Samoa National Junior Secondary 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	NUMBERS & OPERATION	2	12	7
STRAND 2	ALGEBRA	3-6	40	22
STRAND 3	STATISTICS & PROBABILITY	7-9	25	14
STRAND 4	MEASUREMENTS	10-13	32	17
STRAND 5	GEOMETRY	14-16	25	14
STRAND 6	TRIGNOMETRY	17-18	12	7
STRAND 7	RATES OF CHANGE	19-21	34	19
TOTAL			**180**	**100**

Check that this booklet contains pages 2-22 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 Question 1, choose and write the LETTER of the correct answer in the box provided.

1. The final answer for the following multiplication is rounded to how many significant figures?

$$\sqrt{3} \times 1.025 = 1.775$$

SL 1

A.	3		C.	4
B.	5		D.	1

2. State the difference between ratio and proportion.

SL 2

3. Prove the expression below using the laws of indices.

$$\left(\frac{2^2}{3^2}\right)^{-1} \times \left(\frac{8}{27}\right)^{\frac{1}{3}} = \frac{3}{2}$$
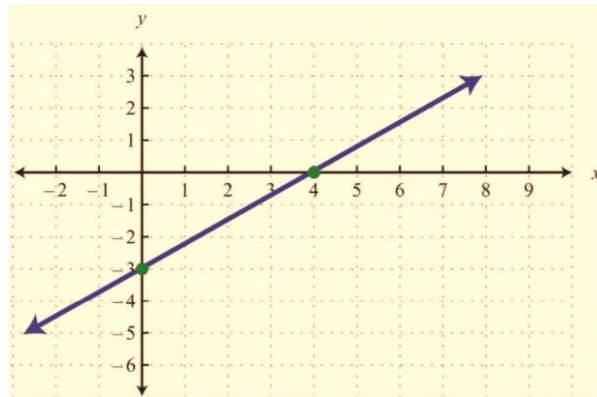
SL 4

4. The fraction $\frac{1}{5}$ is the same as 5^{-1} in index form. **TRUE or FALSE?** Circle the correct answer.

SL 1

TRUE or **FALSE**

For Question 5, choose and write the LETTER of the correct answer in the box provided.

Use the graph below to answer Question 5.

5. What are the coordinates of the x-intercept and y-intercept of the graph above?

A. $(-4, 0)$ & $(0, 3)$ C. $(-4, 0)$ & $(0, -3)$

B. $(4, 0)$ & $(0, -3)$ D. $(4, 0)$ & $(0, 3)$

SL 1

6. Write the following in index form:

$$\sqrt{x}$$ $$\sqrt[3]{a}$$

SL 2

7.   Rearrange the equation below in gradient-intercept form $(y = mx + c)$.

$$6x + 3y - 9 = 0$$

SL 2

8.   Solve for the value of x. Give your answer in simplest fraction form.
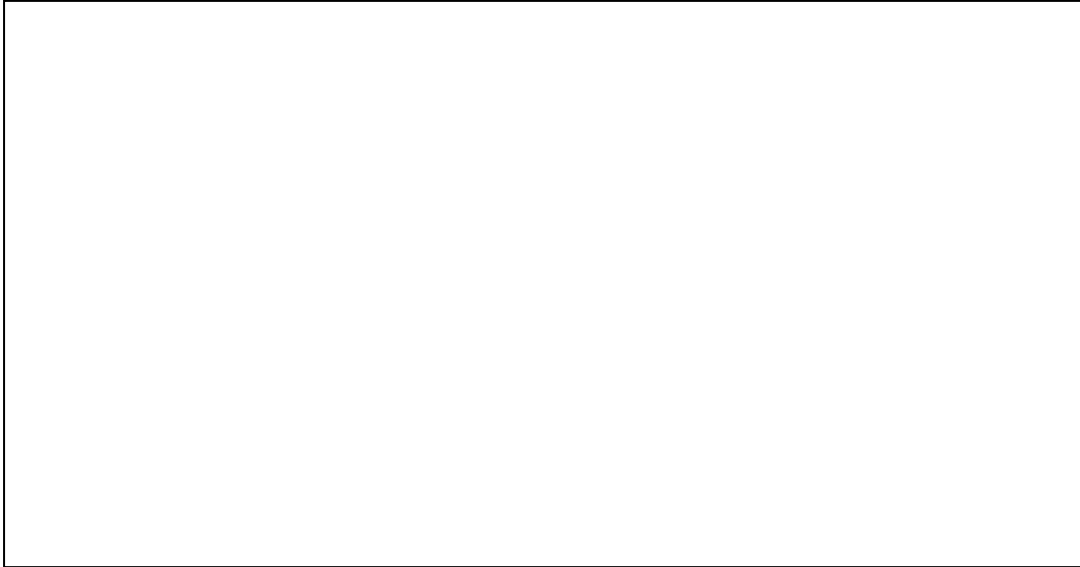
$$\frac{2x + 3}{1 - x} = 8$$

