

MARKER CODE

--	--	--	--	--	--	--	--



Student Personal Identification Number

--	--	--	--	--	--	--	--

Solomon Islands National Form Six School Certificate

MATHEMATICS

2017

QUESTION AND ANSWER BOOKLET

Time allowed: Three hours + 10 min. reading time

INSTRUCTIONS

1. This Examination Paper consists of two 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 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.

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 1-29 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**

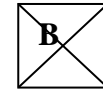
On the BackFlap on the back cover, write the letter which corresponds to the answer you consider correct. An example is shown below. Check question numbers carefully. Allow about 30 minutes to answer the questions in this section. Each question is worth only one mark.

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:

**C**

- Which of the following gives the inverse $f^{-1}(x)$ of the function $f(x) = \sqrt{x-2} + 1$
 - $f^{-1}(x) = (x-1)^2 + 2$
 - $f^{-1}(x) = (x-2)^2 + 1$
 - $f^{-1}(x) = (y-2)^2 + 1$
 - $f^{-1}(x) = (x-1)^2 - 2$
- Find the value of x in the equation $\frac{1}{3^{x+1}} = 9$
 - 3
 - 1
 - 3
 - $-\frac{1}{3}$
- When $\frac{2\pi}{3}$ in radians is converted to degrees the answer will be
 - 180°
 - 120°
 - 270°
 - 240°

4. $2\log 9 - 3\log 3$ when written as a single log is equals to

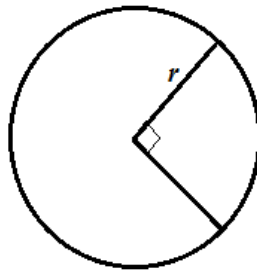
- A. $-\log 6$
- B. $\log 3$
- C. $\log 54$
- D. $\frac{2}{3}\log 3$

5. Which is the correct solution set of the function $f(x) = (2x-1)(x+2)(x-1)$

- A. $\{x : x = 2, -2, 1\}$
- B. $\left\{x : x = \frac{1}{2}, 2, -1\right\}$
- C. $\left\{x : x = \frac{1}{2}, -2, -1\right\}$
- D. $\left\{x : x = \frac{1}{2}, -2, 1\right\}$

6. The area of a sector subtended at the centre of a circle of radius r cm is $\frac{\pi}{2} \text{ cm}^2$ by an angle of 90° . The radius r of the circle will be.

- A. $4\pi \text{ cm}$
- B. $2\pi \text{ cm}$
- C. $\sqrt{2\pi} \text{ cm}$
- D. $\sqrt{2} \text{ cm}$



7. If $(ax + c)$ is a factor of the polynomial $P(x)$ then the remainder is given by
- A. $P\left(-\frac{c}{a}\right)$
 - B. $P\left(-\frac{a}{c}\right)$
 - C. $P\left(\frac{x}{a}\right)$
 - D. $P\left(-\frac{x}{c}\right)$
8. A straight line forms an angle of size 45° with the positive x -axis and passes through the point $(0,1)$. The equation of the straight line is.
- A. $2y + 2x = -3$
 - B. $-3x - 2y = 1$
 - C. $-2x + y = -2$
 - D. $2y - 2x = 2$
9. The y -intercept of the line $3x - 2y - 6 = 0$ will be
- A. 3
 - B. -6
 - C. -3
 - D. -2
10. Given $t_1 = -2$, find the value of t_3 given $t_{n+1} = 2t_n - 1$
- A. -11
 - B. -5
 - C. -4
 - D. -10
11. Given $f'(x) = 2x$ and $f(2) = 5$. An expression for $f(x)$ is
- A. $2x + c$
 - B. $2x^2 + 5$
 - C. $2x + 4$
 - D. $x^2 + 1$

12. The given set of data 5, 7, 10, 8, 9, 7, 12, is from a math quiz. What is the median and the mode of the given data?
- A. Median 8.2 , mode 7
 - B. Median 8 , mode 7
 - C. Median 7 , mode 8
 - D. Median 8.2 , mode 5
13. Find the area under the standard normal curve **between** $z = 0$ and $z = -1.96$ is
- A. -0.5
 - B. 0.025
 - C. -0.475
 - D. 0.475
14. A line passes through the curve $f(x) = x^2 - x$ at the point $x = a$, find the value of a if the gradient of the line is 3 at point $x = a$.
- A. 3
 - B. 4
 - C. 2
 - D. 1
15. A fair coin is tossed 3 times, the probability of getting exactly two heads is
- A. $\frac{3}{8}$
 - B. $\frac{1}{8}$
 - C. $\frac{7}{8}$
 - D. $\frac{5}{8}$

16. The exact value of $\tan \frac{\pi}{6}$ is

- A. $\frac{3}{\sqrt{3}}$
- B. 2
- C. $\sqrt{3}$
- D. $\frac{\sqrt{3}}{3}$

17. The limit of the function $f(x) = \lim_{x \rightarrow 3} \frac{9 - x^2}{3 - x}$

- A. 0
- B. 6
- C. does not exist
- D. -6

18. Given $y = -3\cos(2x - 90)$ for, $0 \leq x \leq 360$. The amplitude and period will be

- A. $-3, 90^\circ$
- B. $3, 45^\circ$
- C. $3, 180^\circ$
- D. $-3, 180^\circ$

19. The rate of change of the volume of a cube that has a side length of $2\sqrt{2}$ cm is

- A. $12\text{cm} / s$
- B. $8\text{cm} / s^2$
- C. $24\text{cm}^3 / s$
- D. $6\sqrt{2}\text{cm}^3$

20. If $f(x) = \sqrt{x^3}$ then $f'(4)$ is

- A. 3
- B. 8
- C. $\frac{3}{2}$
- D. 6

SECTION B: LONG ANSWER QUESTIONS**(100 MARKS)****QUESTION 1**(a) Solve for x in the following equations.

(i) $5 \times 2^x - 2^x = 64$

$x =$ _____

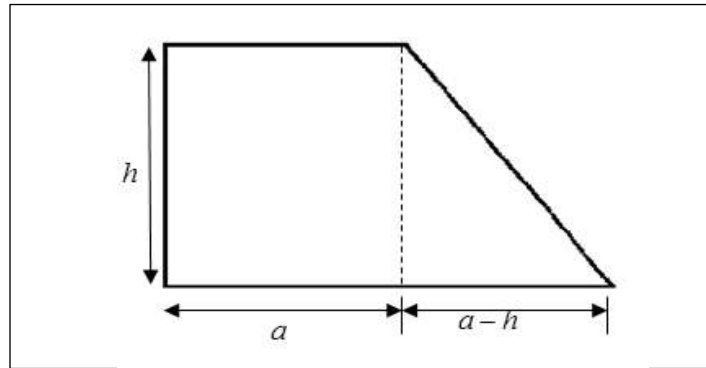
(2 marks)

(ii) $\left(x - \frac{3}{4}\right)^2 - \frac{25}{16} = 0$

$x =$ _____

(3 marks)

(b) A trapezium is drawn below with a height h and base of $2a - h$.

