REDDAM HOUSE

EXAMINATION:	**MATHEMATICS**		
GRADE:	**12**	**MARKS:**	**150**
DATE:	**14 MAY 2022**	**TIME:**	**3 HOURS**
EXAMINER:	**E KOTZE**	**MODERATOR:**	**I HARRISON**

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY:

1. Read carefully and answer all 13 questions in the spaces provided.
2. You may use an approved, non-programmable calculator.
3. All necessary working out must be clearly shown.
4. Where necessary round your solutions off to **ONE DECIMAL PLACE**
5. Write your name and the name of your Maths teacher in the space provided below:

NAME:
TEACHER'S NAME:

SECTION A

QUESTION 1 (12 marks)

In the table below, the average daily income for households and the mean family size have been tabulated for 10 areas in the Western Cape.

Average daily Income in Rand **(*x*)**	**Mean family size** **(y)**
423	3,31
516	3,14
657	2,98
798	2,7
1008	2,63
1023	2,59
1275	2,45
1398	2,34
1456	2,21
1667	2,15

a. State whether there is a positive or a negative correlation between the average daily income for households and the mean family size, using the necessary calculations. (2)

b.

i. Use your calculator to determine the equation of the regression line for the data, giving the answer correct to FOUR decimal digits. (4)

ii. Use the regression line equation to predict the family size of a family with an average daily income of correct to TWO decimal places. (2)

iii. Use the regression line equation to predict the average daily income for households (to the nearest unit) if the family size is 1,23. (2)

iv. Would you have confidence in this prediction for 1,23? Justify your answer. (2)

QUESTION 2 (19 marks)

a. Simplify:

(7)

b. It is given that and . Determine, **without using a calculator,** the value of .

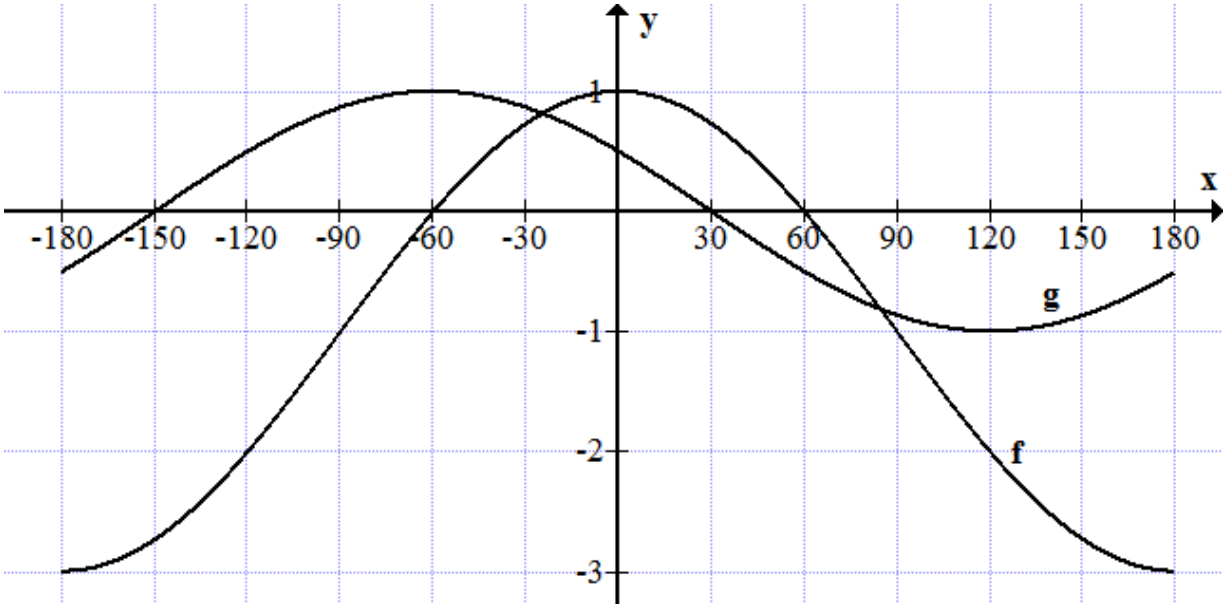
(5)

c. Determine the values of if given that:

(7)

QUESTION 3 (7 marks)

Sketched below are the graphs of and for the interval



a. Write down the range of the graph of . (2)

b. Write down the period of the graph of . (1)

c. Determine the value of and . (3)

