

MARKER CODE



Student Personal Identification Number

Solomon Islands National Form Six School Certificate

MATHEMATICS

2018

QUESTION AND ANSWER BOOKLET

WEDNESDAY 7th NOVEMBER 9:00 AM

TIME: 3 Hours Plus 10 Minutes Reading Time.

INSTRUCTIONS

1. This Examination Paper consists of TWO (2) Sections. **ANSWER ALL QUESTIONS.**
SECTION A: (20 MARKS) contains 20 Multiple Choice questions worth one mark each.
SECTION B: (100 MARKS) contains 10 questions requiring detailed answers.
Each question is worth 10 marks.
2. An answer sheet for Section A is found in the **FOLD OUT FLAP** on the last page.
In **SECTION B**, write the answers to the questions in the spaces provided in this booklet.
3. Write your **Student personal Identification Number (SPIN)** on the top right hand corner of this page and at the top of the **fold out flap**. Write the Marker Code in the box at the top left hand corner of this page.
4. If you use extra sheets of paper(s) be sure to show clearly the question being answered. Write your SPIN on the top right hand corner of each sheet, and tie it securely at the appropriate place in this booklet.
5. Do NOT use correction fluid.
6. Mobile phones are NOT allowed in the Examination room.

NOTE: (i) There should be a Mathematics Formulae Sheet (No.8/3) with this booklet.
(ii) Non-programmable calculators are allowed into the examination room.
(iii) Unless stated, diagrams are not drawn to scale.

Check that this booklet contains pages 2-29 in the correct order and that none of these pages are blank. Page 28 has been left blank deliberately.

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

TOTAL MARKS

120

SECTION A: MULTIPLE CHOICE QUESTIONS**(20 MARKS)****ANSWER ALL THE QUESTIONS IN THIS SECTION**

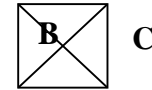
On the Back flap on the back cover, write the letter which corresponds to the answer you consider correct. An example is shown below. Check question numbers carefully. Allow about 30 minutes to answer the questions in this section. Each question is worth only one mark.

Example: If you consider B is correct, write it like this;



To change your answer from B to C, cross out B

And write the new answer by the box, like this:



1. The remainder when $x^3 + 4x^2 - x + 3$ is divided by $x - 2$ is;

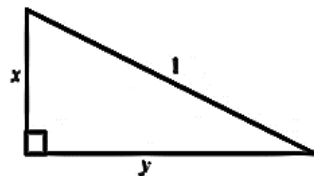
- A. -19
- B. 3
- C. 13
- D. 25

2. A function is given as $f(x) = \frac{x}{1-x}$. The expression $f(1-x)$ is;

- A. x
- B. $\frac{x}{1-x}$
- C. $1-x$
- D. $\frac{1-x}{x}$

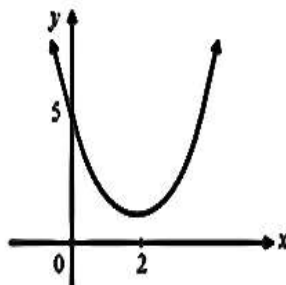
3. In the right angle triangle drawn below, the side labelled y expressed in terms of x is;

- A. $y = 1 - x^2$
- B. $y = \sqrt{1 - x^2}$
- C. $y = x^2 + 1$
- D. $y = \sqrt{x^2 - 1}$



4. The equation of the graph shown on the right is;

- A. $y = (x - 2)^2 + 5$
- B. $y = (x + 2)^2 + 1$
- C. $y = (x - 2)^2 + 1$
- D. $y = x^2 + 2x + 5$



5. The equation of a line that cuts the x -axis at 4 and the y -axis at -2 is;

- A. $y = 4x - 2$
- B. $y = -2x + 4$
- C. $y = -2x + 4$
- D. $y = \frac{1}{2}x - 2$

6. The line joining $(1, 2)$ and $(3, k)$ is parallel to the line $3x - 2y + 8 = 0$. What is the value of k ?

- A. -1
- B. $\frac{3}{10}$
- C. 5
- D. 8

7. What is the sum of the first 50 terms of the **arithmetic sequence** given below?

$$\langle a, 2a, 3a, \dots \rangle$$

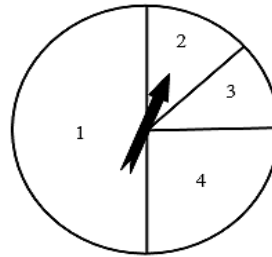
- A. $50a$
- B. $1275a$
- C. $1250a$
- D. $1a$

8. The value of $\sum_{r=1}^3 (2^r - 1)$ is;

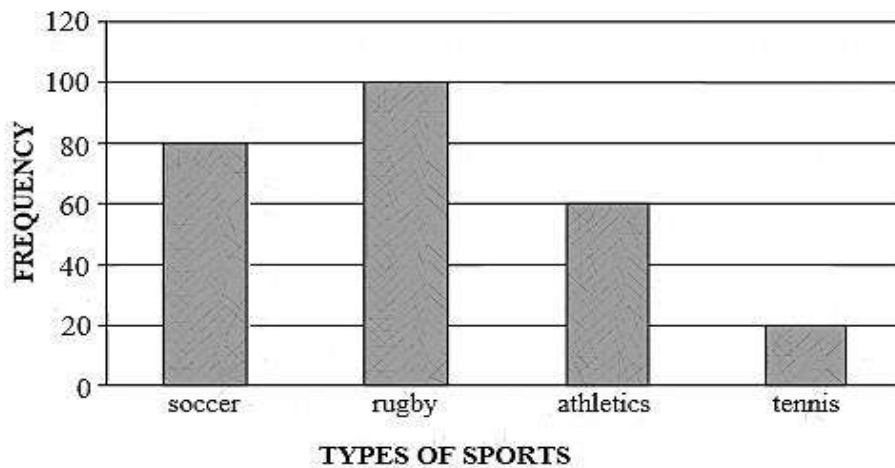
- A. 9
- B. 11
- C. 15
- D. 17

9. A spinner is made by dividing a circular board into four sectors as shown below. When rotated 40 times, how many times the pointer is expected to stop on the sectors labelled with a prime number?