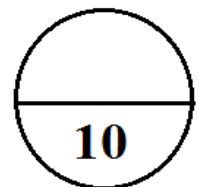


(i) If the area of the trapezium is A show that $a = \frac{2A + h^2}{3h}$

(3 marks)

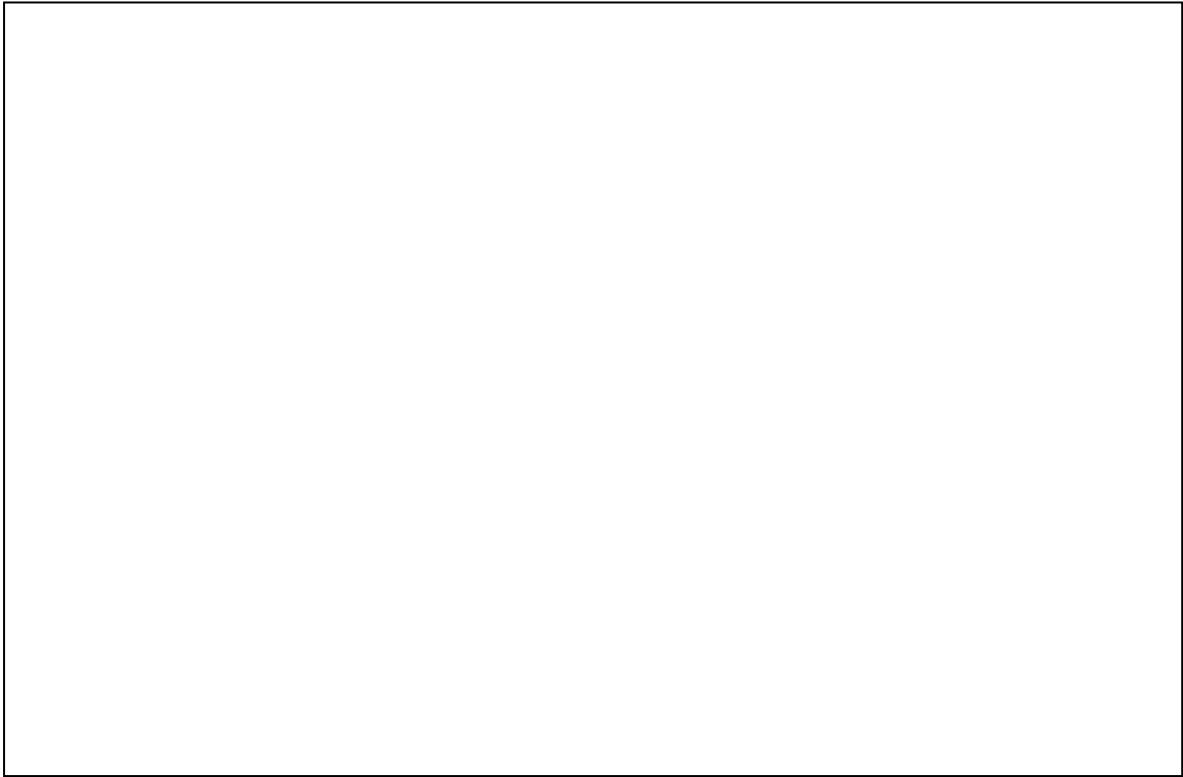
(ii) If $A = 28\text{cm}^2$ and $h = 4\text{cm}$, find the value of the base.

(2 marks)



QUESTION 2

- (a) If $3x - 2$ is a factor of the polynomial $f(x)$, factorize $f(x) = 3x^3 - 11x^2 + 12x - 4$ completely.



(3 marks)


- (b) Simplify $\frac{3x-1}{x^2-1} - \frac{2}{x+1}$



(3 marks)

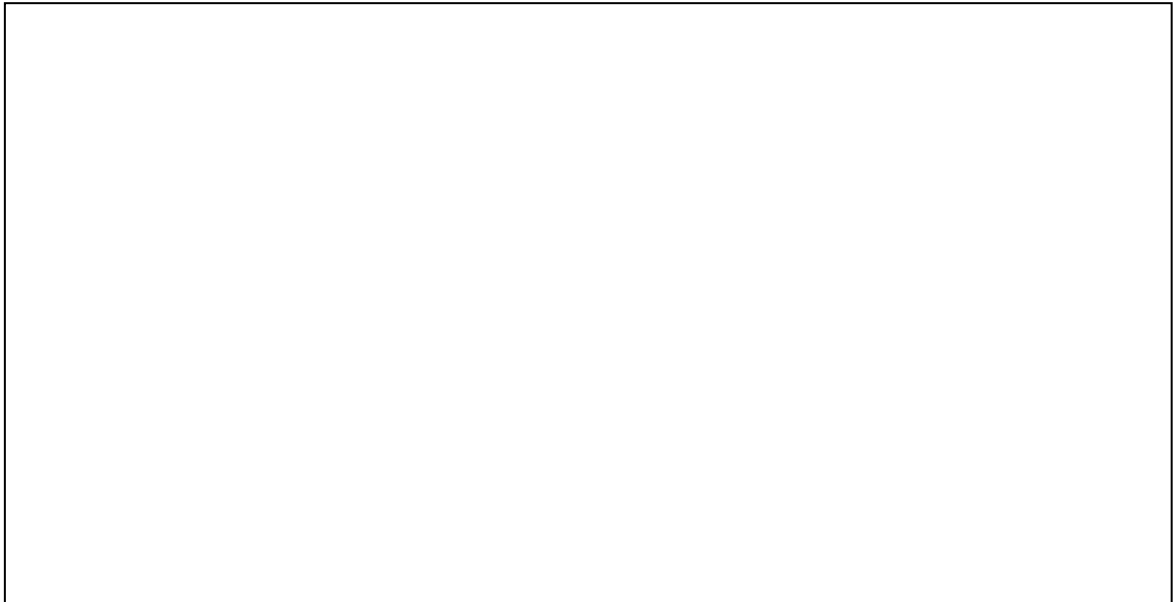
(c) When the polynomial $kx^2 + mx - 2$ is divided by $(x+1)$ and $(x-2)$ the remainders are -3 and 12 respectively.

i. Write two equations in terms of k and m that represent the above information.

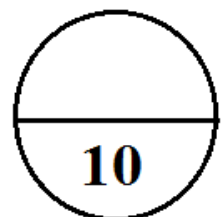


(2 marks)

ii. Solve the equations obtained in (i) above to determine the value of k and m .