SL 2

9.   Provide three reasons why the algebraic factorization below is incorrect.

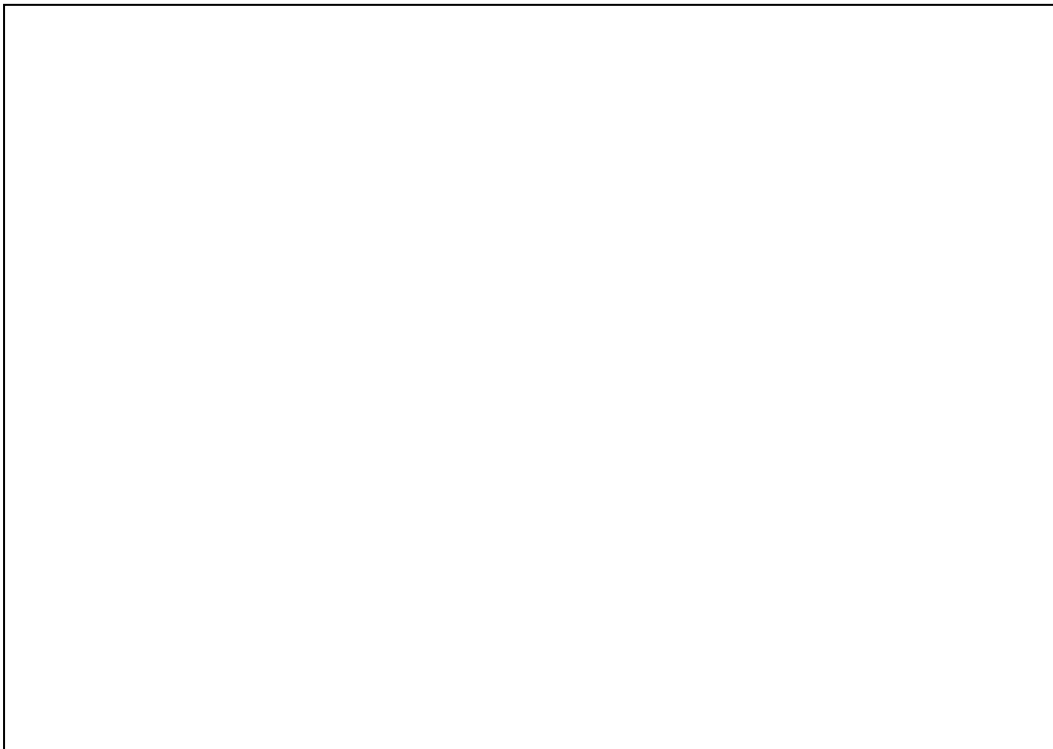$$10xy - 20x^2y = 10y(x + 2x)$$

SL 3

10. Find the point of intersection of the two linear equations below using the elimination or substitution method:

$$y = 3 - 2x$$
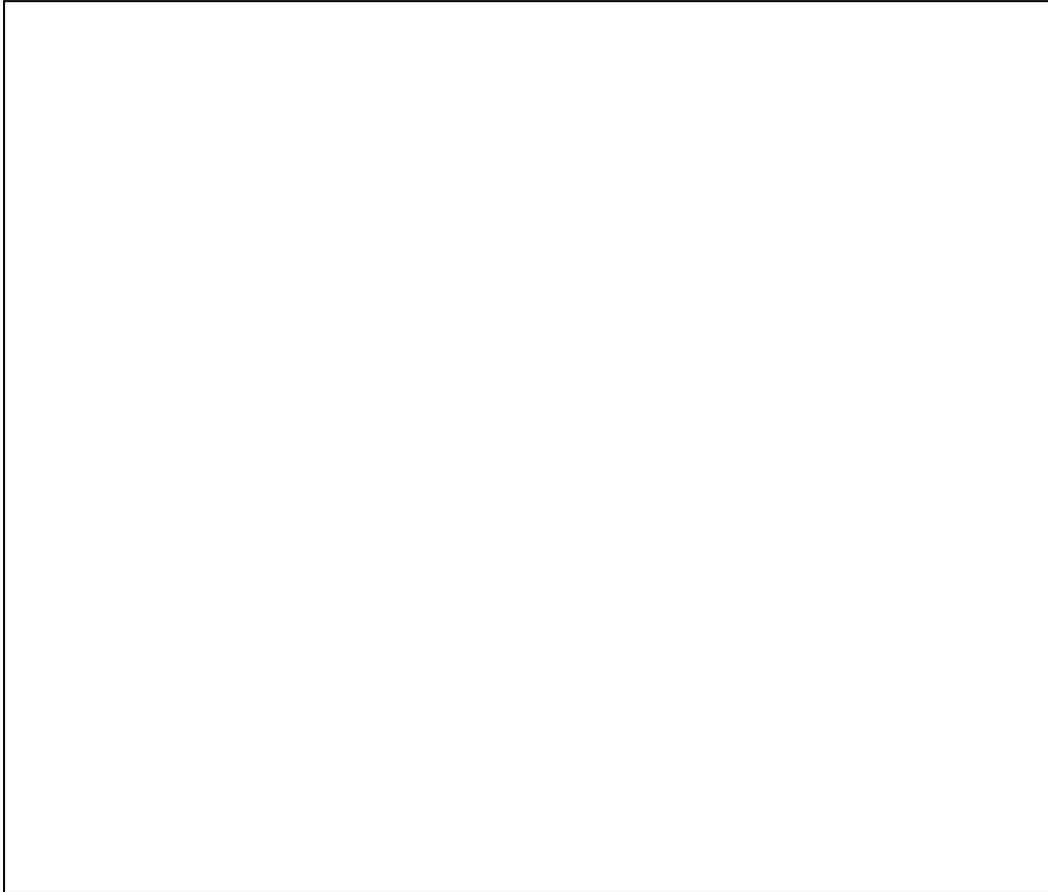$$y = 2x + 1$$

SL 3

11. The sum of two numbers is 14 and their difference is 2. Find the two numbers.

SL 4

