GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION
2025

NAME OF SCHOOL	
CANDIDATE'S NAME	
DATE	D D M M Y Y Y Y
TEACHER	

BOOK NUMBER		OF		BOOK(S)
PAPER NUMBER	2			

SUBJECT NAME	**MATHEMATICS (10612)**

ANSWER ALL THE QUESTIONS IN THE QUESTION PAPER.

MARKER				MODERATOR'S INITIALS IN RELEVANT BLOCK						RE-MARK/RE-CHECK			
Question	Marks		Marker's Code & Initials	Marks						Question	Marks		Initials
1										1			
2										2			
3										3			
4										4			
5										5			
6										6			
7										7			
8										8			
9										9			
10										10			
11										11			
			TOTAL							TOTAL			

TIME: 3 hours

MARKS: 150

34 pages + 1 information sheet

P.T.O.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 11 questions. Answer ALL questions in the spaces provided.

2. Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your answers.

3. Answers only will NOT necessarily be awarded full marks.

4. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.

5. If necessary, round-off answers correct to TWO decimal places, unless stated otherwise.

6. Diagrams are NOT necessarily drawn to scale.

7. An information sheet with formulae is included at the end of the question paper.

8. No pages may be torn from this question paper.

9. Candidates may not retain a question paper or remove it from the examination room. Question papers must be returned to the invigilator at the end of the examination session.

10. Answers must be written in black/blue ink as distinctly as possible. Do NOT write in the margins.

11. Indicate the questions you have answered by drawing a circle around the relevant numbers on the front cover of the question paper where marks are to be recorded.

12. Draw a neat line through any work/rough work that must NOT be marked.

13. In the event that you use the additional space provided:

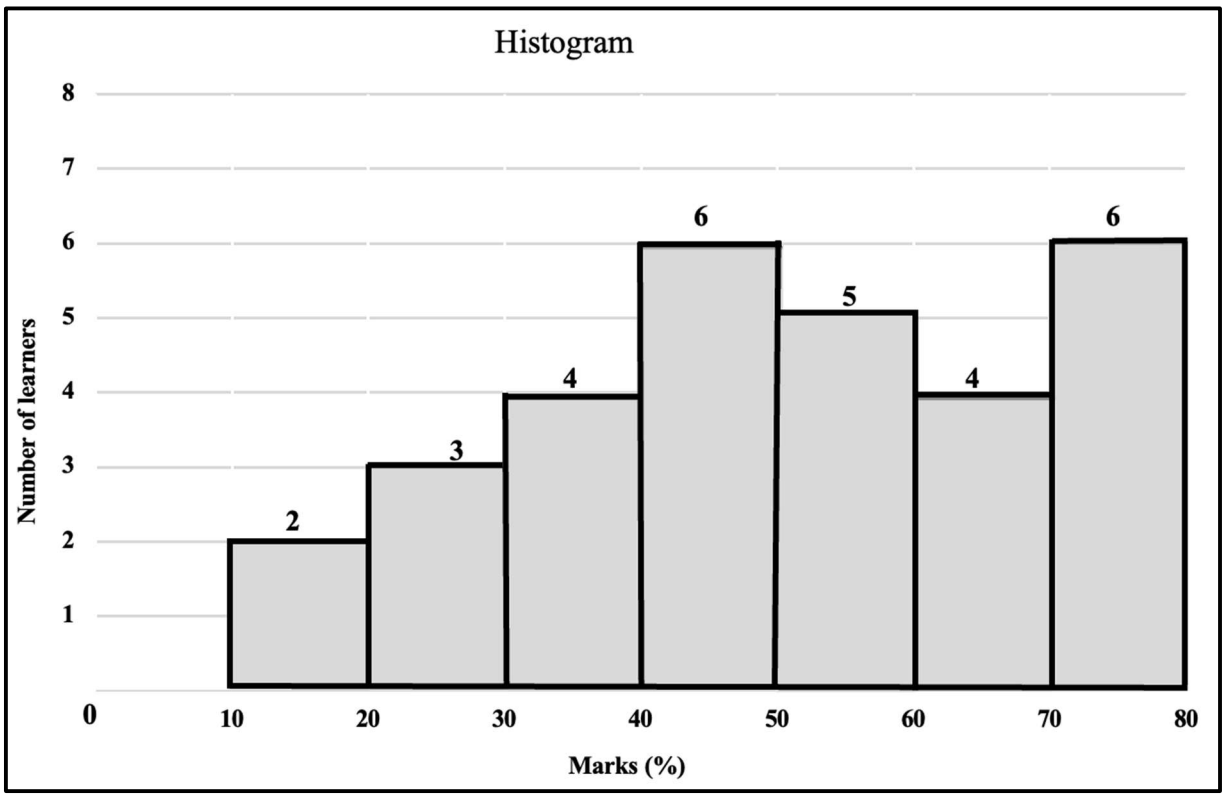
    13.1 Write down the number of the question.
    13.2 Leave a line and rule off after your answer.