(2 marks)



QUESTION 3

(a) Consider the function $f(x) = \log_2(x-2) + 1$

(i) State the domain and range of f

Domain: _____

Range: _____

(2 marks)

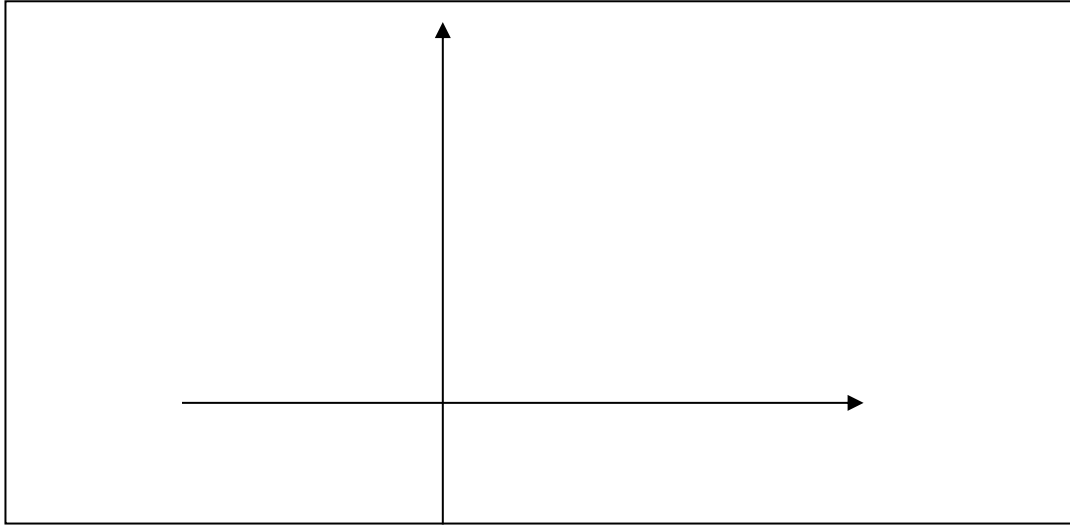
(ii) Find the equation of the inverse $f^{-1}(x)$

(2 marks)

(iii) Find the y-intercept of the inverse function $f^{-1}(x)$

(1 mark)

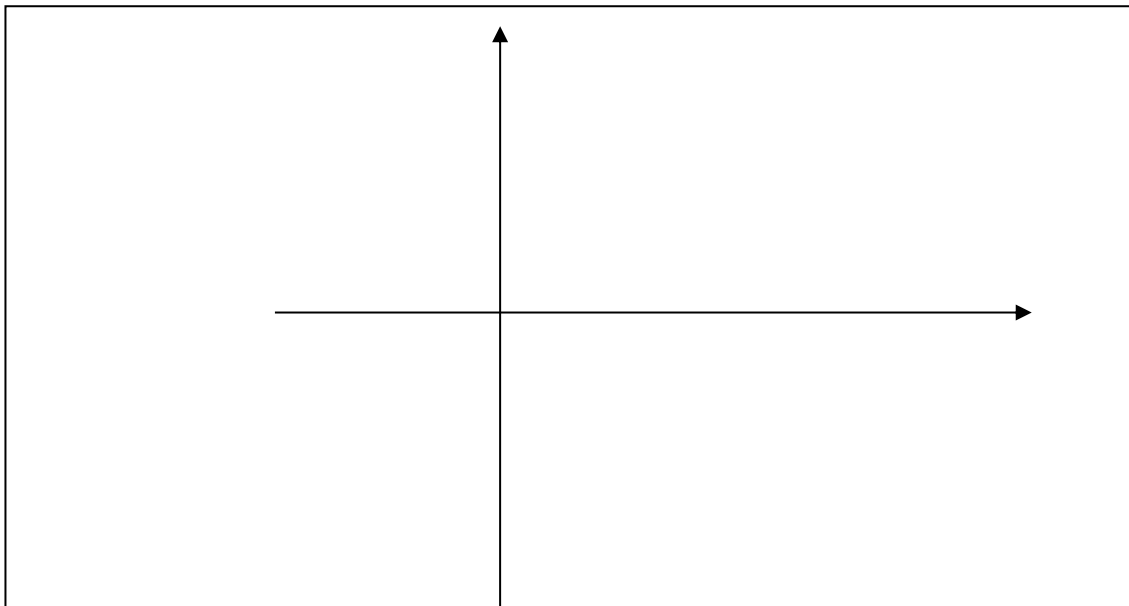
(iv) Sketch the graph of the inverse function $f^{-1}(x)$ with labels



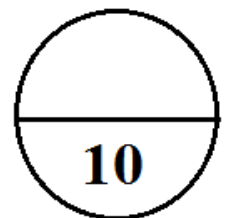
(3 marks)

(b) The graph of the cubic function $f(x) = x^3$ is translated 2 units to the right and 1 unit up.

Sketch the graph of the translation. Showing all intercepts



(2 marks)



QUESTION 4

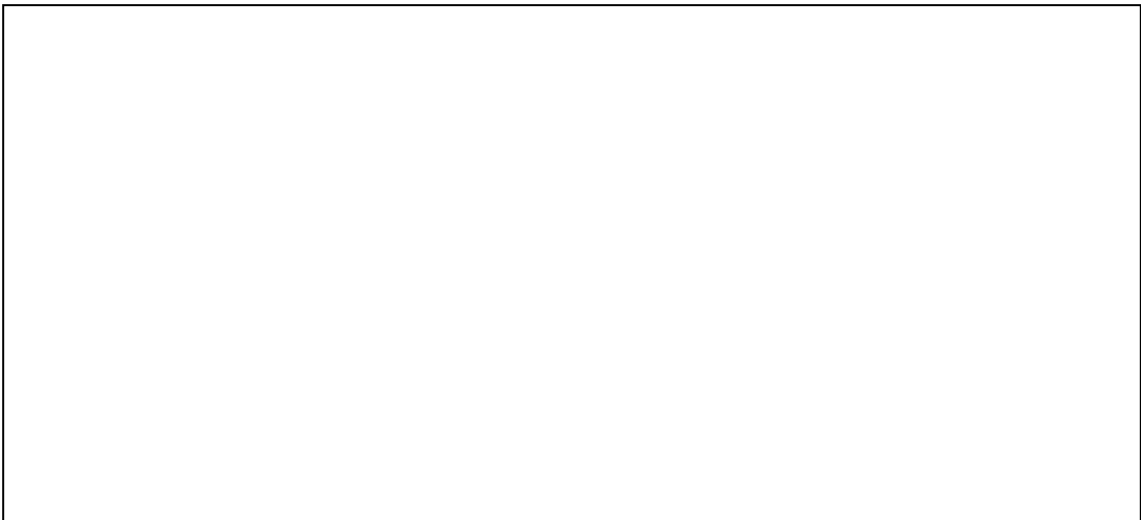
(a) A tray of egg has ten eggs, 4 of which are defective. Marcus selected 3 eggs from the tray for his evening meal without replacement.