- A. 10
- B. 15
- C. 20
- D. 30



10. The bar graph given below shows the number of students taking part in various sports in a junior secondary school competition.



What is the probability that a student selected at random takes part in athletics?

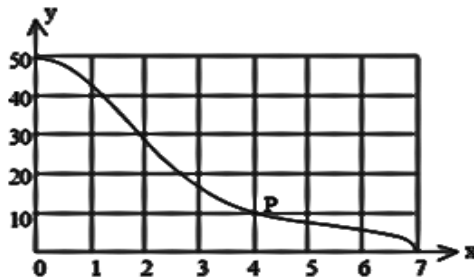
- A. $\frac{1}{13}$
- B. $\frac{3}{13}$
- C. $\frac{4}{13}$
- D. $\frac{5}{13}$

11. If $y = x^2 + x$, the instantaneous **rate of change** of y with respect to $x = 2$ is;

- A. 2
- B. 4
- C. 5
- D. 6

12. P is the point $(4,10)$. The gradient of the graph at P is closest to;

- A. -5
- B. -2.5
- C. -0.02
- D. 5



13. A derived function is given by $f'(x) = 3x^2 - 5$. Which of the following is **most** likely to be the expression for $f(x)$?

- A. $6x$
- B. $3x^2 - 5x$
- C. $x^3 - 5x + 2$
- D. $x^3 - 5x^2 - 5x$

14. If $\int_1^3 f(x) dx = 5$, then $\int_1^3 [f(x) + 1] dx$ is;

- A. 5
- B. 6
- C. 7
- D. 10

15. Compare to the graph of $y = \sin \theta$, the graph of $y = \frac{1}{2} \sin \theta$ has the same;

- A. amplitude, but half the period
- B. amplitude, but double the period
- C. period, but double the amplitude
- D. period, but half the amplitude

16. The value of $\log_2 8$ is;

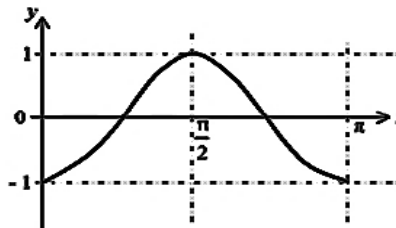
- A. 2
- B. 3
- C. 4
- D. 8

17. The value of 150° in radians is;

- A. $\frac{5\pi}{6}$
- B. $\frac{6\pi}{5}$
- C. $\frac{\pi}{3}$
- D. $\frac{\pi}{6}$

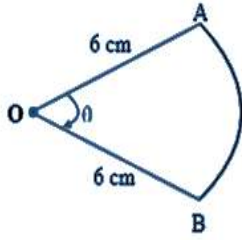
18. The equation of the graph shown on the right where $0 \leq x \leq \pi$ is;

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



Use the information below to answer questions 19 and 20.

The diagram below shows a sector of a circle with a radius of 6cm .
Point **O** is the center of the circle.

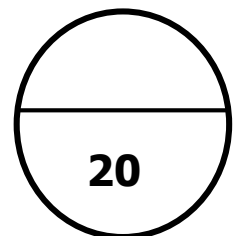


19. If the area of the sector OAB is $3\pi \text{ cm}^2$. The value of θ is;

- A. 6π
- B. $\frac{\pi}{6}$
- C. $\frac{\pi}{36}$
- D. π

20. The length of the minor arc AB is;

- A. $\pi \text{ cm}$
- B. $3\pi \text{ cm}$
- C. $6\pi \text{ cm}$
- D. $36\pi \text{ cm}$



SECTION B: LONG ANSWER QUESTIONS**(100 MARKS)**

Answer these questions on the spaces provided. Show all necessary work and steps as marks are awarded accordingly. There are 10 questions in this Section. Each question is worth 10 marks.

Question 21.

a) Solve these equations;

i. $2(x-1) - 3(2-2x) = 16$

(2 marks)

ii. $\frac{x}{2} - \frac{x+1}{3} = 1$

(2 marks)

iii. $\sqrt{x} = 2 - x$

(2 marks)

b) Make x the subject of the given equation $y = \frac{2x+1}{x-3}$

(2 marks)

c) If $\log 2 = x$ and $\log 3 = y$, write an expression for $\log 36$ in terms of x and y .

(2 marks)

Question 22.

a) Simplify $\frac{x^2 + 2xy}{2x^3y} \div \frac{xy + 2y^2}{6x^2y^3}$

(3 marks)

b) A function f is given by $f(x) = x^3 + 4x^2 + x - 6$.

