



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

NOVEMBER 2010

MATHEMATICS – PAPER 2

MARKS: 150

TIME: 3 hours

This question paper consists of 14 pages, including a formula sheet and 3 diagram sheets.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 11 questions. Answer ALL the questions.
2. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining the answers.
3. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
4. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
5. THREE diagram sheets for answering QUESTION 2.1, QUESTION 2.2 and QUESTION 9.1 are attached at the end of this question paper. Write your centre number and examination numbers on these sheets in the space provided and place it in your ANSWER BOOK.
6. Diagrams are NOT drawn to scale.
7. Number the answers correctly according to the numbering system used in this question paper.

QUESTION 1

1.1 The following statistical data is available:

The minimum value is 23, the maximum value 123, the lower quartile 58, the median is 14 more than the lower quartile and the semi-inter-quartile range is 19.

1.1.1 Draw a box and whisker diagram of the data. (6)

1.1.2 Comment on the skewness of the data. (1)

1.2 The scores for 5 batsmen in two opposing cricket teams are given as follows:

Team A: {25 ; 30 ; 37 ; 41 ; 57}

Team B: {9 ; 21 ; 46 ; 51 ; 63}

Use the standard deviations for both teams to comment on the scores for the 2 teams. (5)

[12]

QUESTION 2

2.1 The following table shows the number of pages and the weight in grams for each of 10 books.

No of pages	80	130	100	140	115	90	160	140	105	150
Weight	160	270	180	290	230	180	320	270	210	300

2.1.1 Use the diagram sheet and draw a scatter plot for the information above. (3)

2.1.2 Use the scatter plot and describe the relationship between the number of pages and the weight of the books. (1)

2.1.3 Draw a line of best fit. (2)

2.1.4 Use this line to estimate:

2.1.4.1 The number of pages with a book weighing 280 g. (1)

2.1.4.2 The weight of a book with 200 pages. (1)

2.2 The table below shows the marks of 200 matrics in Mathematics.

Marks	Frequency	Cum. Frequency
$0 \leq x < 20$		22
$20 \leq x < 40$		68
$40 \leq x < 60$		142
$60 \leq x < 80$		179
$80 \leq x < 100$		200

2.2.1 Complete the frequency column of the table. (Use the table on the diagram sheet.) (2)

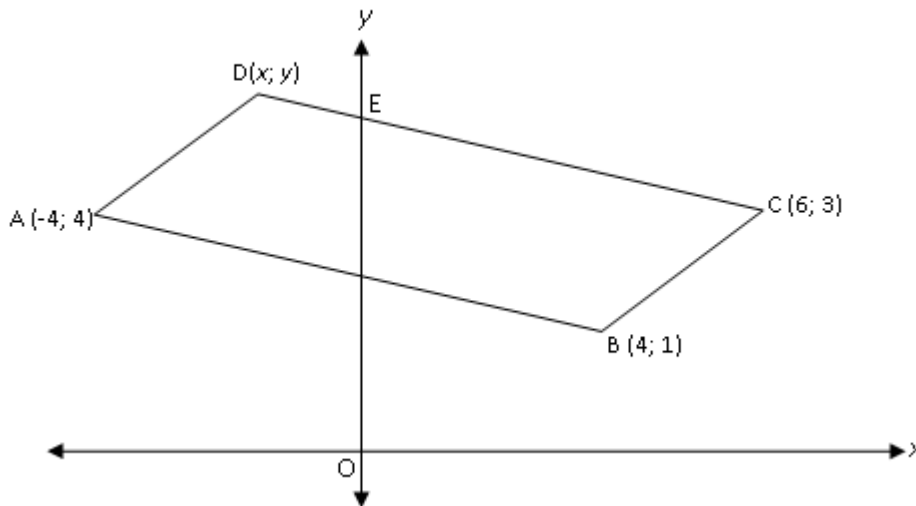
2.2.2 Draw an ogive curve for the data. (Use the grid on the diagram sheet.) (4)

2.2.3 The top 20% of the learners were allowed entry to university. Determine the required mark for entry to university. Indicate your answer with the letter A on the graph. (2)

[16]

QUESTION 3

The diagram shows parallelogram ABCD with A (-4; 4), B (4; 1), C (6; 3) and D(x; y). E is a point on the y-axis and lies on CD.