(i) Draw a tree diagram to show all possible outcomes. Use G for good and D for defective.



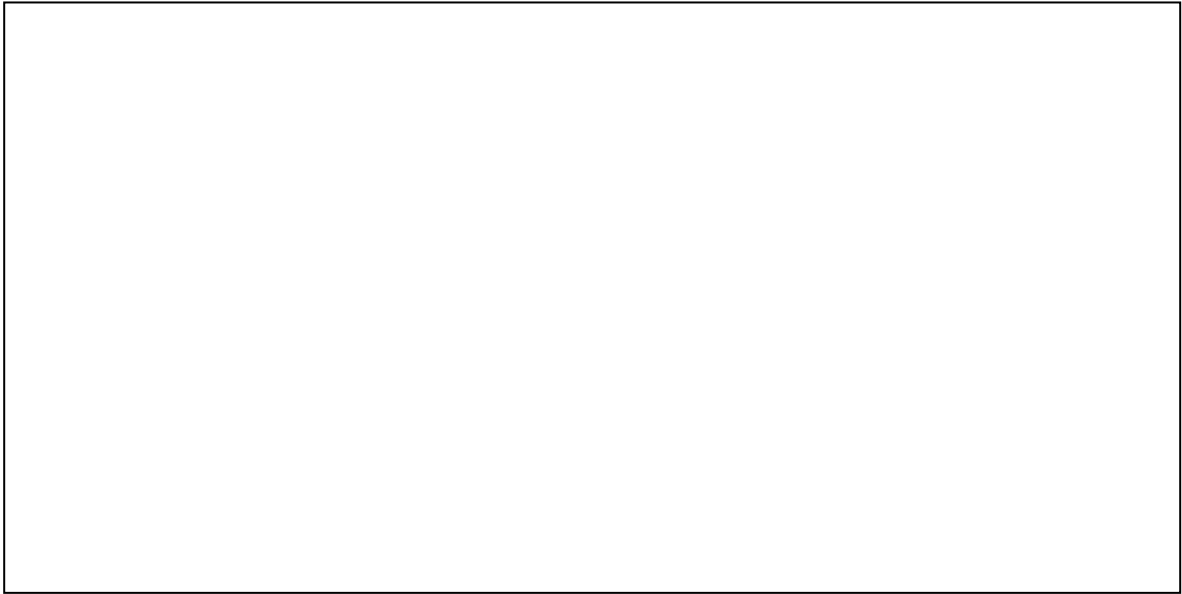
(3 marks)

(ii) Calculate the probability of Marcus selecting two good eggs in any order.



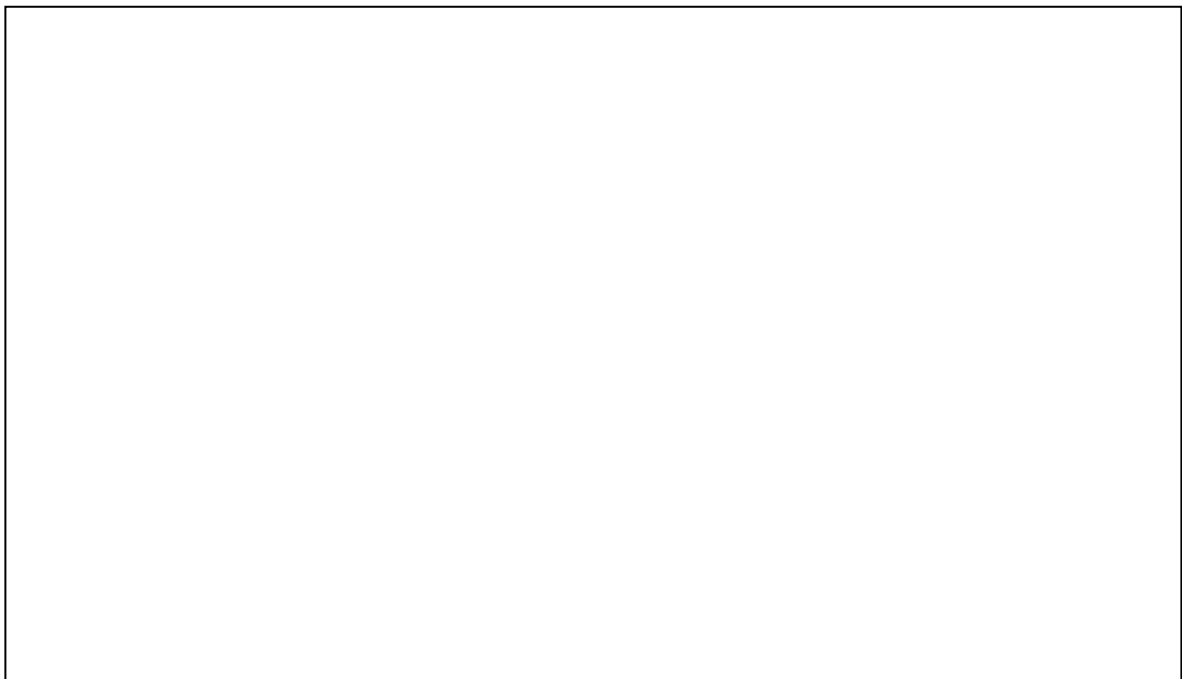
(2 marks)

(b) Find the limit of $\lim_{x \rightarrow 4} \frac{x^2 - 16}{x^2 - 2x - 8}$

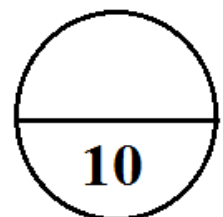


(2 marks)

(c) The first, second and n^{th} term of an arithmetic sequence are 2, 8 and 32. Find the sum of the n^{th} term.



(3 marks)



QUESTION 5

(a) Consider the sequence $\langle 2, 1, \frac{1}{2}, \frac{1}{4}, \dots \rangle$

(i) Find the common ratio.

(1 mark)

(ii) Show that the formula for the general term of the above sequence is given by $t_n = 2^{2-n}$

(2 marks)

(iii) Find the n^{th} term that gives the sequence $\frac{1}{32}$.

(2 marks)

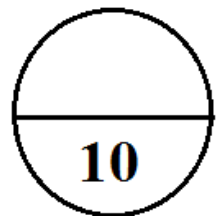
(b) Given $\sum_{i=1}^n 6i - 4 = 3n^2 - n$

- i. Show that the general formula for the sum of the n^{th} term of the sequence is $S_n = 3n^2 - n$

(3 marks)

- ii. Hence, find the 6^{th} term and the sum of the first three terms of the sequence.