12. If twice the age of the son is added to the age of his father, the sum is 56. But if twice the age of the father is added to the age of his son, the sum is 82. Find the ages of the father and son.

SL 4

13.   **Number of siblings** is a type of continuous data. **TRUE or FALSE?** Circle the correct answer.

SL 1

<center>**TRUE**   or   **FALSE**</center>

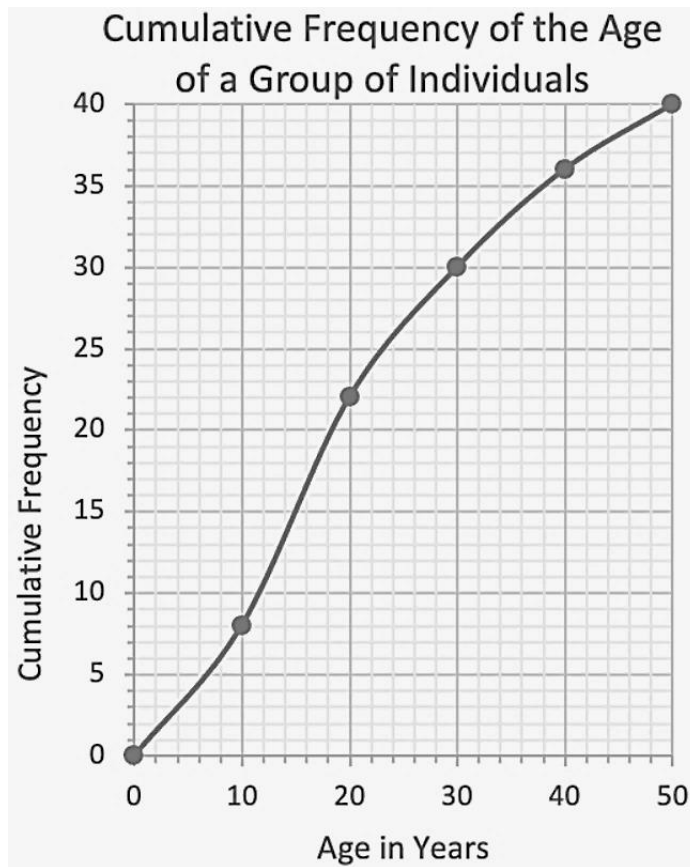**For Questions 14 and 15, choose and write the LETTER of the correct answer in the box provided.**

Use the information below to answer Question 14.