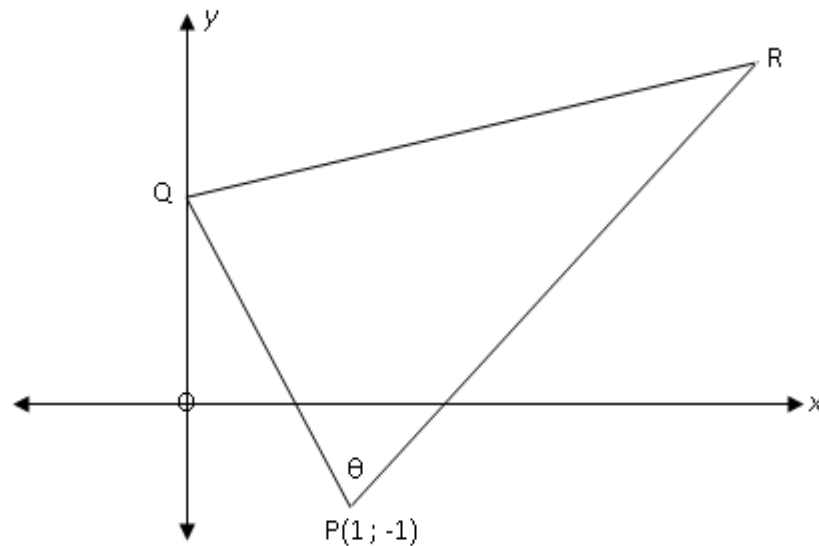
3.1 Determine the equation of DC. (5)

3.2 Write down the coordinates of D. (2)

- 3.3 Establish whether E is the midpoint of DC. Show all calculations clearly. (4)
- 3.4 Determine the length of AB. Leave the answer in surd form. (3)
- 3.5 Prove that the inclination of AD with the positive x -axis is 45° . (3)
- [17]**

QUESTION 4

The following diagram shows $\triangle PQR$ with $P(1; -1)$. The equation of QR is $x - 3y = -6$ and that of PR is $x - y - 2 = 0$. $\angle RPQ = \theta$.



- 4.1 Write down the y coordinate of Q. (2)
- 4.2 Prove that $PQ \perp QR$. (3)
- 4.3 Write down the gradient of PR. (1)
- 4.4 Calculate the value of θ in degrees, rounded off to two decimal places (5)
- 4.5 Find the equation of the median PS, with S on QR if the y coordinate of R is 4 (7)
- [18]**

QUESTION 5

5.1 Given: $f(x) = -3\sin x$ $x \in [-90^\circ ; 90^\circ]$

5.1.1 Write down the coordinates of the maximum point of $g(x)$ which is the reflection of f in the y -axis. (2)

5.1.2 Write down the coordinates of the turning points of $h(x)$ which is the reflection of f in the x -axis (4)

5.2 The points $R(2; -1)$, $P(-1; 3)$ and $Q(-3; -2)$ are given.

5.2.1 Translate $\triangle PQR$, -3 units horizontally and 2 units vertically. Write down the coordinates and call it R' , P' and Q' . (3)

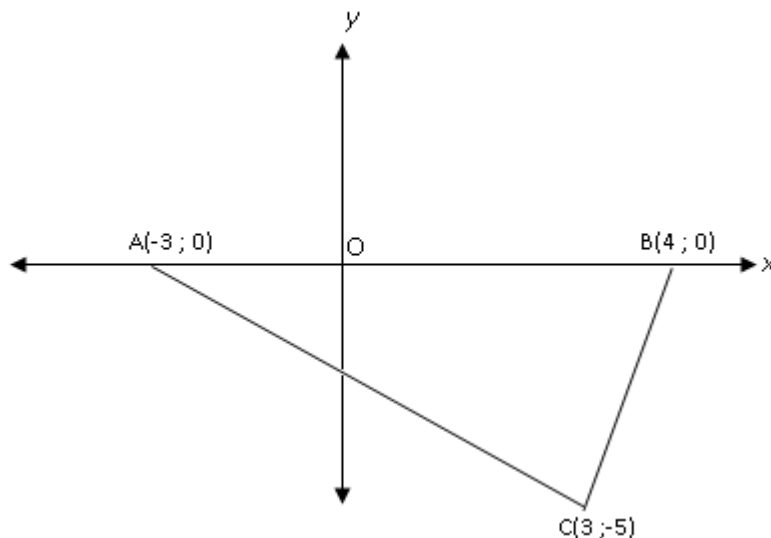
5.2.2 Write down the coordinates of Q'' which is the rotation of Q' through 90° anticlockwise. (2)