(2 marks)



QUESTION 6

- (a) Find the angle that the line $\sqrt{3}x - y + 1 = 0$ makes with the positive x -axis

(2 marks)

- (b) If the distance between the points $A(-2, k)$ and $B(3, -2)$ is 13 units. Calculate the values of k .

(3 marks)

(c) The table drawn below gives the points on a straight line.

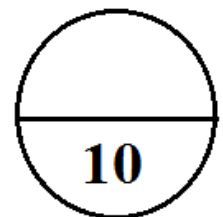
x	-4	a	2	6
y	11	5	b	-9

(i) Write the equation of the straight line in the form $y = mx + c$

(3 marks)

(ii) Using your answer in (i), to find the values of a and b

(2 marks)



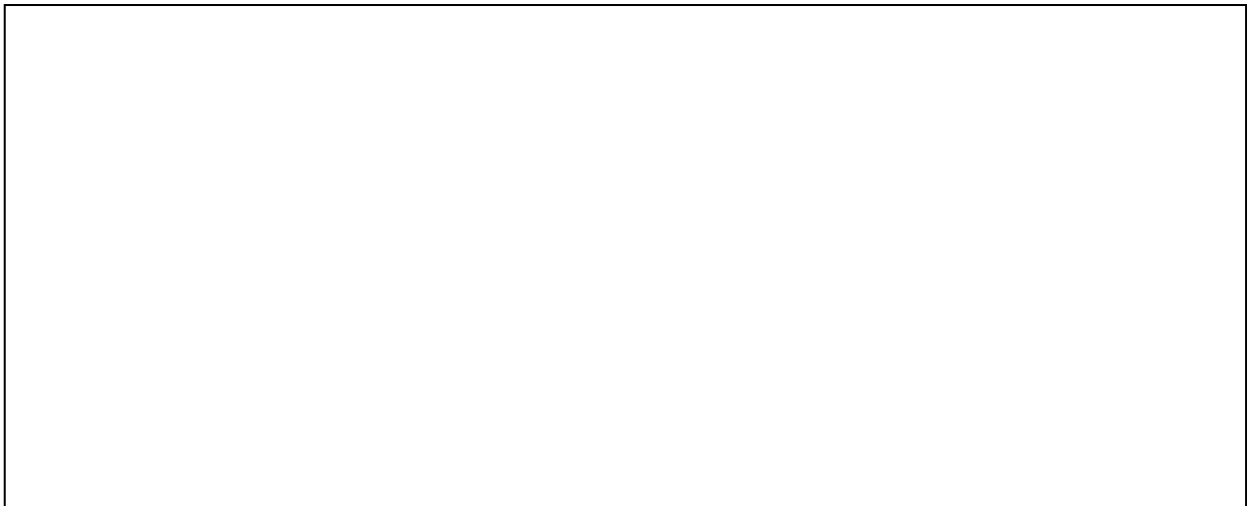
QUESTION 7

- (a) (i) Use the **First Principle** to find the derivative of the function
 $f(x) = -2x^2 + 1$



(3 marks)

- (i) Find the equation for the tangent line to the graph of $f(x) = -2x^2 + 1$ at $x = 1$

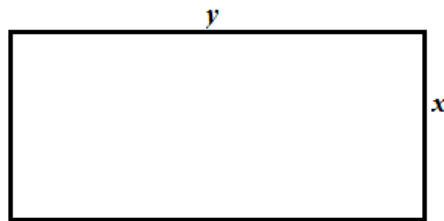


(2 marks)

- (b) Given $f(1)=2$ and $f'(1)=4$, find an equation for the normal line to the graph of $y=f(x)$ at $x=1$

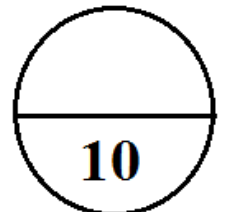
(2 marks)

- (c) A rectangular area of garden is to be fenced using $100m$ of chicken wire. Find the maximum area that can be enclosed. Use x and y for the dimensions of the rectangle.



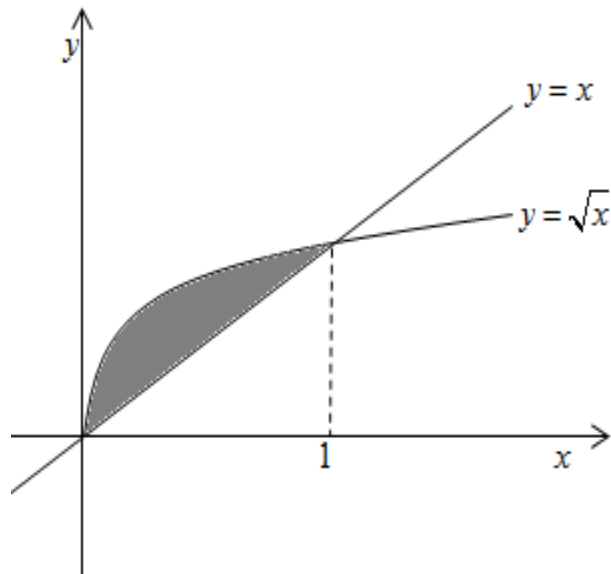
Maximum area = _____

(3 marks)



