 respectively. This information is represented by the tree diagram below.

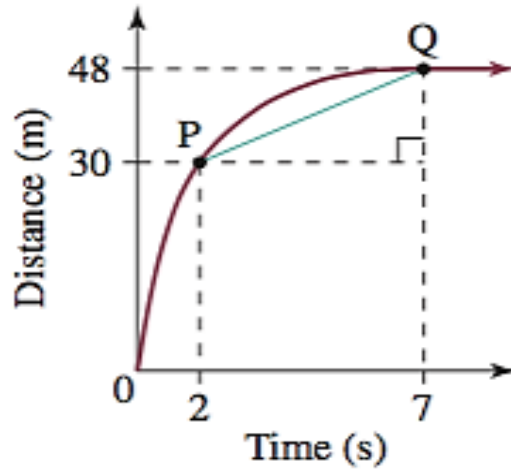


Assuming the seedlings' chance of survival are independent, calculate the probability that more than one seedling will survive to the end of the first week.

SL 4

For Question 30, choose and write the LETTER of the correct answer in the box provided.

30. The average rate of change between points P and Q on the graph below is:



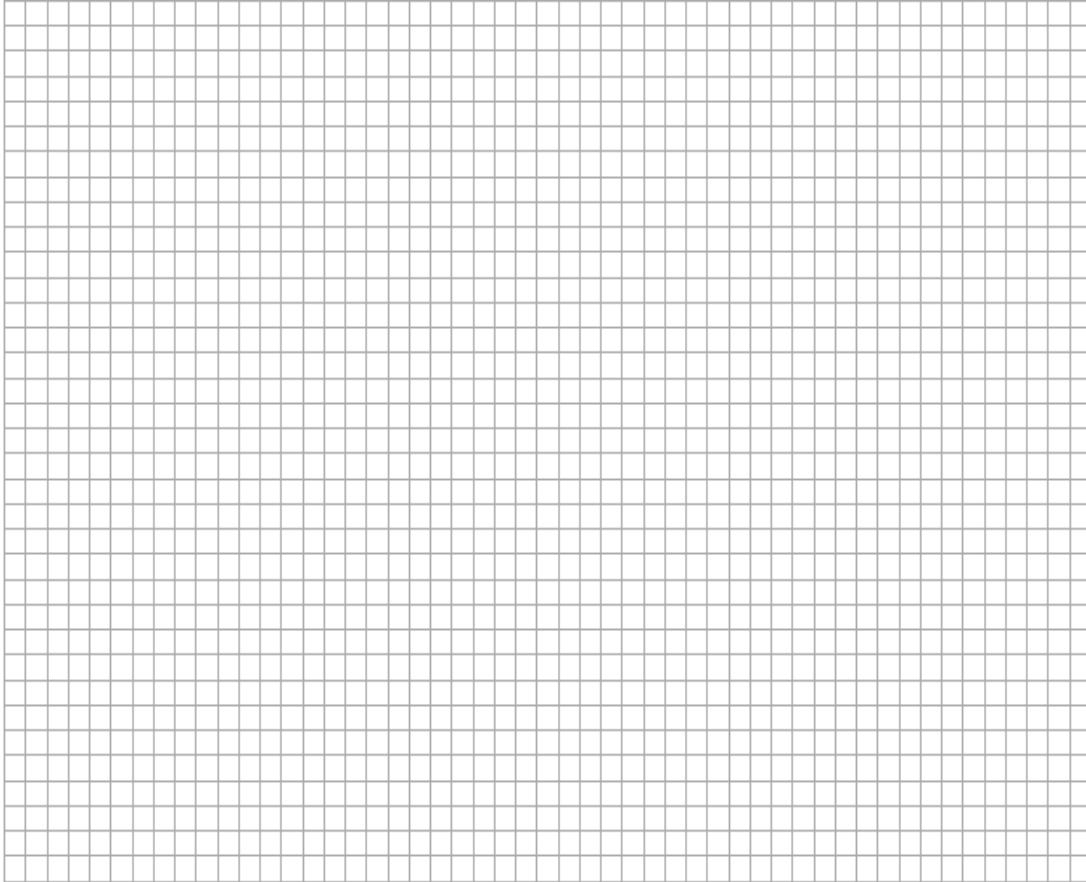
- A. 18.0 m/s
- B. 5.2 m/s
- C. 1.8 m/s
- D. 3.6 m/s