5.2.3 Reflect the point P in the line $y = -x$ and write down the coordinates as P'' . (2)

5.2.4 Write down the rule for the reflection in the y -axis. (2)

5.2.5 Write down the coordinates of R'' which is the reflection of R' in the y -axis. (2)

5.3 $A(-3; 0)$, $B(4; 0)$ and $C(3; -5)$ are points in a Cartesian plane.



5.3.1 Find the area of $\triangle ABC$. (2)

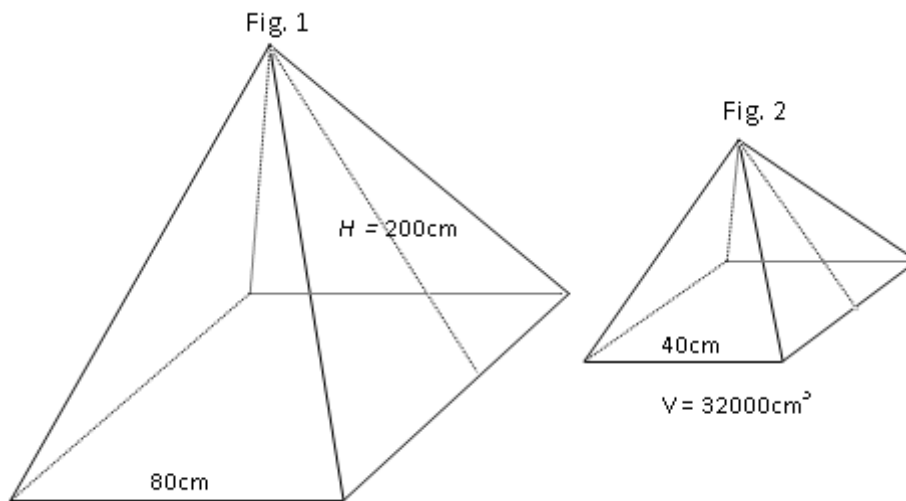
5.3.2 With what factor will the area of $\triangle ABC$ increase if it is enlarged by a scale factor of 2? (2)

5.3.3 If $\Delta A'B'C'$ is the enlarged triangle, what is the ratio of the sides of ΔABC with respect to $\Delta A'B'C'$? (2)

5.3.4 Write down the length of $A'B'$. (2)
[25]

QUESTION 6

A pyramid with the following dimensions are given below: the slant height H 200 cm and the base sides 80 cm. [$V = \frac{1}{3}$ area of base. Height]

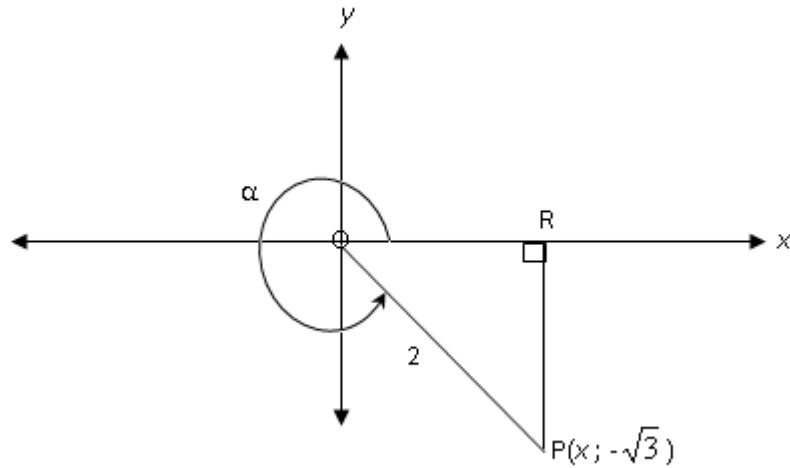


6.1 Calculate the volume of the pyramid in Figure 1. (5)

6.2 If the pyramid is cut off at the top to leave a smaller pyramid with base sides 40 cm x 40 cm (Figure 2) and volume $32\,000 \text{ cm}^3$, calculate the surface area of the sides of the smaller pyramid. (6)
[11]