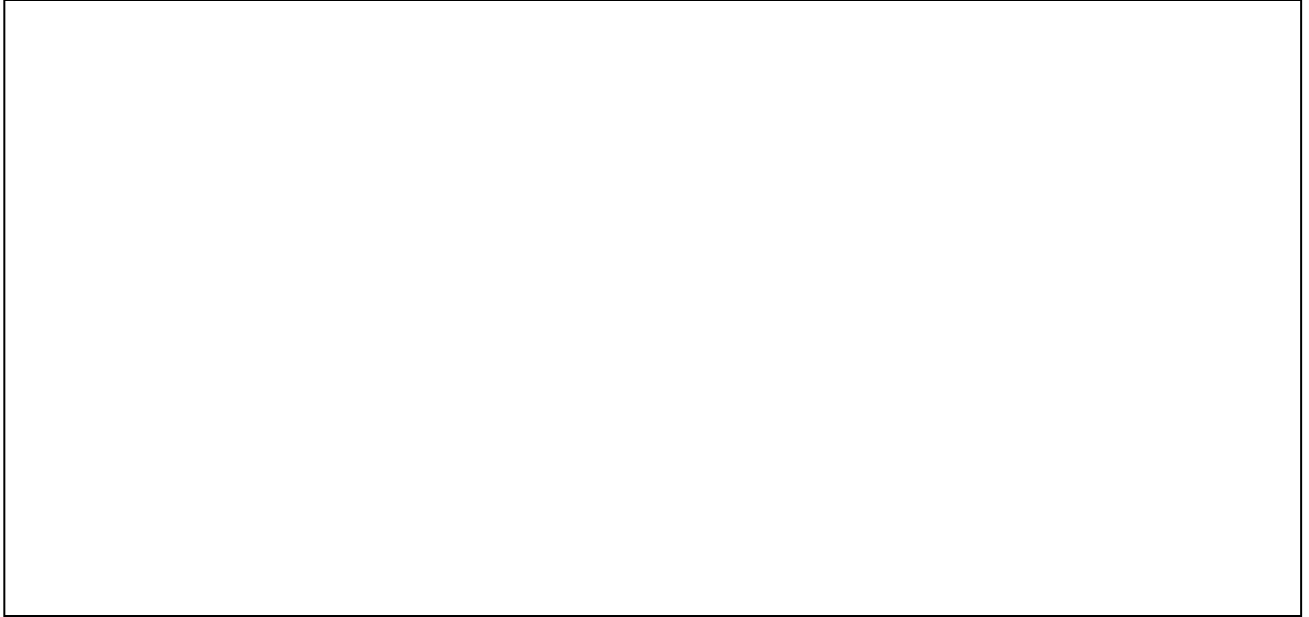
QUESTION 8

(a) Calculate the area of the shaded region in the graph below



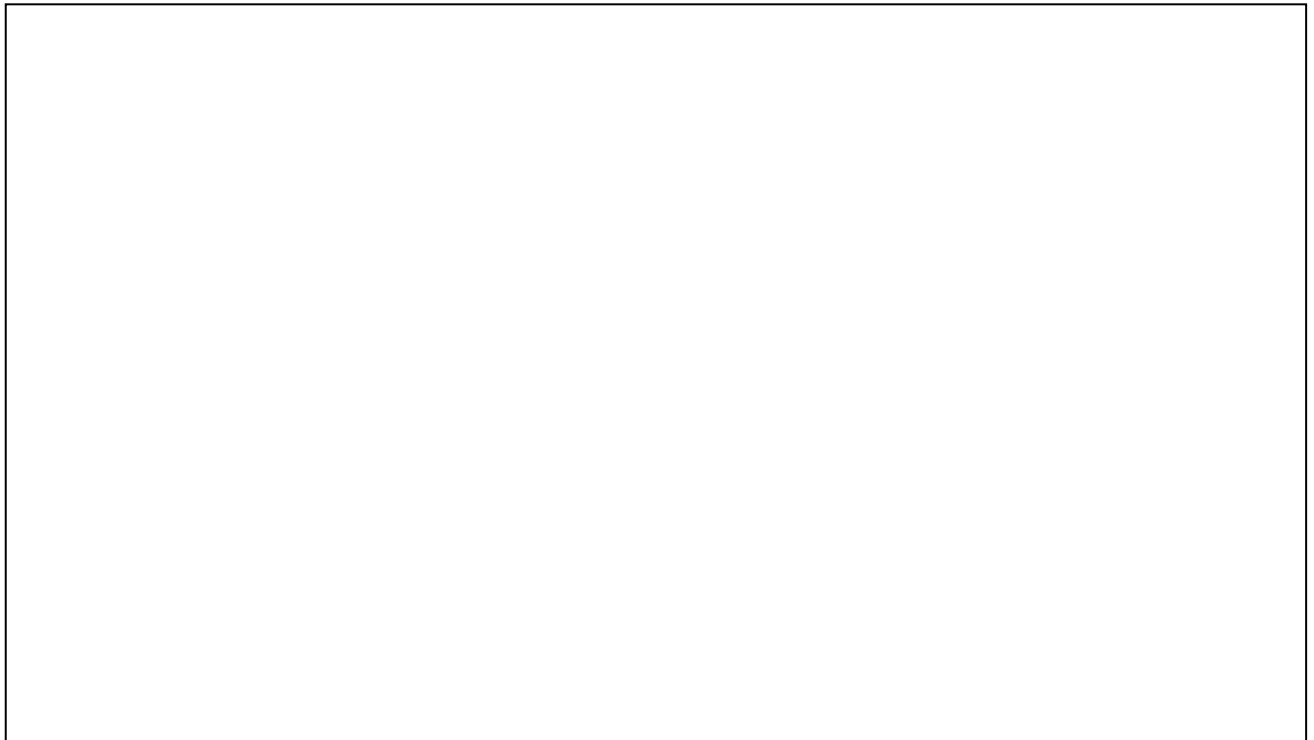
(3 marks)

(b) Evaluate $\int (x-2)(x+3)dx$



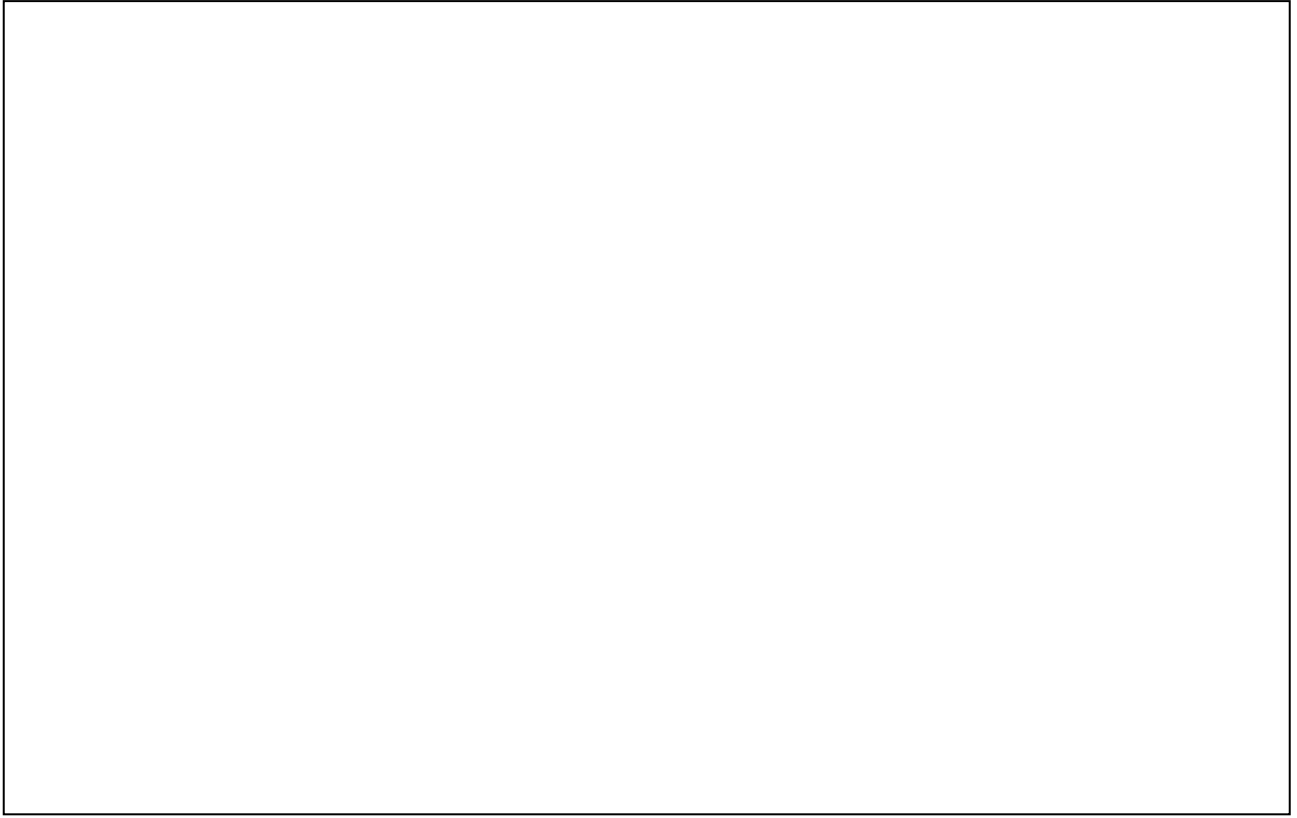
(3 marks)