SL 1

31. Determine the coordinates of a stationary point for $f(x) = x^2 - 2x - 3$

SL 2

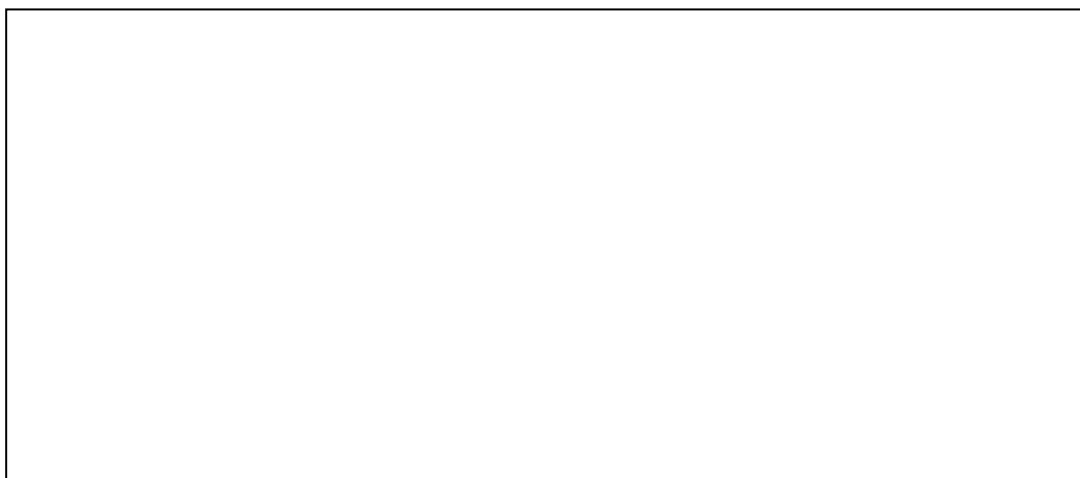
32. Draw the graph for $f(x) = x^2 - 2x - 3$, labeling its x and y intercepts and its stationary point.



SL 3

33. The cost of producing a particular toaster is $\$(250 + 1.2n^2)$, where n is the number of toasters produced each day. The toasters are then sold for $\$60$ each.

Find the maximum daily profit P possible.



SL 4

34. Use the first principle formula to find the derivative for $f(x) = x^2 + 1$

$$\text{First Principle formula : } f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

SL 3

35. Complete the following statement.

The anti-derivative of the function ax^n is given by _____

SL 1

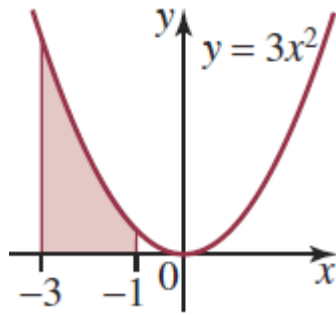
36. Identify the limits of integration in $\int_1^3 1 - 2x$

SL 1

37. Evaluate the definite integral for $\int_1^3 1 - 2x$

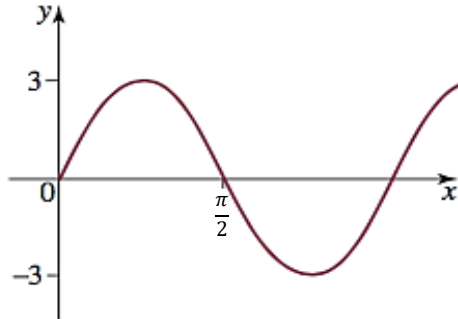
SL 2

38. Calculate the area of the shaded region in the graph shown below, bounded by the graph of $y = 3x^2$, x -axis and the lines $x = -1$ and $x = -3$.



SL 3

Refer to the graph below to answer Questions 39 and 40.



39. The given graph has an amplitude of 0.

Circle True or False.

True

False

SL 1

For Question 40, choose and write the LETTER of the correct answer in the box provided.

40. The equation for the graph could be:

- A. $y = 3 \cos(x)$
- B. $y = 3 \cos(2x)$
- C. $y = 3 \sin(2x)$
- D. $y = 3 \sin(x)$

SL 1

41. State **ONE** of the common trigonometric identities.

SL 1

42. Simplify $\tan \theta \cos \theta$ using a known trigonometric identity.

--

SL 2

43. If $\sin \theta = 0.4$ and $0^\circ < \theta < 90^\circ$, use $\sin^2 \theta + \cos^2 \theta = 1$ to find $\cos \theta$. (Correct to 2 decimal places).