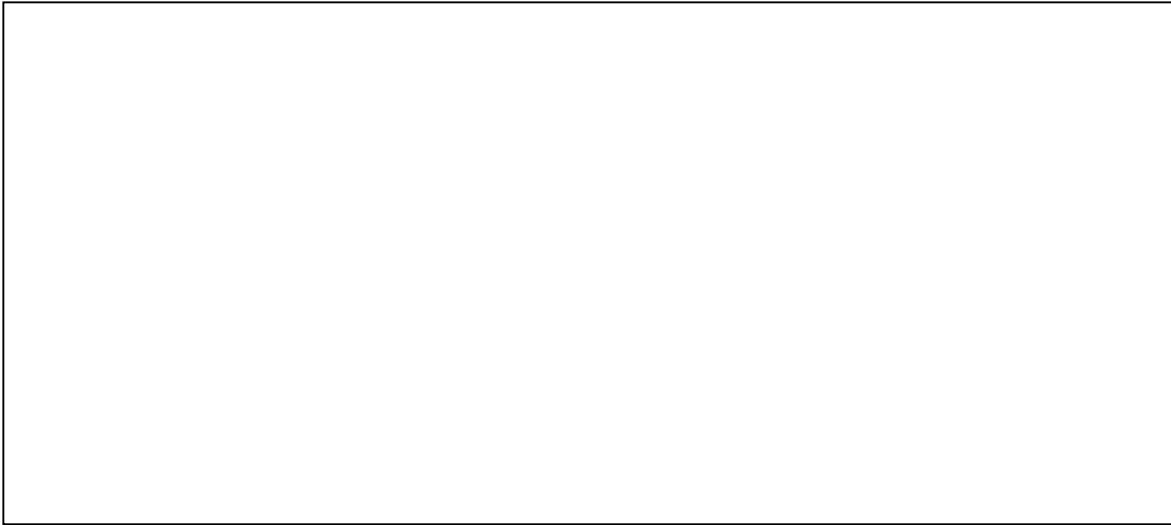
i) Show that $x+3$ is a factor of $f(x)$.

(2 marks)

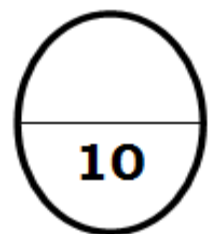
ii) Using long division method or by any other means, write down the other two factors of $f(x)$

(3 marks)

c) If the straight line $5x - 2y = 1$ passes through the point $(1, p)$, find the value of p .

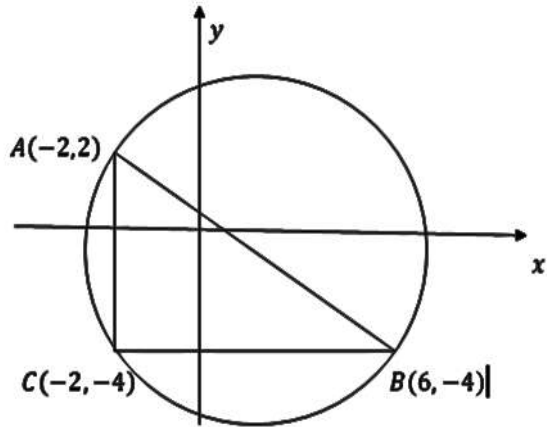


(2 marks)



Question 23.

Points $A(-2, 2)$, $B(6, -4)$ and $C(-2, -4)$ lie on the circumference of a circle and form a right angle-triangle. Chord AB is the diameter of the circle.



- i. Find the coordinates of the center of the circle.

(2 marks)

- ii. Find the radius of the circle.

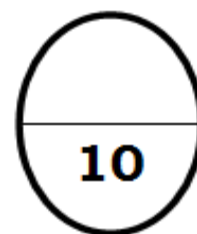
(2 marks)

iii. Hence, find the equation of the circle.

(3 marks)

iv. Show that the **ratio of lengths** of the chords AC , BC and AB is $3:4:5$

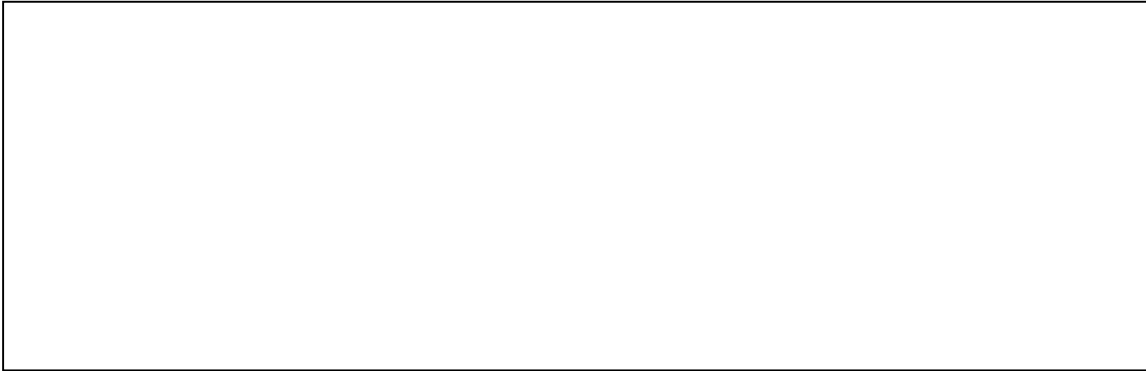
(3 marks)



Question 24.

A cubic function is given as $y = \frac{1}{3}x^3 + 2x^2 + 3x$;

- i. Find $\frac{dy}{dx}$.