(c) A line passes through the centre of a circle through the points $(1, -2)$ and $(5, -2)$. Find the coordinates of the centre of the circle and write its equation in the form $(x-a)^2 + (y-b)^2 = r^2$, the radius of the circle is 2 units.

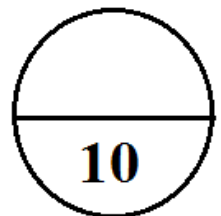


(2 marks)

(d) Prove that $\frac{1 - \sin^2 \theta}{\cos \theta (1 + \sin \theta)} = \sec \theta - \tan \theta$

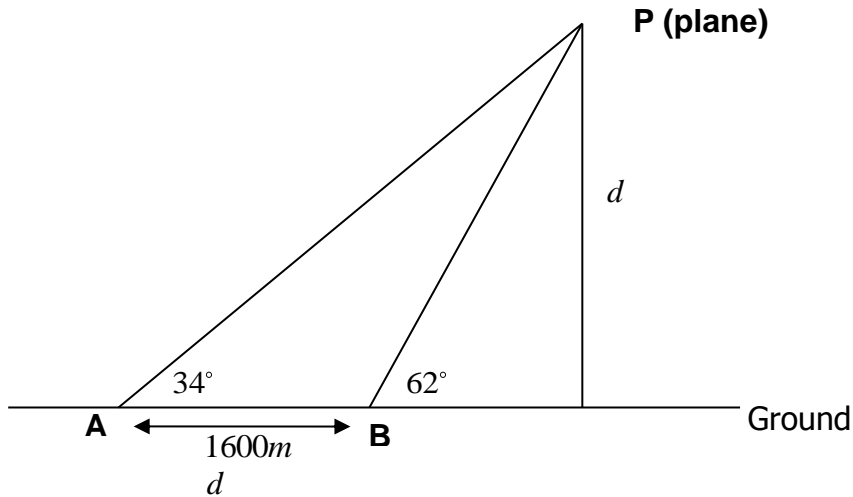


(2 marks)



QUESTION 9

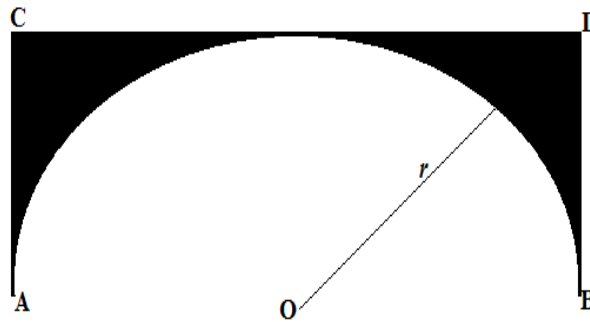
- (a) Two observers A and B sighted a plane above them in two different locations. Observer A saw plane P at an angle of 34° to the ground and observer B at an angle of 62° to the ground as shown below. The distance between the two observers is $1600m$.



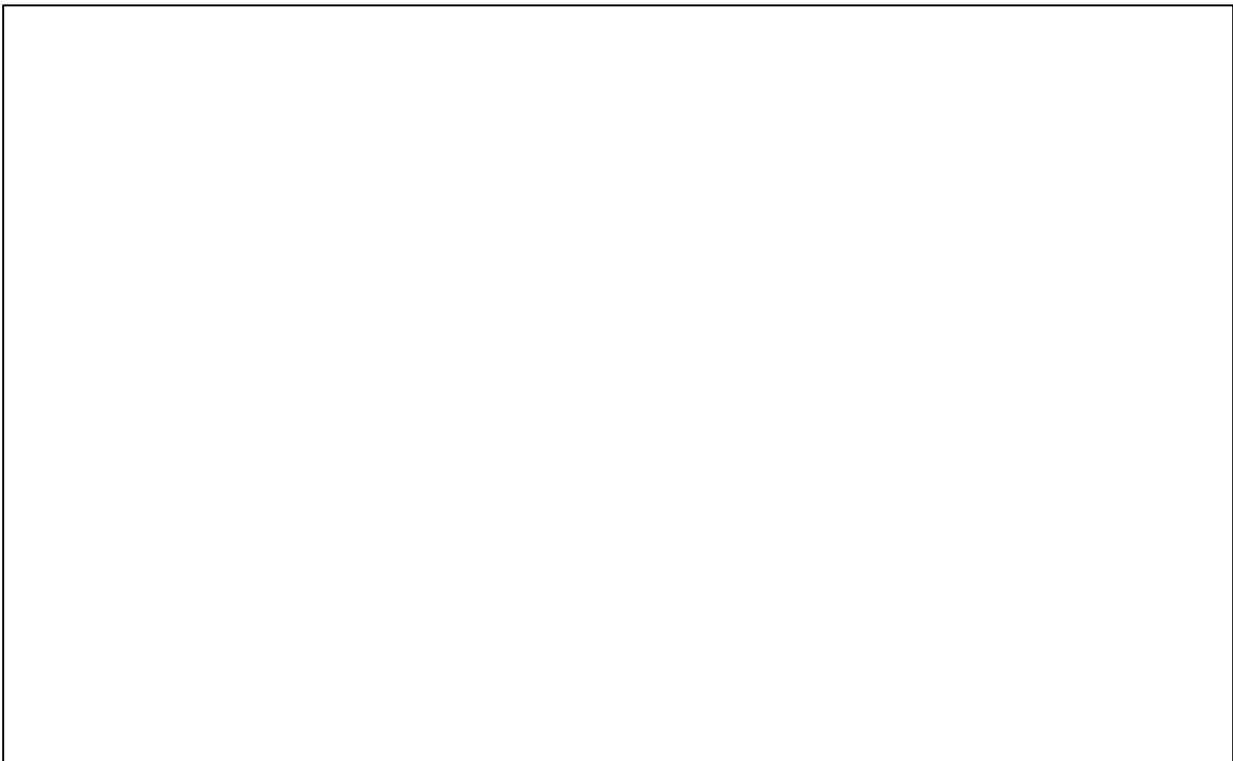
Calculate the perpendicular distance d of the plane from the ground, to the nearest metre.