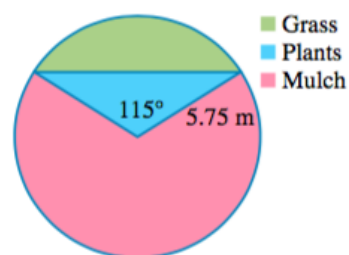
--

SL 2

44. A circular garden bed is to be landscaped with grass, plants and mulch. The circular garden is designed with the shown dimensions as below.

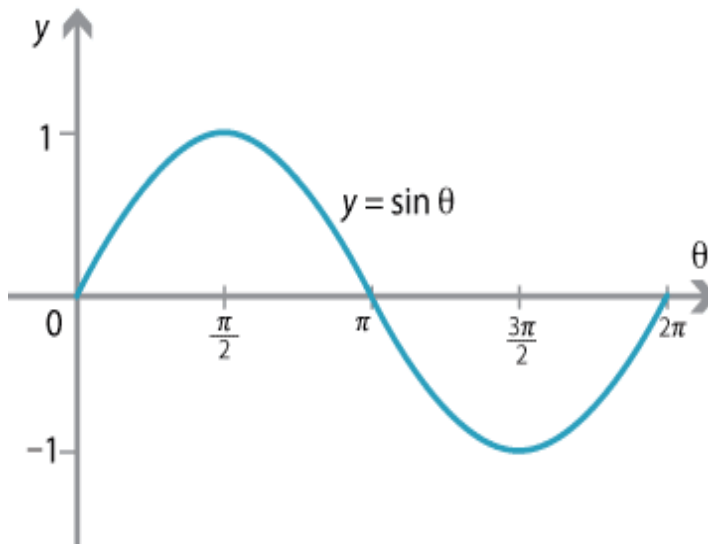
Calculate the **grassed area** only, correct to 2 decimal places.