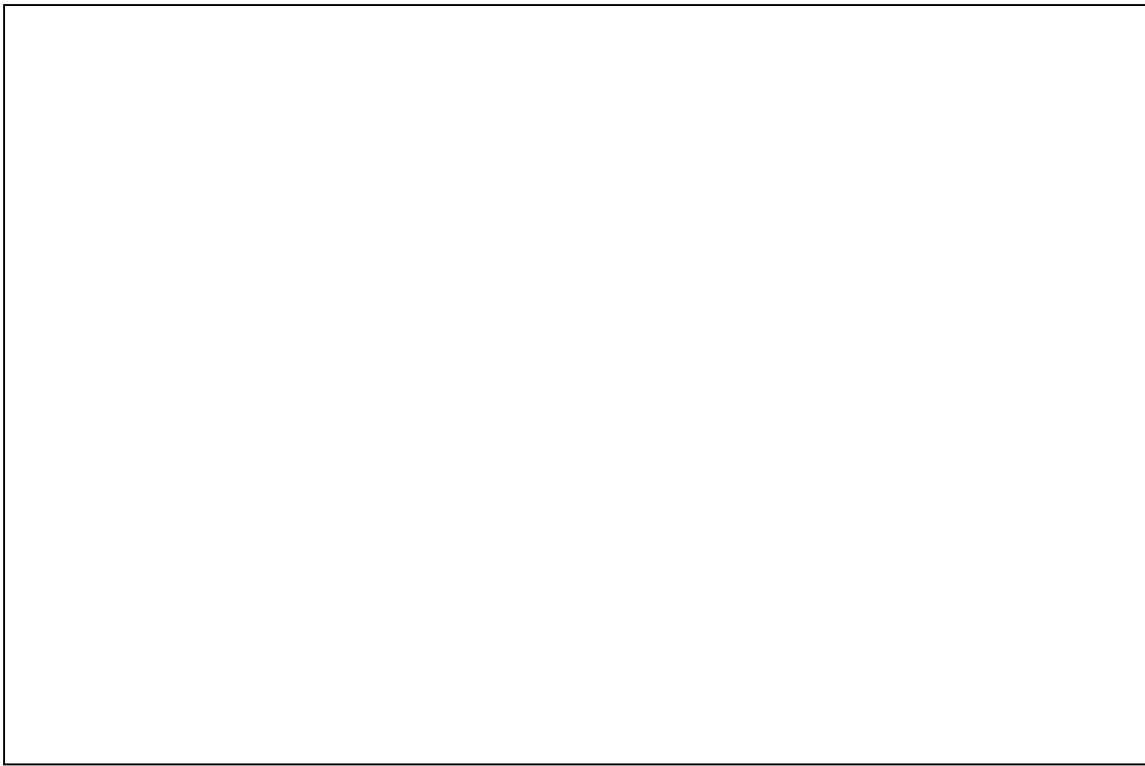
(2 marks)

- ii. Find the coordinates of the turning points of $y = \frac{1}{3}x^3 + 2x^2 + 3x$.

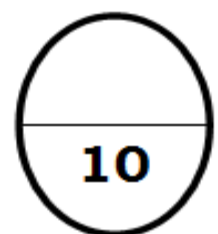


(4 marks)

iii. Determine the x values for which the function is increasing.



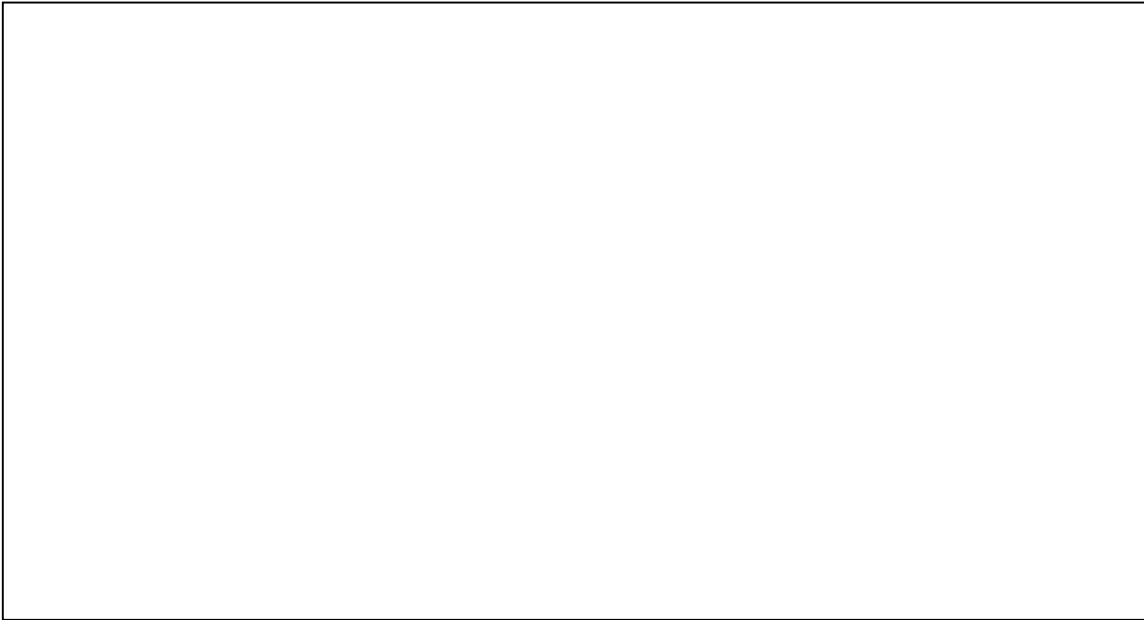
(4 marks)



Question 25.

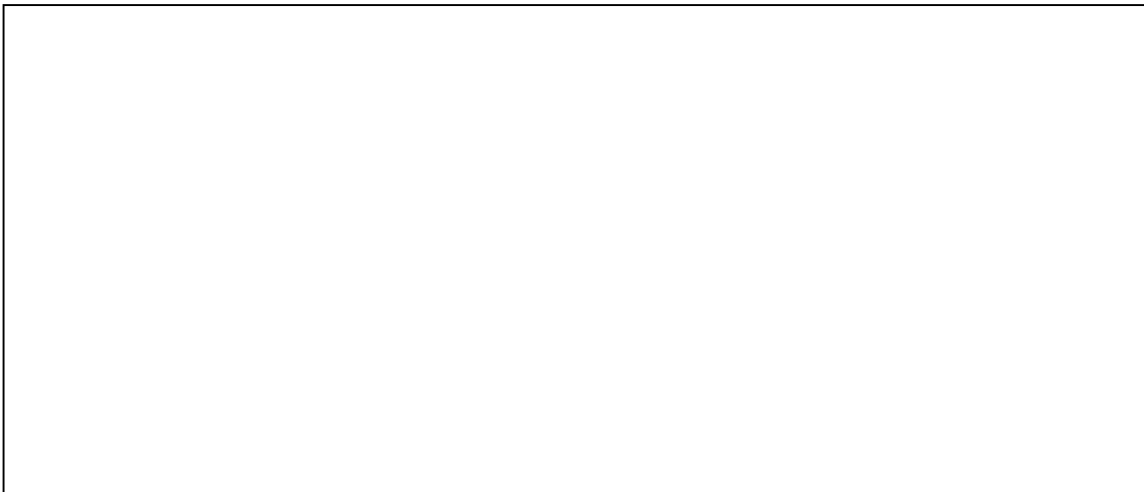
a) The general term of a geometric sequence is $t_n = \left(\frac{1}{2}\right)^{-n}$.

i. Generate the first THREE (3) terms of the geometric sequence.