The graph below is a cumulative frequency polygon of the age of a group of 40 individuals.

14.   Using the graph above what is the median of the data?

A. 18	C. 21
B. 20	D. 19

	SL 1

Use the information below to answer Questions 15 and 16.

The height of some plants grown in a laboratory was recorded after 4 weeks. The results are listed in the following frequency table.

Height (cm)	Frequency	Cumulative frequency
0-6	3	3
7-13	7	10
14-20	19	29
21-27	20	49
28-34	11	60
35-41	2	62

15.   What is the **modal class** of the data above?

A. 0-6   C. 28-34

B. 21-27   D. 35-41

SL 1

16.   Draw a cumulative frequency polygon (ogive) of the data above.

Title:_____

SL 3

Y - LABEL:

X - LABEL: _____

Use the information below to answer Questions 17 and 18.

A coin is flipped. If it lands head up, you win $5. If it lands tail up, you win nothing.

17.   What is the probability of the coin landing head up?

	SL 2

18.   What is the expected value of your winnings?

	SL 2

19.   A box contains 10 green balls and 5 blue balls. If two balls are randomly selected from the box without replacement, what is the probability that both balls are green?

	SL 4

For Questions 20 and 21, choose and write the LETTER of the correct answer in the box provided.

Use the information below to answer Questions 20 and 21.

Marina used the measuring jug to measure the amount of water to make lemonade for a birthday party.

20.   How much water did Marina measure?

A. 42 ml	C. 310 ml
B. 320 ml	D. 420 ml

SL 1

21.   How much cubic centimeter (*cm³*) of water in the jug?

A. 320	C. 32
B. 310	D. 3.2

SL 1

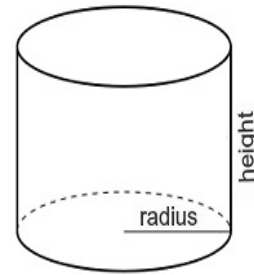22.   What is the time in New York when it is 8:00am on Friday in Samoa?

(**Note**: *New York is 17 hours behind Samoa*)

SL 2

23. Calculate the radius of a cylinder with a volume of *9000cm³* and a perpendicular height of 12cm. Round your answer to 1 decimal place. Use $\pi = \frac{22}{7}$

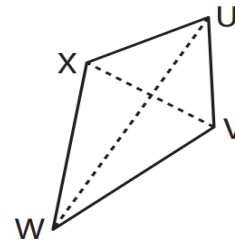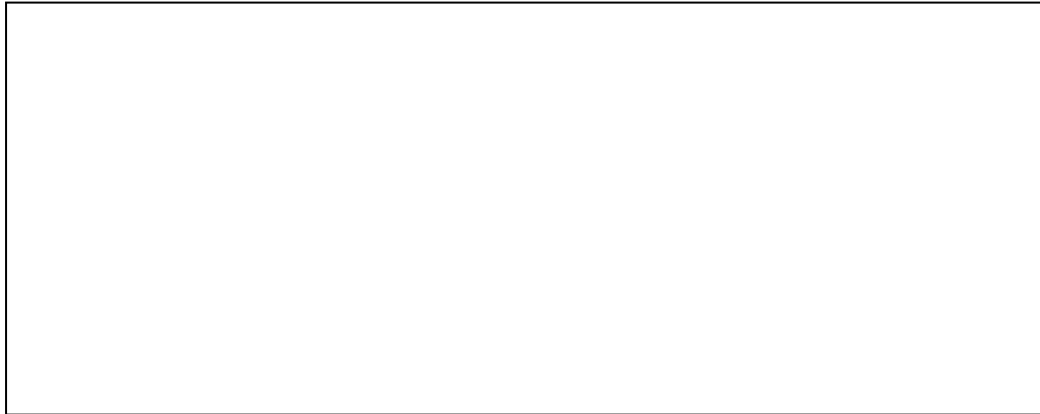   *(Note:* $V = \pi r^2 h$*)*

radius

height

SL 2

24. Find the area of the kite shown if length VX = 5m and length UW = 14m.

    (Note: formula area of Kite: $A = \frac{1}{2}ab$)

X

U

V

W

SL 3

25. Find the area of the base of a rectangular prism if its volume is 350 cm³ and its height is 5 cm.

	SL 3

Use the information below to answer Questions 26 and 27.