--

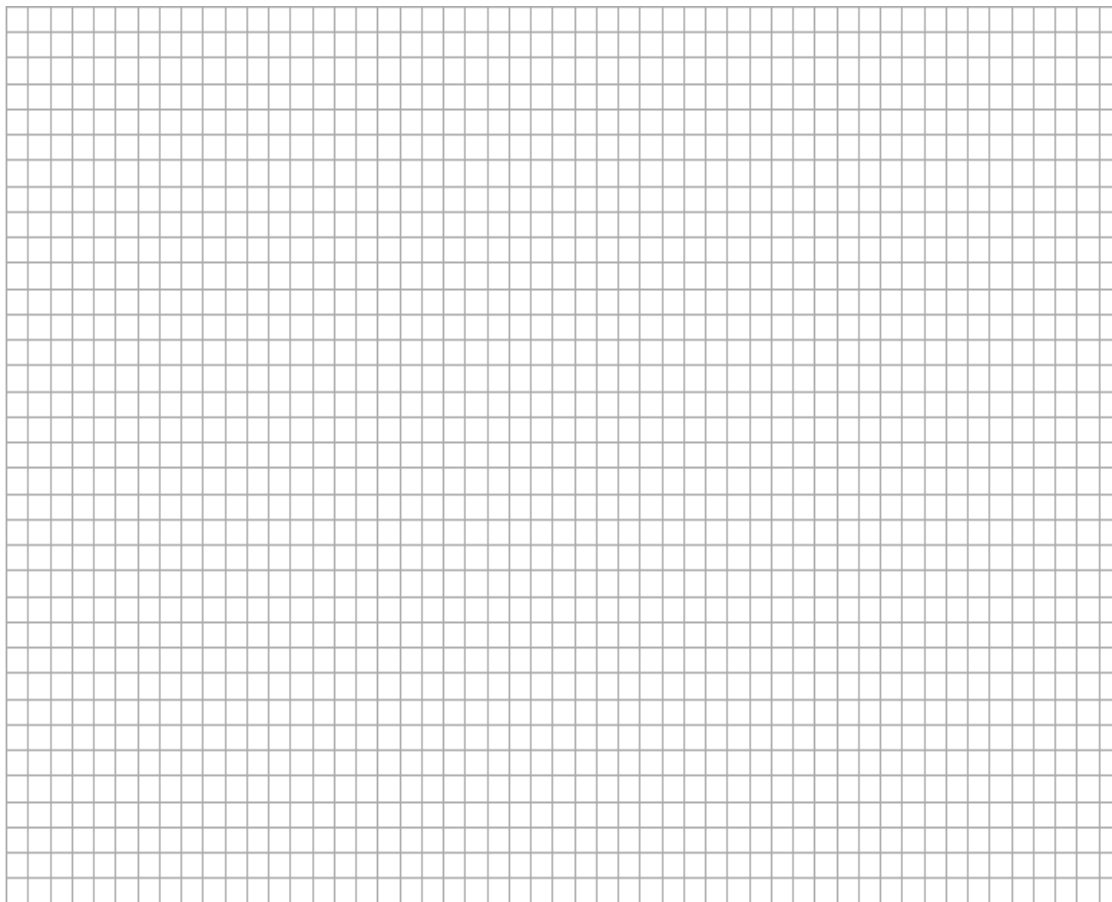


SL 3

45. Shown below is a graph of $y = \sin x$



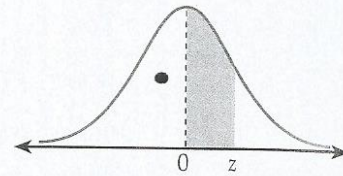
Draw and label the graph for $y = 2 \sin(3x)$, $x \in [0, 2\pi]$ showing how the graph shifts from $y = \sin x$ to $y = 2 \sin(3x)$



SL 4

Normal distribution

Each entry gives the probability that the standardised normal random variable, Z , lies between 0 and z , shaded in the diagram.



Differences

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	1	2	3	4	5	6	7	8	9
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359	4	8	12	16	20	24	28	32	36
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0754	4	8	12	16	20	24	28	32	36
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141	4	8	12	15	19	22	27	31	35
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517	4	8	11	15	19	22	26	30	34
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879	4	7	11	14	18	22	25	29	32
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224	3	7	10	14	17	21	24	27	31
0.6	.2258	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549	3	6	10	13	16	19	23	26	29
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852	3	6	9	12	15	18	21	24	27
0.8	.2881	.2910	.2939	.2967	.2996	.3023	.3051	.3078	.3106	.3133	3	6	8	11	14	17	19	22	25
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389	3	5	8	10	13	15	18	20	23
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621	2	5	7	9	12	14	16	18	21
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830	2	4	6	8	10	12	14	16	19
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015	2	4	5	7	9	11	13	15	16
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177	2	3	5	6	8	10	11	13	14
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319	1	3	4	6	7	8	10	11	13
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441	1	2	4	5	6	7	8	10	11
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545	1	2	3	4	5	6	7	8	9
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633	1	2	3	3	4	5	6	7	8
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706	1	1	2	3	4	4	5	6	6
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767	1	1	2	2	3	4	4	5	5
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817	0	1	1	2	2	3	3	4	4
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857	0	1	1	2	2	2	3	3	4
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890	0	1	1	1	2	2	2	3	3
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916	0	0	1	1	1	2	2	2	2
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936	0	0	1	1	1	1	1	2	2
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952	0	0	0	1	1	1	1	1	1
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964	0	0	0	0	1	1	1	1	1
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974	0	0	0	0	0	1	1	1	1
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981	0	0	0	0	0	0	0	0	1
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986	0	0	0	0	0	0	0	0	1
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990	0	0	0	0	0	0	0	0	0
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993	0	0	0	0	0	0	0	0	0
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995	0	0	0	0	0	0	0	0	0
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997	0	0	0	0	0	0	0	0	0
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998	.4998	0	0	0	0	0	0	0	0	0
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	0	0	0	0	0	0	0	0	0
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	0	0	0	0	0	0	0	0	0
3.7	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	0	0	0	0	0	0	0	0	0
3.8	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.5000	.5000	0	0	0	0	0	0	0	0	0
3.9	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	0	0	0	0	0	0	0	0	0

STUDENT EDUCATION NUMBER									

SSLC MATHEMATICS

2023

(For Scorers only)

STRANDS		Weighting	Scores	Check Scorer	AED Check
STRAND 1	ALGEBRA	18			
STRAND 2	COORDINATE GEOMETRY	14			
STRAND 3	GRAPHS & FUNCTIONS	14			
STRAND 4	SEQUENCES & SERIES	6			
STRAND 6	PROBABILITY	14			
STRAND 7	CALCULUS	20			
STRAND 8	TRIGONOMETRY	14			
TOTAL MARKS		100			