QUESTION 7

- 7.1 The diagram below shows the point $P(x; -\sqrt{3})$ in a Cartesian plane.
 $OP = 2$ units and $\hat{R}OP = \alpha$



Find the value of:

7.1.1 x (1)

7.1.2 $\sin(360^\circ - \alpha)$ (2)

- 7.2 If $\cos 160^\circ = \frac{1}{p}$, determine, without the use of a calculator, the value of $\sin 250^\circ$ in terms of p . (4)
[7]

QUESTION 8

- 8.1 Prove the following identity:

$$\frac{1}{\cos^2 x} + \frac{1}{\sin^2 x} = \frac{1}{\cos^2 x \cdot \sin^2 x} \quad (3)$$

- 8.2 Without the help of a calculator, simplify into one trigonometric ratio:

$$\sqrt{\frac{\sin(-390^\circ)}{\cos 240^\circ} + \tan(180^\circ + \theta) \cdot \cos(180^\circ + \theta) \cdot \cos(90^\circ - \theta)} \quad (9)$$

[12]

QUESTION 9

- 9.1 Draw the graphs of the following functions on the same set of axes provided on the diagram sheet for $x \in [-120^\circ; 210^\circ]$

(i) $f(x) = -\cos 2x$ and

(ii) $g(x) = -\sin(x - 90^\circ)$ (6)

- 9.2 Determine from your graph the values for x such that:

9.2.1 $g(x) + \frac{1}{2} = 1$ (2)

9.2.2 $f(180^\circ) - g(x) = 0$ (2)

9.2.3 $g(x) > f(x)$ (3)
[13]

QUESTION 10

- 10.1 Solve for θ in the following trigonometric equation:

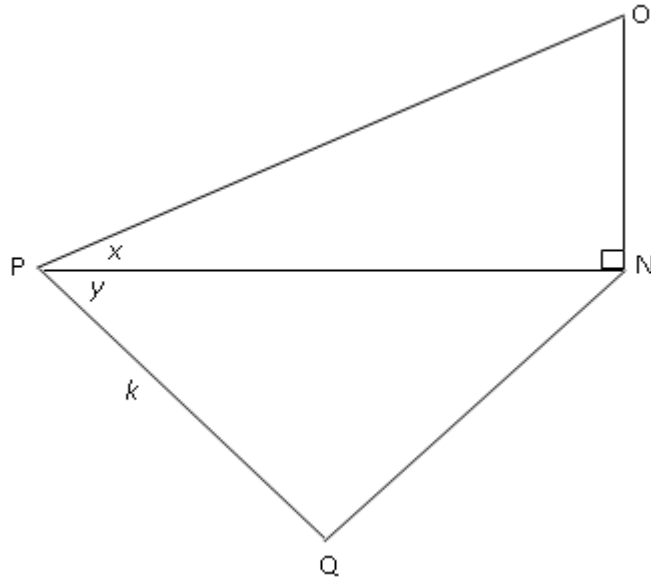
$-4\cos 2\theta + 1 = 0$; $\theta \in [-180^\circ; 270^\circ]$ (5)

- 10.2 Determine the general solution of:

$3\tan 2x = 3,2$ (5)
[10]

QUESTION 11

ON is a pylon of Eskom and a vantage point for an owl at night. $\triangle NPQ$ in the horizontal plane represents the owl's hunting area. The distance between P and Q is k meters. The angle of elevation from P to O is x degrees. The area of $\triangle NPQ$ is h square meters. $\hat{NPQ} = y$.