For Question 26, choose and write the LETTER of the correct answer in the box provided.

The diagram below shows a composite solid of length 14 cm and a height of 5 cm.
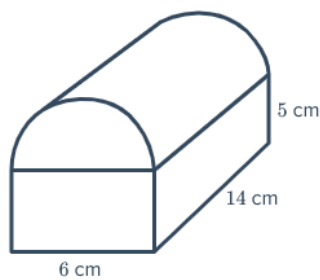
26. What are the two 3D shapes that make up the composite figure shown.

    A.   Rectangular prism and Sphere.
    B.   Cubic and Cylinder.
    C.   Sphere and Cylinder.
    D.   Rectangular prism and Cylinder.

27. Calculate the surface area of the ==composite solid== and round your answer into nearest centimetre. Use $\pi = \frac{22}{7}$

(Note: $A = 2\pi rh + 2\pi r^2$ and $A = 2wl + 2hl + 2hw$)
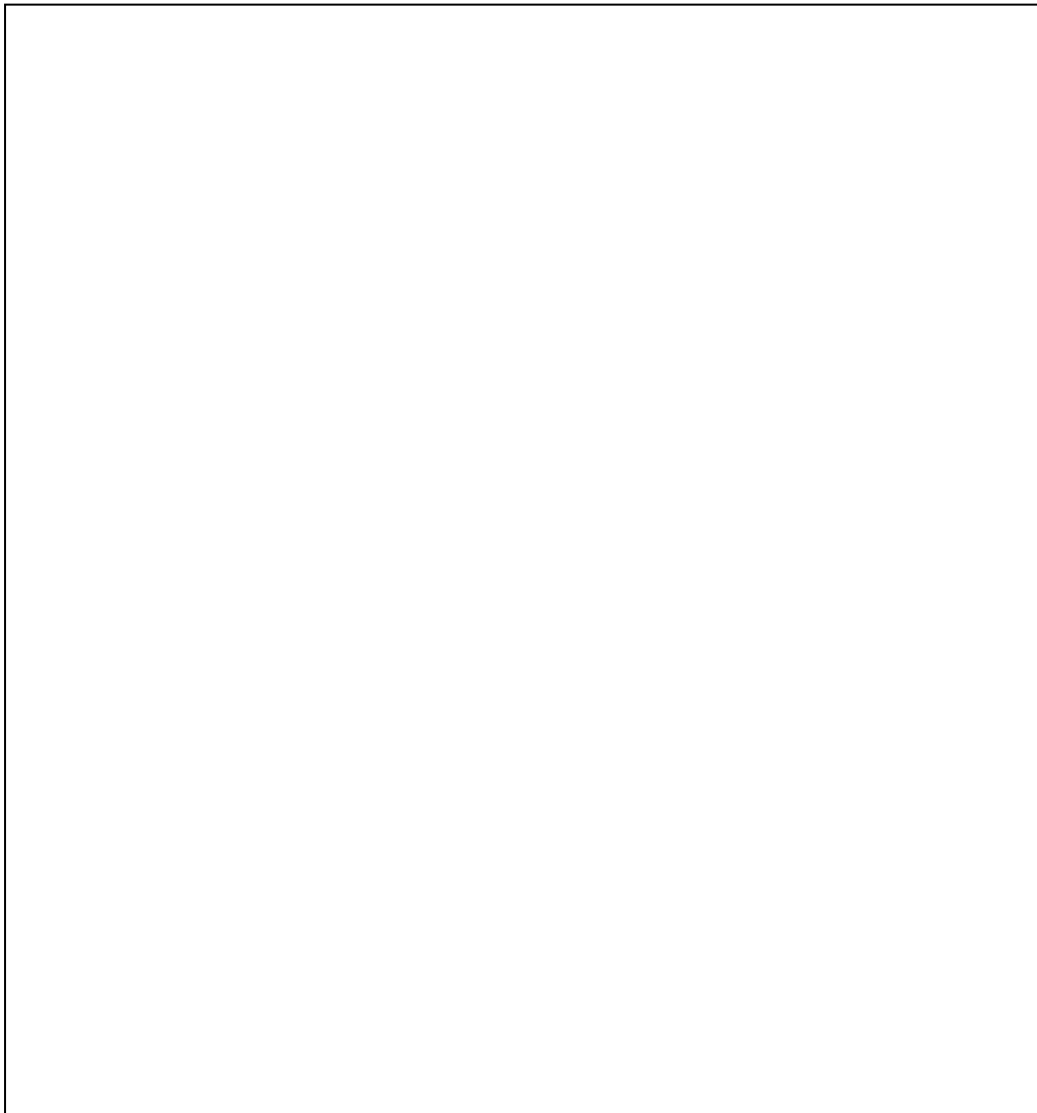
28.   If two triangles have exactly the same three sides and exactly the same three angles, then the two triangles are congruent. **TRUE or FALSE?** CIRCLE the correct answer.