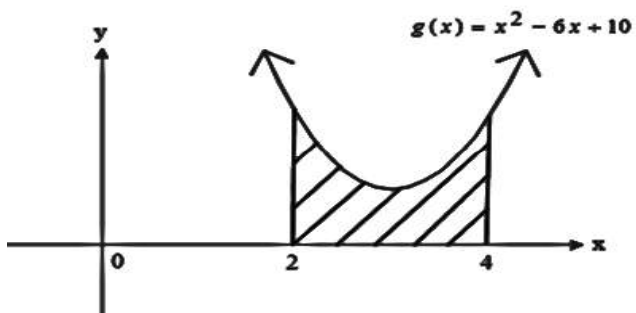
(3 marks)

ii. Show that the sum of the n -terms of the geometric sequence is $S_n = 2^{n+1} - 2$.



(2 marks)

- b) Area bounded by the parabola $g(x) = x^2 - 6x + 10$, the x axis and the lines $x = 2$ and $x = 4$ is shown below;



- i. Write an expression to find the area of the shaded region.

(2 marks)

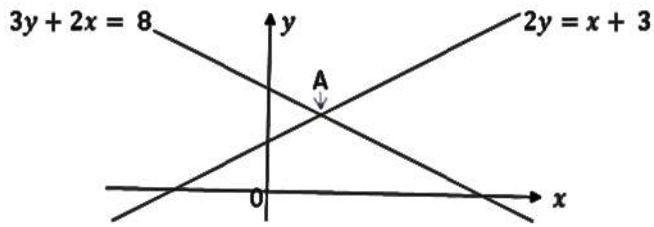
- ii. Hence, calculate the area of the shaded region.

(3 marks)

10

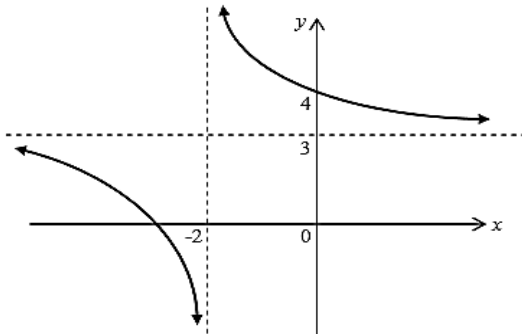
Question 26.

- a) The TWO (2) lines intersect at point **A**. Find the coordinates at point **A**.



(3 marks)

- b) The graph of the function $y(x)$ crosses the y -axis at $y = 4$ as shown below.



- i. Complete the following statements;

As $x \rightarrow +\infty$, $y(x) \rightarrow$ _____ (1 mark)

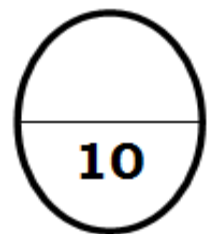
As $x \rightarrow -2$, $y(x) \rightarrow$ _____ (1 mark)

ii. State the equation of the vertical and horizontal asymptotes of the function $y(x)$.

(2 marks)

iii. Find the equation of the function $y(x)$.

(3 marks)



Question 27.

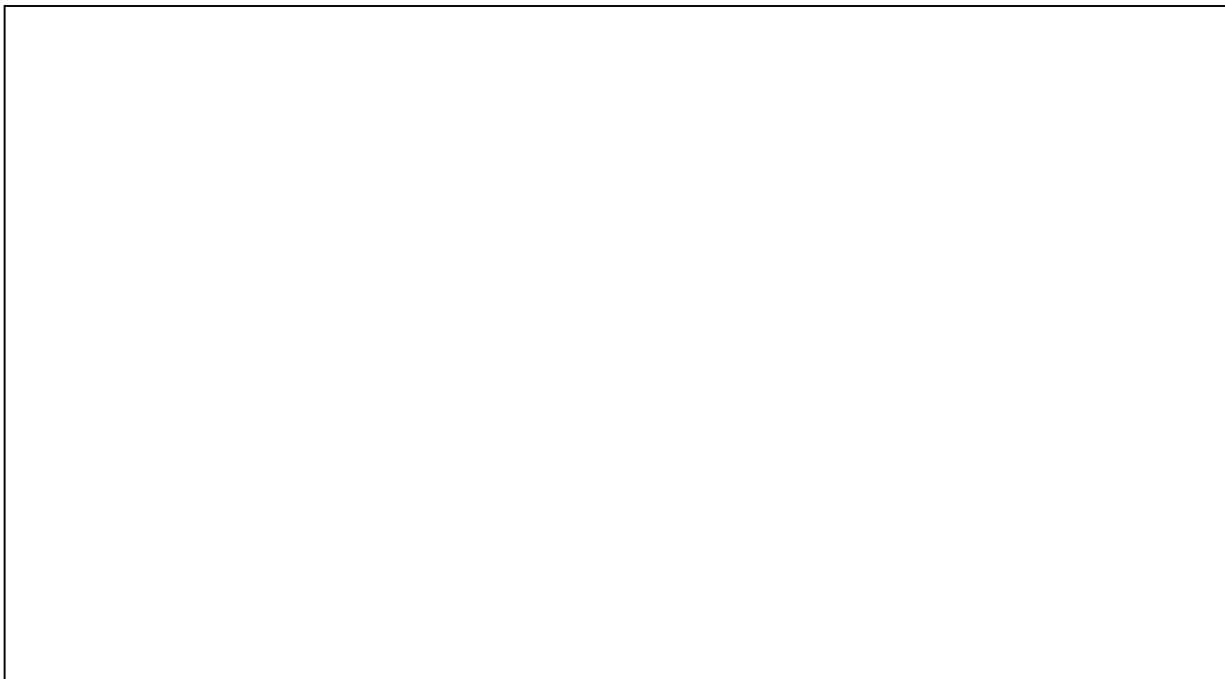
- a) The first THREE (3) terms of an arithmetic sequence is given as $\langle x, 1 - y, 2x, \dots \rangle$. Using this sequence, show that $3x + 2y - 2 = 0$.