(3 marks)

- (b) Consider the diagram below. The centre of the semi-circle is O and with a radius r



- (i) Show that the total area of the shaded region is $A = \frac{r^2}{2}(4 - \pi)$.



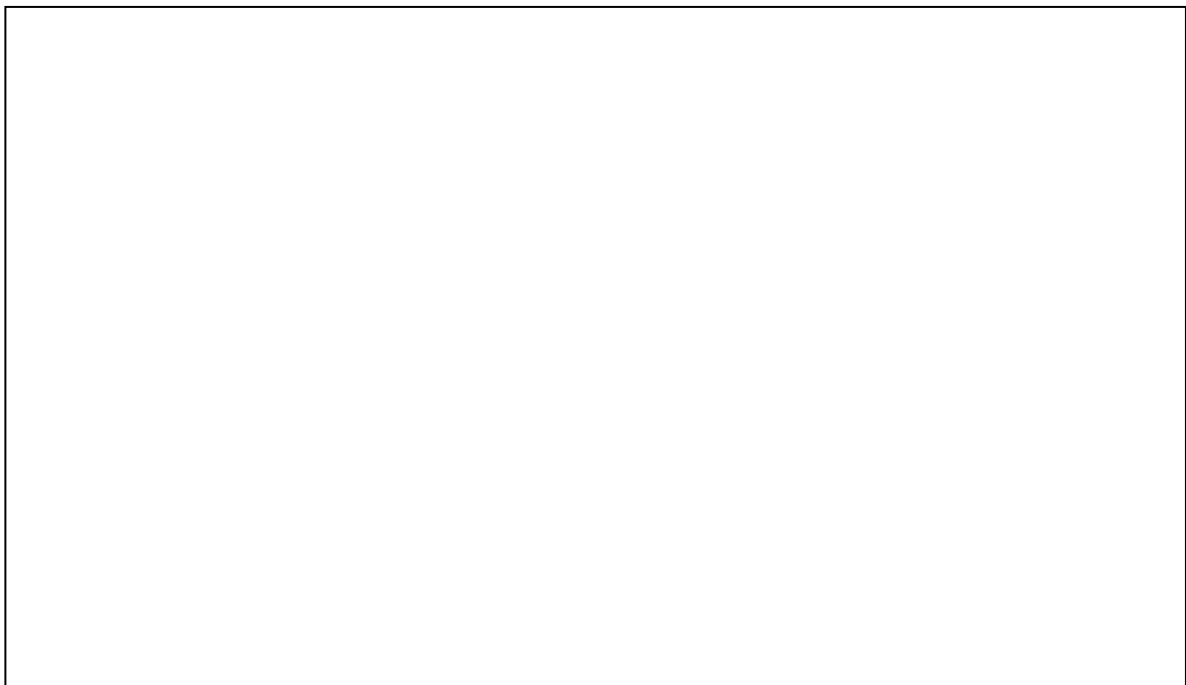
(3 marks)

- (ii) Calculate the value of the radius r if the area of the shaded region is 21cm^2 .
(Use $\pi = \frac{22}{7}$).

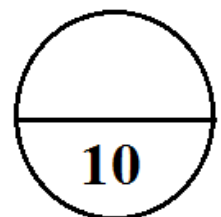


(2 marks)

- (iii) Use your answer in (ii) to calculate the total distance around the shape.



(2 marks)

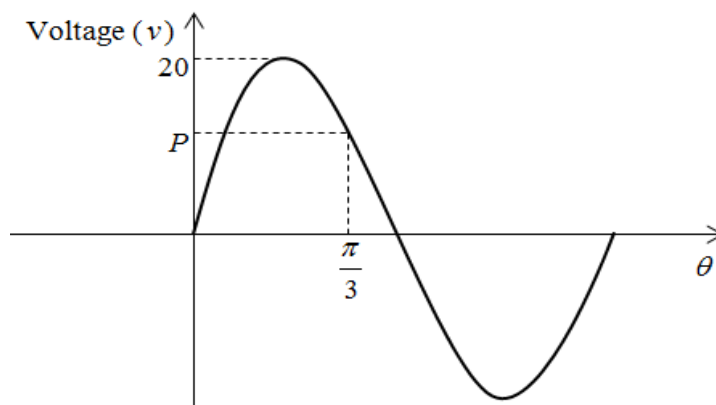


QUESTION 10

- (a) If $\sin \alpha = \frac{8}{10}$, calculate $2 \cos \alpha - 1$. (Hint: Use Pythagoras theorem)

(2 marks)

- (b) The graph below shows the instantaneous voltage of an AC power. The instantaneous voltage is given by the expression $v = V_p \sin \theta$, where v the instantaneous value of voltage, V_p is the peak voltage. Find the instantaneous voltage at point P , given $0 \leq \theta \leq 2\pi$.



(2 marks)

(c) In a test the average score of the 80 students is 45 with a standard deviation of 6. Assume the scores are normally distributed.

(i) What percentage of students scored between 30 and 63

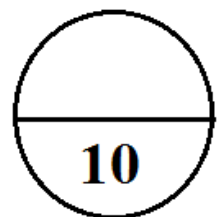
(3 marks)

(ii) How many students are expected to score more than 55?

(2 marks)

(iii) Find the range in which the marks of students **almost certainly** lie.

(1 mark)



This page has been left blank deliberately

MATHEMATICS 2017

Student Personal Identification Number

--	--	--	--	--	--	--	--	--	--

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:

B

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

B 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> |
|--|---|

FOR MARKER USE ONLY

QUESTION	MARKS	
M/C	20	
Q.1.	10	
Q.2.	10	
Q.3.	10	
Q.4.	10	
Q.5.	10	
Q.6.	10	
Q.7.	10	
Q.8.	10	
Q.9.	10	
Q.10.	10	
TOTAL	120	
CHECKER'S INITIAL		