SL 1

TRUE   or   **FALSE**

29.   Find the value of angles x and y of the isosceles triangle shown.
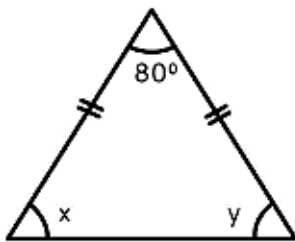
SL 2

30.   Cone A and Cone B are similar. The total surface area of Cone A is *120cm²*. The total surface area of Cone B is *1080cm²*. Work out the scale factor for the enlargement.
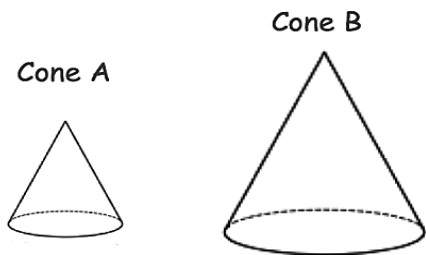
SL 2

31. Given triangle $\triangle$ ABC is similar to triangle $\triangle$DEF. Find the values of x, y and z.

32. Name the following parts of the circle shown.

The curve side AB: _____

Angle M: _____

Angle C: _____

33.

SL 3

For Questions 34 and 35, choose and write the LETTER of the correct answer in the box provided.

34. How does the cosine ratio change as the angle increases from 0° to 90°

    A. The cosine ratio starts at 1 when the angle is 0°, and decreases to 0 when the angle is 90°.

    B. The cosine ratio starts at 0 when the angle is 0°, and increases to 1 when the angle is 90°.

    C. The cosine ratio starts at 0 when the angle is 0°, and increases without bound as the angle approaches 90°.

    D. The cosine ratio starts at infinity when the angle is 0°, decreases to 1 when the angle is 90°.

	SL 1

35. If sin *A = 0.5 and 0° ≤ A ≤ 180°*, what are the two possible values of A?

    A. 90° & 0°   C. 130° & 150°

    B. 0° & 180°   D. 5° & 15°

	SL 1

36. A flagpole (d) sits on the top of a building represented by h. Angles of elevation are measured from a point 500 feet away from the building. The angle of elevation to the top of the building is 38° and to the top of the flagpole 42°. Find the length of the flagpole (i.e. find d).

	SL 2

37.   Sketch the graph of trigonometric function below using domain $0° \leq x \leq 180°$

$$y = \sin x$$

For Questions 38 to 41, choose and write the LETTER of the correct answer in the box provided.

38. Which of the following is the correct domain and range for the sequence
     $a_n = 3n - 1$?

     A.   Domain: {1, 2, 3,…} Range: {2, − 1, 4, 7, …}

     B.   Domain: {1, 2, 3, …} Range: {2, 5, 8, 11, …}

     C.   Domain: { − 2, 1, 4, 7, …} Range: {1, 2, 3, …}

     D.   Domain: {0, 1, 2, 3, …} Range: { − 2, 1, 4, − 7, …}

     SL 1

Use the information below to answer Questions 39 and 40.

Consider the number sequence {1, 3, 5, 7, 9, 11, …}

39. What is the general term (nth) term of the given number sequence above?

     A. $2n + 1$ C. $2n - 1$

     B. $n - 1$ D. $n - 2$

     SL 1

40. What is the position of the number 7 in the sequence above?

     A. 4th term   C. 2nd term

     B. 5th term   D. 1st term

     SL 1

41. Which statement below is **TRUE** about the difference between a relation and a
     function?

     A.   A function is a linear, but relation is a quadratic.

     B.   A function is any set of ordered pairs, whereas a relation is a graph.

     C.   A relation can have many outputs for a single input, but a function has a single
          input for a single output.