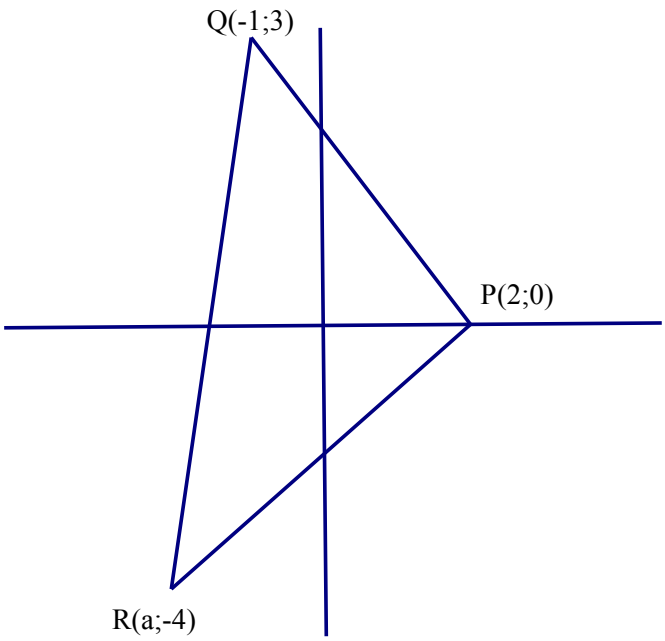
d. If it is given that then determine the amplitude of . (1)

QUESTION 4 (14 marks)

Refer to the figure (not drawn to scale):

Given: with vertices , and , where . The length of .

a. Determine the gradient of . (2)



b. Show that . (5)

c. State the coordinates of , such that forms a parallelogram. (2)

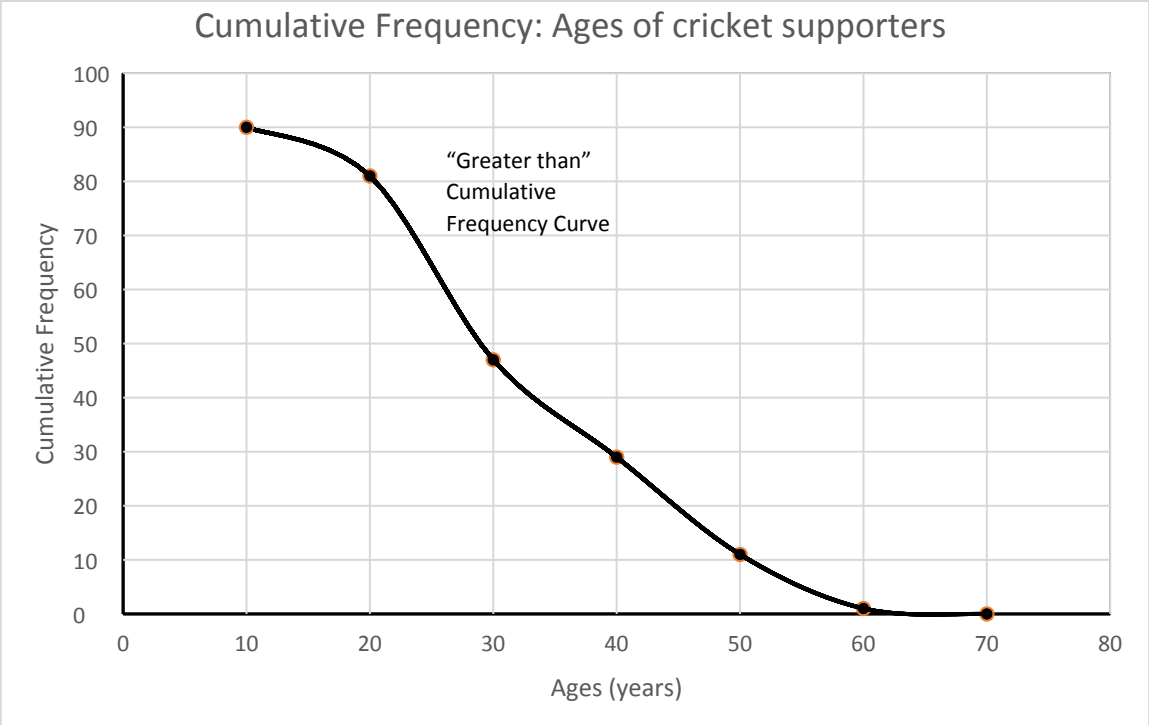
d. Determine the size of . (5)

QUESTION 5 (9 marks)

The table below summarises the ages of 90 cricket supporters at Kingsmead Cricket Stadium.

Age (years)	Frequency	Midpoint	Cumulative Frequency (Greater than)	Cumulative Frequency (Less than)
$10 < x \leq 20$	9	15	90	9
$20 < x \leq 30$	34	25	81	43
$30 < x \leq 40$	18	35	47	61
$40 < x \leq 50$	18	45	29	79
$50 < x \leq 60$	10	55	11	89
$60 < x \leq 70$	1	65	1	90

a. Using the data in the right hand column of the table, draw the **"Less than"** Cumulative Frequency Curve on the set of axes below.