- 11.1 Determine the distance PN in terms of h , k and y . (2)
- 11.2 Determine how high above the ground the owl's vantage point is. (3)
- 11.3 Calculate the owl's hunting area if $ON = 30\text{m}$, $x = 15,8^\circ$, $y = 31,7^\circ$ and $k = 186\text{m}$. (4)

[9]

TOTAL: 150

FORMULA SHEET: MATHEMATICS

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad A = P(1 + ni) \quad A = P(1 - ni) \quad A = P(1 - i)^n \quad A = P(1 + i)^n$$

$$\sum_{i=1}^n 1 = n \quad \sum_{i=1}^n i = \frac{n(n+1)}{2} \quad \sum_{i=1}^n (a + (i-1)d) = \frac{n}{2}(2a + (n-1)d)$$

$$\sum_{i=1}^n ar^{i-1} = \frac{a(r^n - 1)}{r - 1} ; \quad r \neq 1 \quad \sum_{i=1}^{\infty} ar^{i-1} = \frac{a}{1 - r} ; \quad -1 < r < 1$$

$$F = \frac{x[(1+i)^n - 1]}{i} \quad P = \frac{x[1 - (1+i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad y = mx + c \quad y - y_1 = m(x - x_1) \quad m = \tan \theta \quad (x - a)^2 + (y - b)^2 = r^2$$

In $\triangle ABC$:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \quad a^2 = b^2 + c^2 - 2bc \cdot \cos A \quad \text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta \quad \sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta \quad \cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta$$

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2\sin^2 \alpha \\ 2\cos^2 \alpha - 1 \end{cases} \quad \sin 2\alpha = 2\sin \alpha \cdot \cos \alpha$$

$$\bar{x} = \frac{\sum fx}{n} \quad \sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \quad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx \quad b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