     D.   A relation can have single output for many inputs, but a function has a single
          input for a single output.

     SL 1

42. A Georgie's car rental company charges a flat fee of $450 plus $0.25 per mile driven. What is the rate of change of this relationship, and the linear equation if y represents the total charge and x represents the number of miles driven?

SL 2

43. Name **ONE** difference between arithmetic and geometric sequences and provide an example of each.
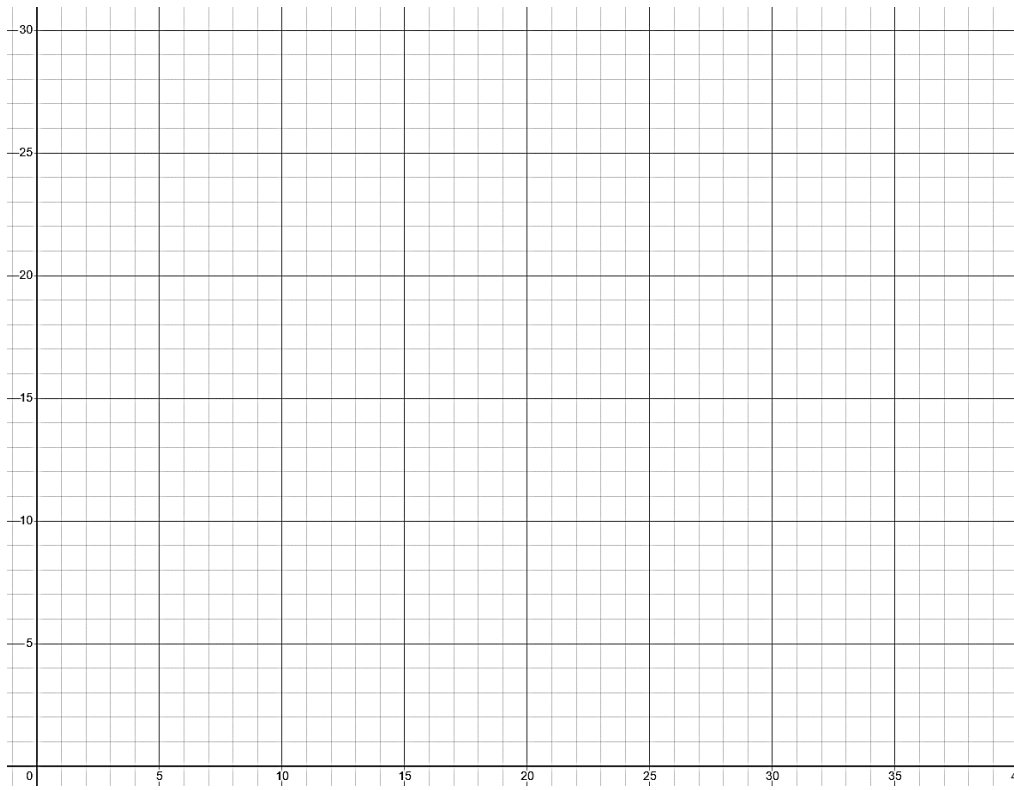
SL 3

44. Give **ONE** difference and **ONE** similarity between geometric sequences and exponential functions.

SL 3

45. Graph the arithmetic sequence below.

{3, 6, 9, 12, 15, 18}

SL 3

46. A ball is thrown upward from a height of 5 feet with an initial velocity of 40 feet per second. The height the ball reaches is given by $h(t) = -16t^2 + 40t + 5$ where t is the time in seconds. How high will the ball go?

SL 4

STUDENT EDUCATION NUMBER									

SNJSC MATHEMATICS

2023

(For Scorers only)

STRANDS		Weighting	Scores	Check Scorer	AED Check
STRAND 1	NUMBERS & OPERATIONS	7			
STRAND 2	ALGEBRA	22			
STRAND 3	STATISTICS & PROBABILITY	14			
STRAND 4	MEASUREMENTS	17			
STRAND 5	GEOMETRY	14			
STRAND 6	TRIGONOMETRY	7			
STRAND 7	RATES OF CHANGE	19			
		100			