(3 marks)

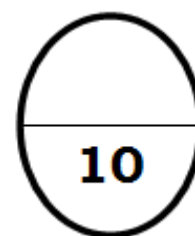
- b) Consider the trigonometric $\tan^2 x - 2\tan x + 1 = 0$ for $0 < x < 2\pi$, solve for all solutions of x .

(4 marks)

c) Prove that $\sec^2 x + \csc^2 x = \sec^2 x \csc^2 x$.



(3 marks)

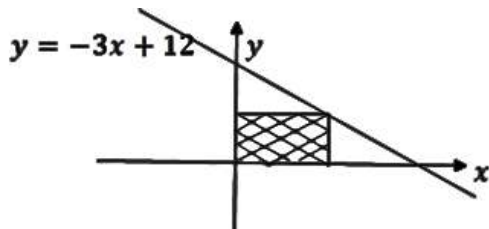


Question 28.

- a) Find the values for x if $2\sin x - 1 = 0$, for $0 \leq x \leq 180$.

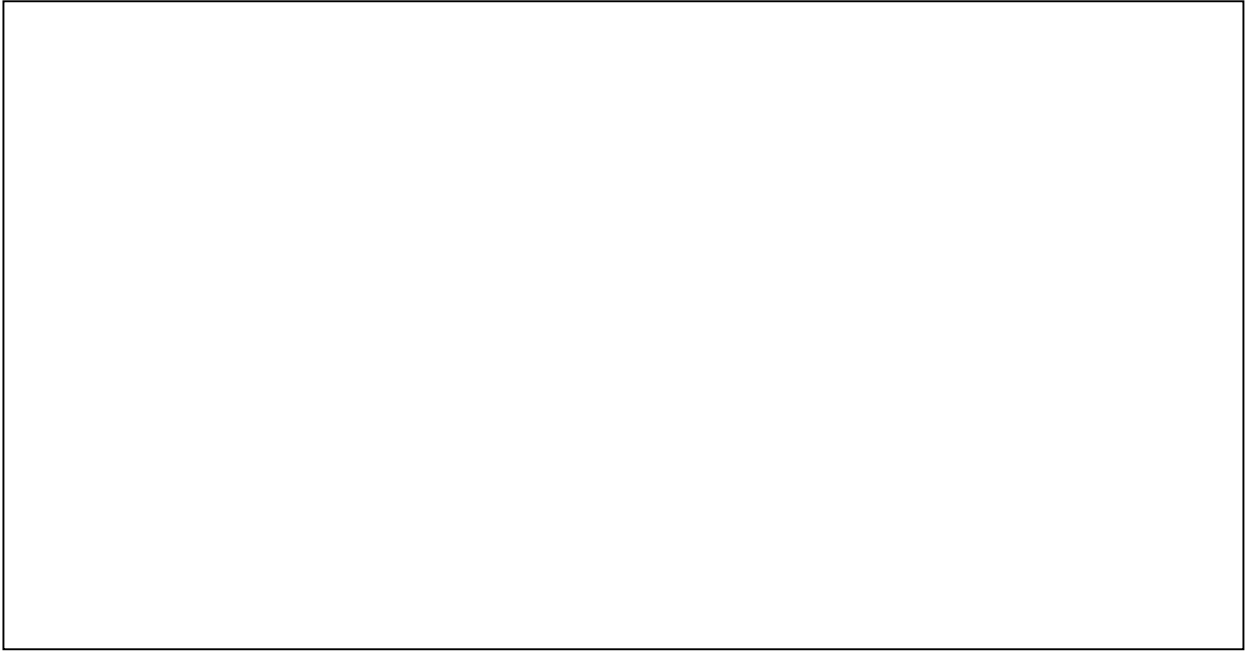
(3 marks)

- b) The four vertices of a rectangle are at the origin, on the x -axis and on the y -axis and on the line $y = -3x + 12$. Find the greatest area that this rectangle can have.



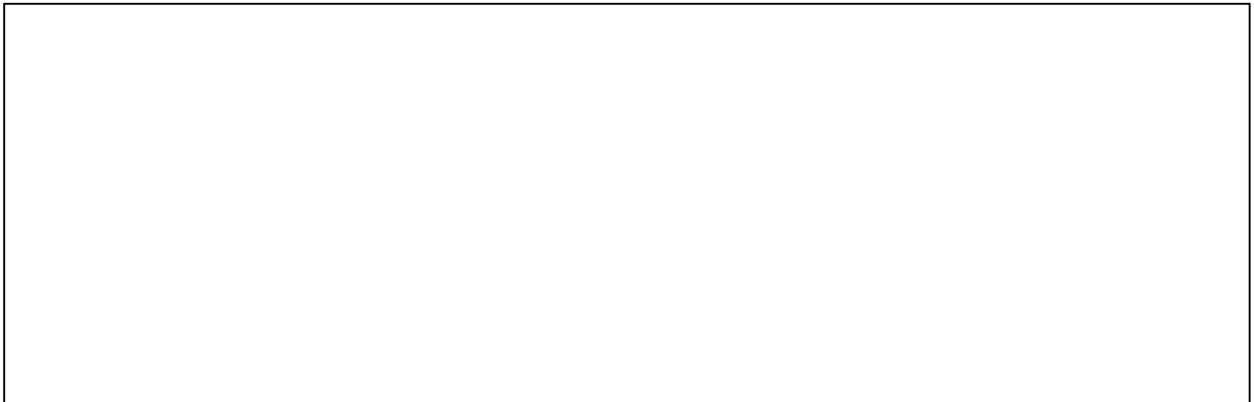
(3 marks)