(3)

b. The point of intersection of the "Less than" and "Greater than" cumulative frequency curves is used to determine the median of the data.

Show, on the graph, where the median will be read off (label it P) and estimate the value of the median. (2)

c.

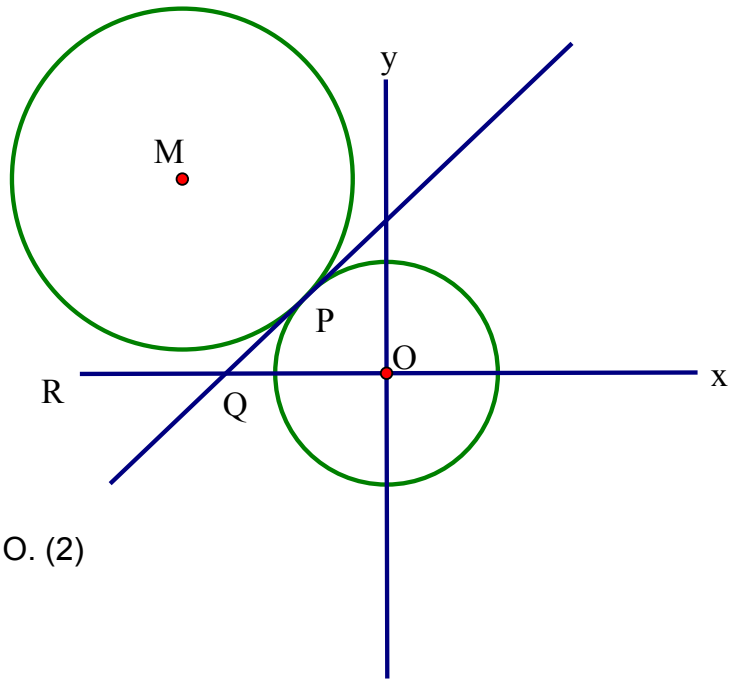
i. Calculate the mean age () **and** the standard deviation (σ) of the cricket supporters. (2)

ii. In order to determine if a data set is skewed, either (positively skewed) or (negatively skewed) needs to be analysed.

Given that the modal age is 25 years old, and with the use of your answers from question b and ci, determine if the data is skewed. (2)

QUESTION 6 (10 marks)

In the figure, two circles touch externally at the point P(-2 ; 3). O is the centre of one of the circles and M (-6 ; 9) is the centre of the second circle. The common tangent PQ cuts the *x*-axis at Q.



a. Determine the equation of circle O. (2)

b. Determine the equation of circle M. (4)

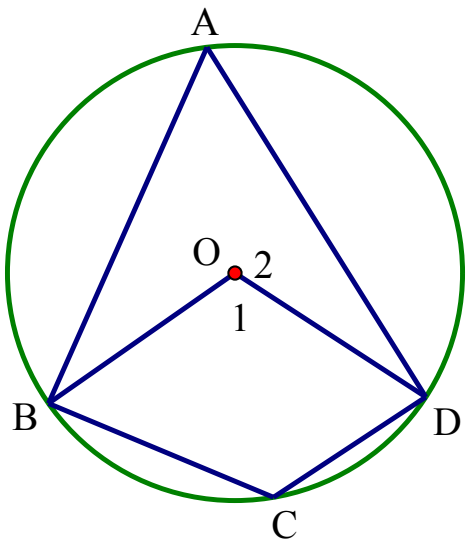
c. Find the equation of line PQ. (4)

QUESTION 7 (10 marks)

a.

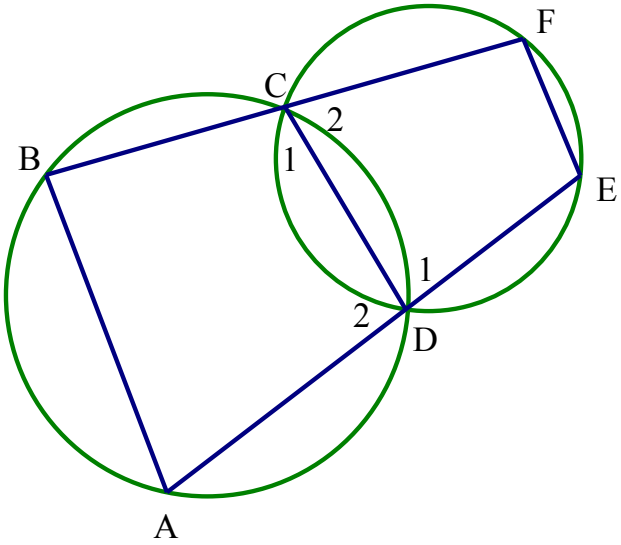
i. Complete the following statement: The angle subtended by a chord at the centre of the circle is _____the angle subtended by the same chord at the circumference of the circle. (1)

ii. Use the statement in a i to prove that = 180°. (5)



b. In the diagram below, CD is a common chord of the two circles. Straight lines ADE and BCF are drawn. Chords AB and EF are drawn.