DIAGRAM SHEET 1

CENTRE NUMBER: SENTRUMNOMMER

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NAME AND SURNAME

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QUESTION 2.1.1

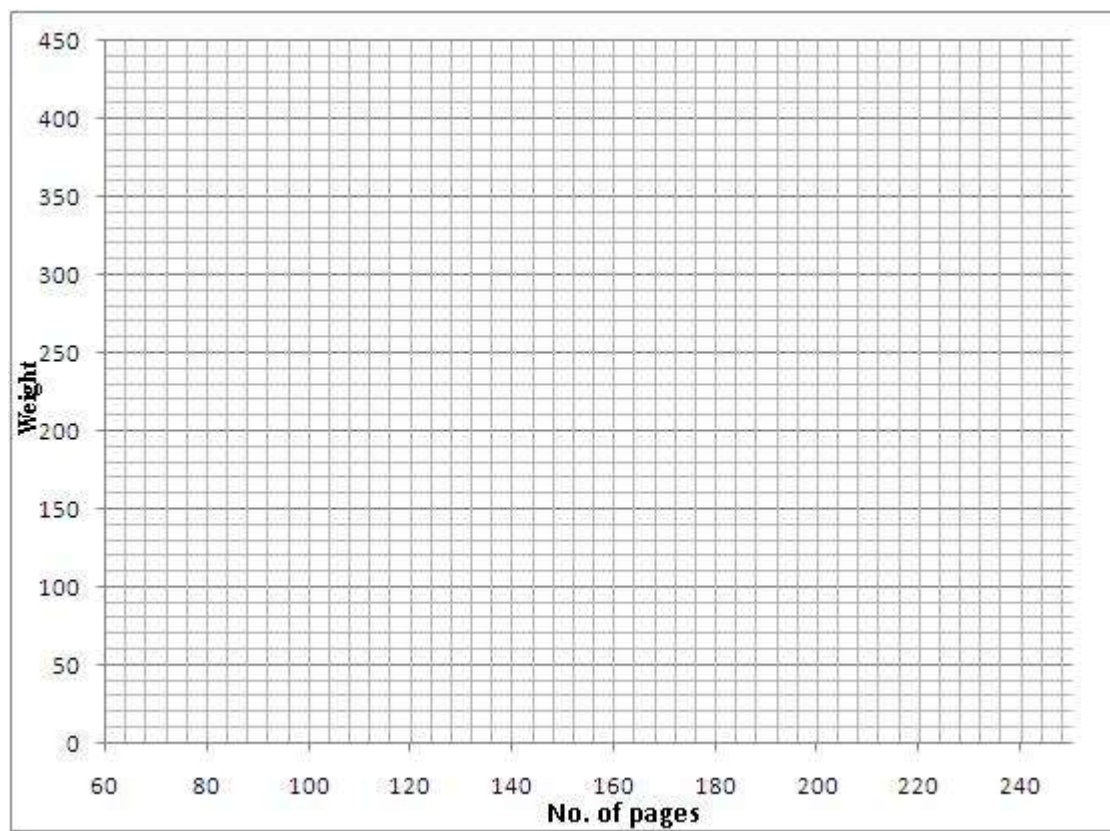


DIAGRAM SHEET 2

CENTRE NUMBER:

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NAME AND SURNAME

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QUESTION 2.2.1

Marks	Frequency	Cum. Frequency
$0 \leq x < 20$		22
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$60 \leq x < 80$		179
$80 \leq x < 100$		200

QUESTION 2.2.2

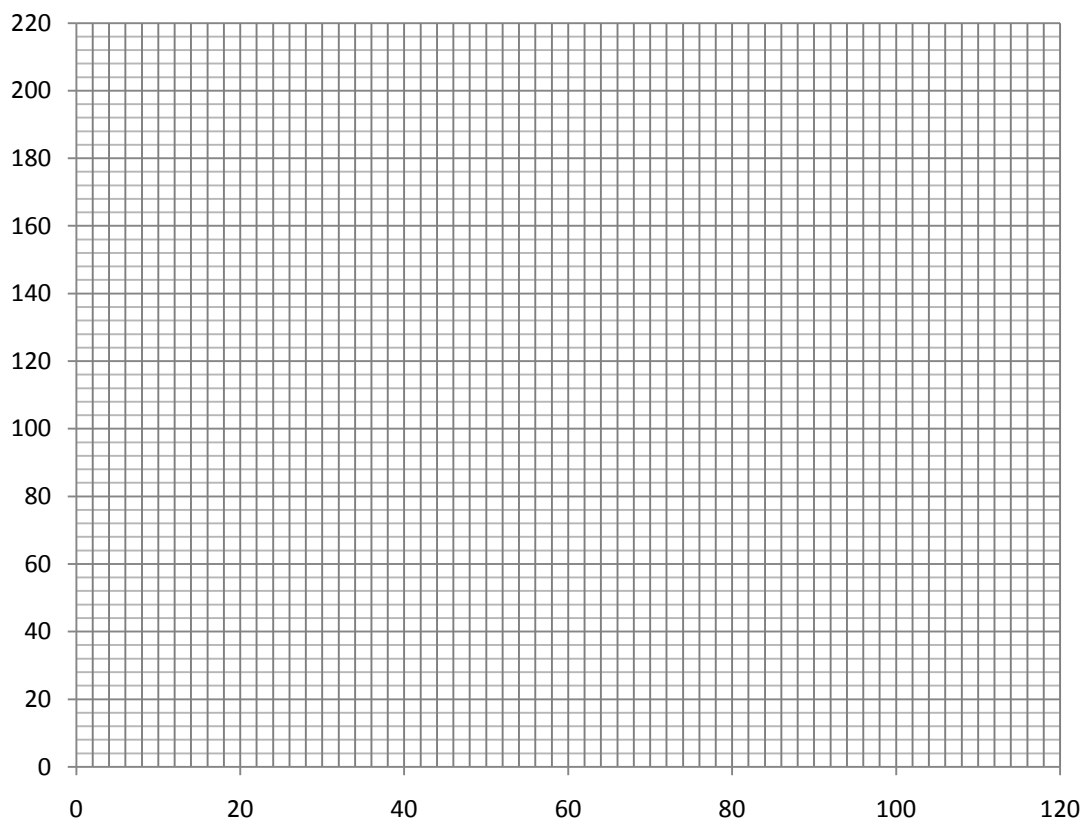


DIAGRAM SHEET 3

CENTRE NUMBER

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NAME AND SURNAME:

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QUESTION 9.1