- c) A bag contains 7 red marbles, 5 blue marbles and 3 green marbles. Two (2) marbles are randomly drawn from the bag without replacement.
- i. Draw a tree diagram to show all the possible combinations of the marbles drawn from the bag. Use **R** for red, **B** for blue and **G** for green. [Note: You must show probabilities along the branches to get full marks].

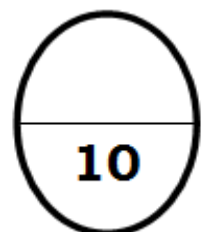


(3 marks)

- ii. What is the probability that the marbles drawn are of the same colour?



(1 mark)

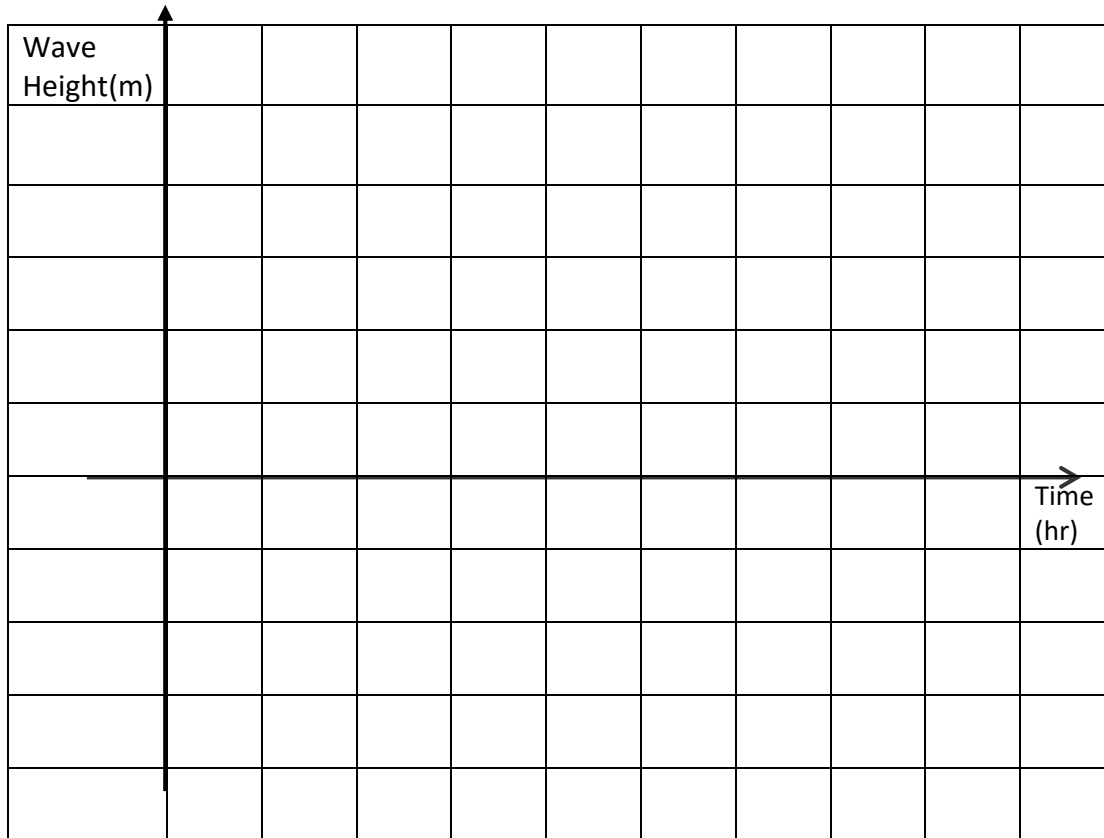


Question 29.

- a) On a particular day, a Meteorologist of the Solomon Islands Meteorological Services has measured tides at Point Cruz wharf in every 3 hours, and notice that highest and lowest tides occur every 24 hours. The first highest tide was measured at 0000hr, the first lowest tide was measured at 1200hr and the next highest tide was measured at 2400hr as tabulated below.

Time (t)	0000hr	0300hr	0600hr	0900hr	1200hr	1500hr	1800hr	2100hr	2400hr
Wave Height	0.20m	0.14m	0.00m	-0.14m	-0.20m	-0.14m	0.00m	0.14m	0.20m

- i. Draw a tide curve from the information given above on the grid below.



(2 marks)

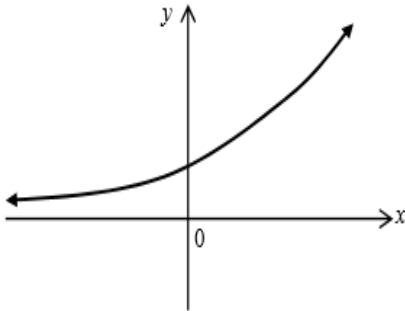
- ii. From the graph or the table, find the amplitude and period.

(2 marks)

iii. Write an equation for the Wave height (h) in terms of time (t).