Prove, with reasons, that EFAB. (4)



SECTION B

QUESTION 8 (25 marks)

a. Prove the following identity:

(6)

b. If , express in terms of *t*, showing all working detail. No calculator may be used.

i. (4)

ii. (3)

iii. (3)

c. Refer to the equation:

i. Show that this equation can be written as (4)

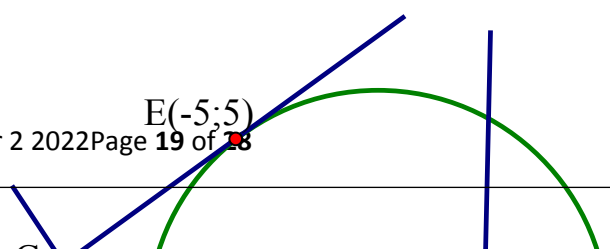
ii. Hence, or otherwise, determine the general solution of the equation

(5)

THIS PAGE MAY BE USED FOR WORKING

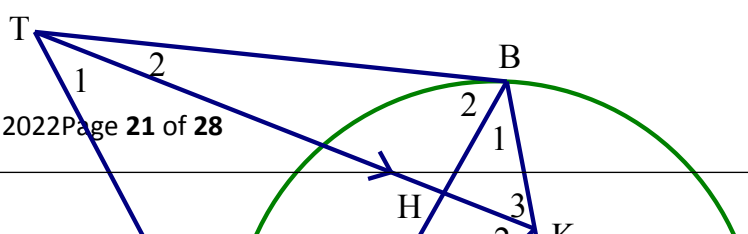
QUESTION 9 (7 marks)

Tangents to a circle with centre , touch the circle at and The tangents intersect at . The equation of circle is given as . Determine the ***x*-coordinate of G.** (7)



QUESTION 10 (10 marks)

In the diagram below, is drawn in the circle. and are tangents to the circle. The straight line is parallel to with on and on . is drawn. Let .



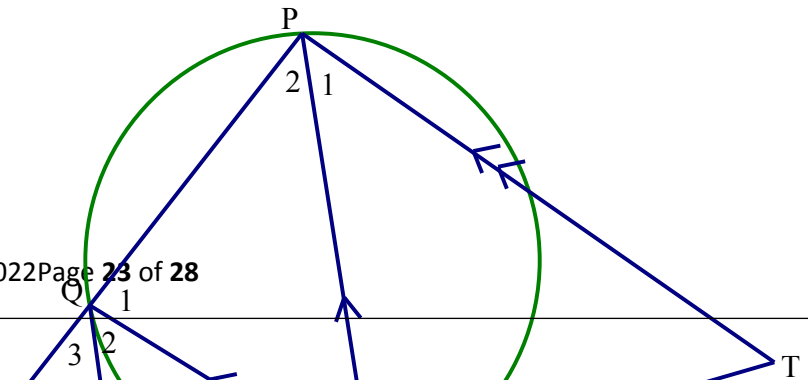
a. Prove that is a cyclic quadrilateral. (3)

b. Prove that bisects . (5)

c. Prove that is a tangent to the circle passing through the points and
(2)

QUESTION 11 (14 marks)

In the diagram, is a tangent. Chord produced meets the tangent at . and .



a. Prove, giving reasons, that:

i. (5)

ii. (2)

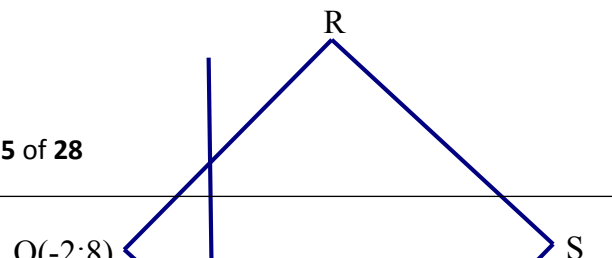
b. If given that , determine, giving reasons:

i. (2)

ii. (5)

QUESTION 12 (7 marks)

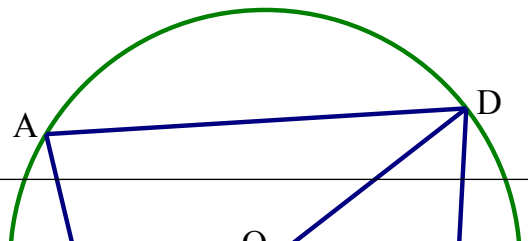
In the diagram below, is a square of side length units. is a vertex and the square cuts the -axis at Determine the equation of line . (7)



QUESTION 13 (6 marks)

In the given diagram, is the centre of the circle, and .

Express in terms of . (6)



TOTAL FOR THIS PAPER: 150