(2 marks)

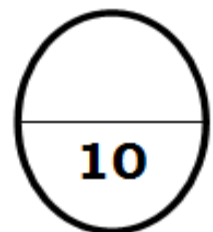
b) The graph of the function $y = 2^x$ is shown below.



i. Write down the y -coordinate of the y -intercept. _____ (1 mark)

ii. What is the equation of the inverse of the function $y = 2^x$? (2 marks)

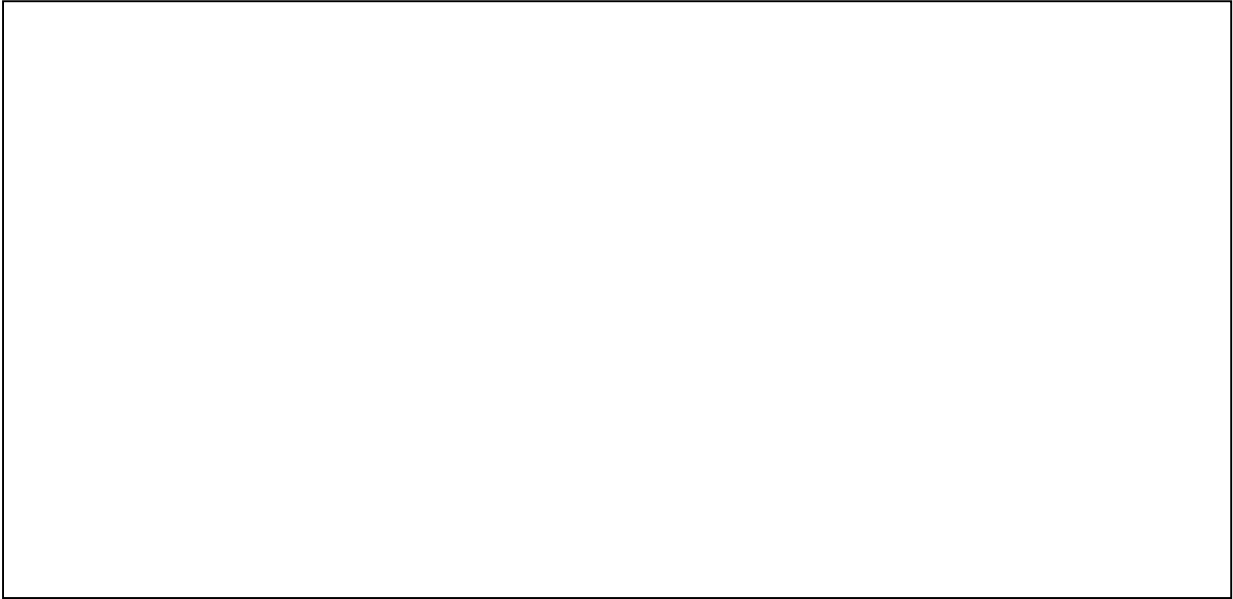
iii. Sketch the inverse of the function $y = 2^x$ on the graph above. (1 mark)



Question 30.

Solomon Airlines believes that the suitcases it receives from overseas flight on check at Henderson airport have weights which are normally distributed with a mean of 17kg and standard deviation of 4kg . It charges for excess baggage if a suitcase weighs more than 20kg .

- i. Find the probability that a passenger have to pay for excess baggage from a particular overseas flight.



(3 marks)

- ii. If two passengers were checked one after another. What is the probability that the first passenger has excess baggage and the second passenger has no excess baggage?



(2 marks)

iii. What percentage of excess baggage is less than 25 kg ?

(4 marks)

iv. If there were 500 suitcases arrived at Henderson airport from an overseas flight. How many excess suitcases were less than 25 kg ?

(1 mark)

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MATHEMATICS 2018

Student Personal Identification Number

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SECTION A

MULTIPLE CHOICE (20 MARKS)

Write clearly the letter of the correct answer in the box provided. Make sure your answer is put alongside the right question number.

EXAMPLE:

If you consider B is the correct answer, write it like this:

To change your answer from B to C, cross out B and write the new answer by the box, like this: C

- | | |
|--|---|
| <p>1. <input style="width: 40px; height: 30px;" type="text"/></p> <p>2. <input style="width: 40px; height: 30px;" type="text"/></p> <p>3. <input style="width: 40px; height: 30px;" type="text"/></p> <p>4. <input style="width: 40px; height: 30px;" type="text"/></p> <p>5. <input style="width: 40px; height: 30px;" type="text"/></p> <p>6. <input style="width: 40px; height: 30px;" type="text"/></p> <p>7. <input style="width: 40px; height: 30px;" type="text"/></p> <p>8. <input style="width: 40px; height: 30px;" type="text"/></p> <p>9. <input style="width: 40px; height: 30px;" type="text"/></p> <p>10. <input style="width: 40px; height: 30px;" type="text"/></p> | <p>11. <input style="width: 40px; height: 30px;" type="text"/></p> <p>12. <input style="width: 40px; height: 30px;" type="text"/></p> <p>13. <input style="width: 40px; height: 30px;" type="text"/></p> <p>14. <input style="width: 40px; height: 30px;" type="text"/></p> <p>15. <input style="width: 40px; height: 30px;" type="text"/></p> <p>16. <input style="width: 40px; height: 30px;" type="text"/></p> <p>17. <input style="width: 40px; height: 30px;" type="text"/></p> <p>18. <input style="width: 40px; height: 30px;" type="text"/></p> <p>19. <input style="width: 40px; height: 30px;" type="text"/></p> <p>20. <input style="width: 40px; height: 30px;" type="text"/></p> |
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FOR MARKER USE ONLY

QUESTION	MARK	MARKER	SCRIPT CHECKER
M/C	20		
Q.21.	10		
Q.22.	10		
Q.23.	10		
Q.24.	10		
Q.25.	10		
Q.26.	10		
Q.27.	10		
Q.28.	10		
Q.29.	10		
Q.30.	10		
TOTAL	120		
Marker / Checker Initials			