14. Write neatly and legibly.

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QUESTION 1

The histogram below shows the marks (in %) of Grade 11 learners in their November 2024 examination.

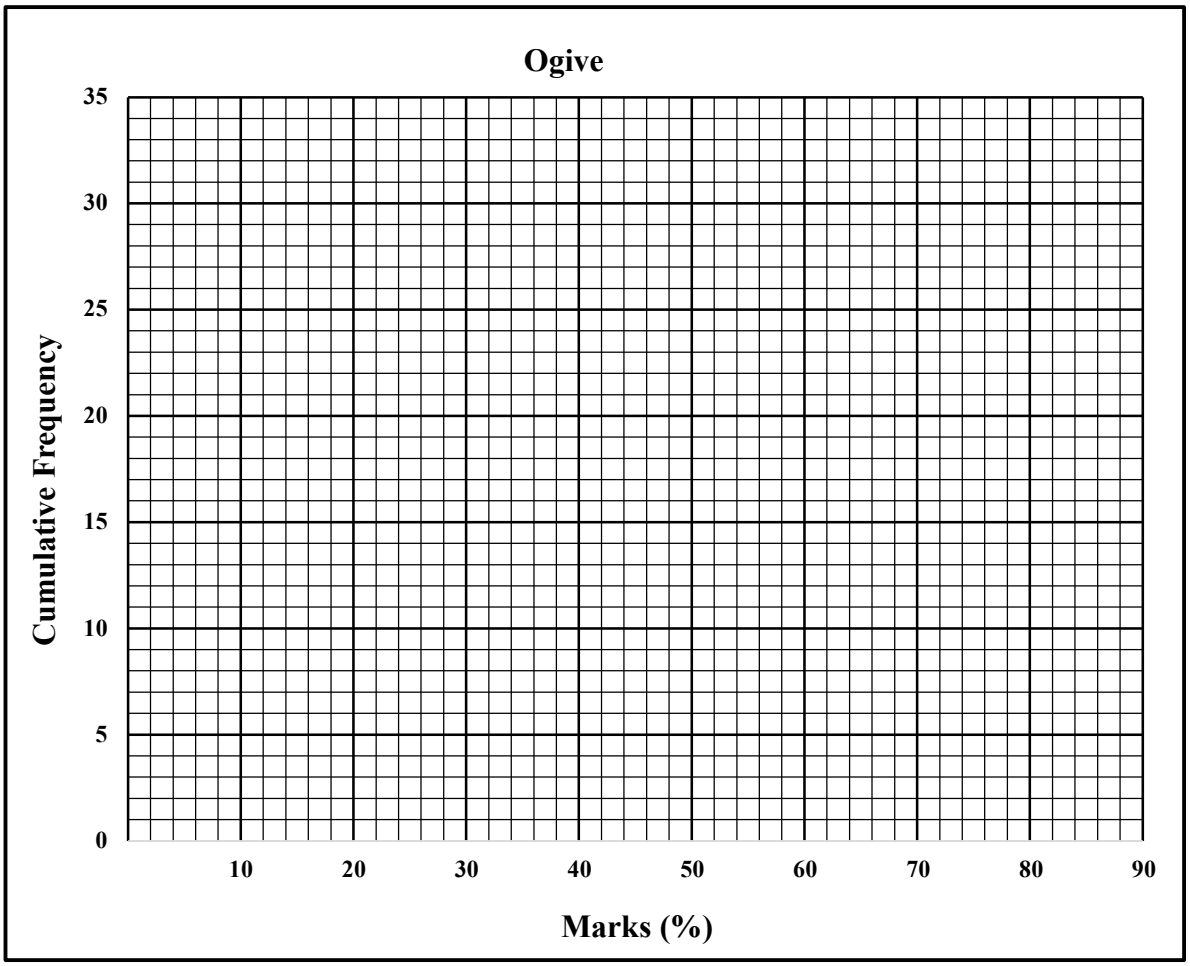


1.1	Complete the table below.	

Class Interval (Marks in %)	Frequency	Cumulative frequency
$10 \leq x < 20$		
$20 \leq x < 30$		
$30 \leq x < 40$		
$40 \leq x < 50$		
$50 \leq x < 60$		
$60 \leq x < 70$		
$70 \leq x < 80$		
TOTAL		

(2)

1.2 Draw an ogive (cumulative frequency graph) to represent the data.

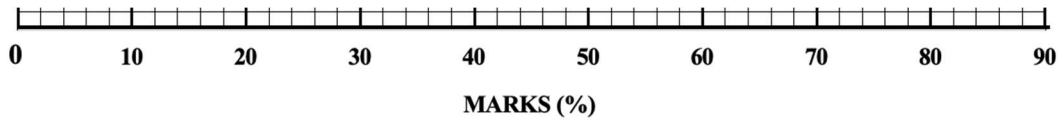


(3)

1.3 Use the ogive to estimate how many learners obtained at least 54% in the examination.

(2)

1.4 It is further given that the minimum mark is 12% and the range of the data is 66%.
Use the grid provided to draw a box-and-whisker diagram.



(4)

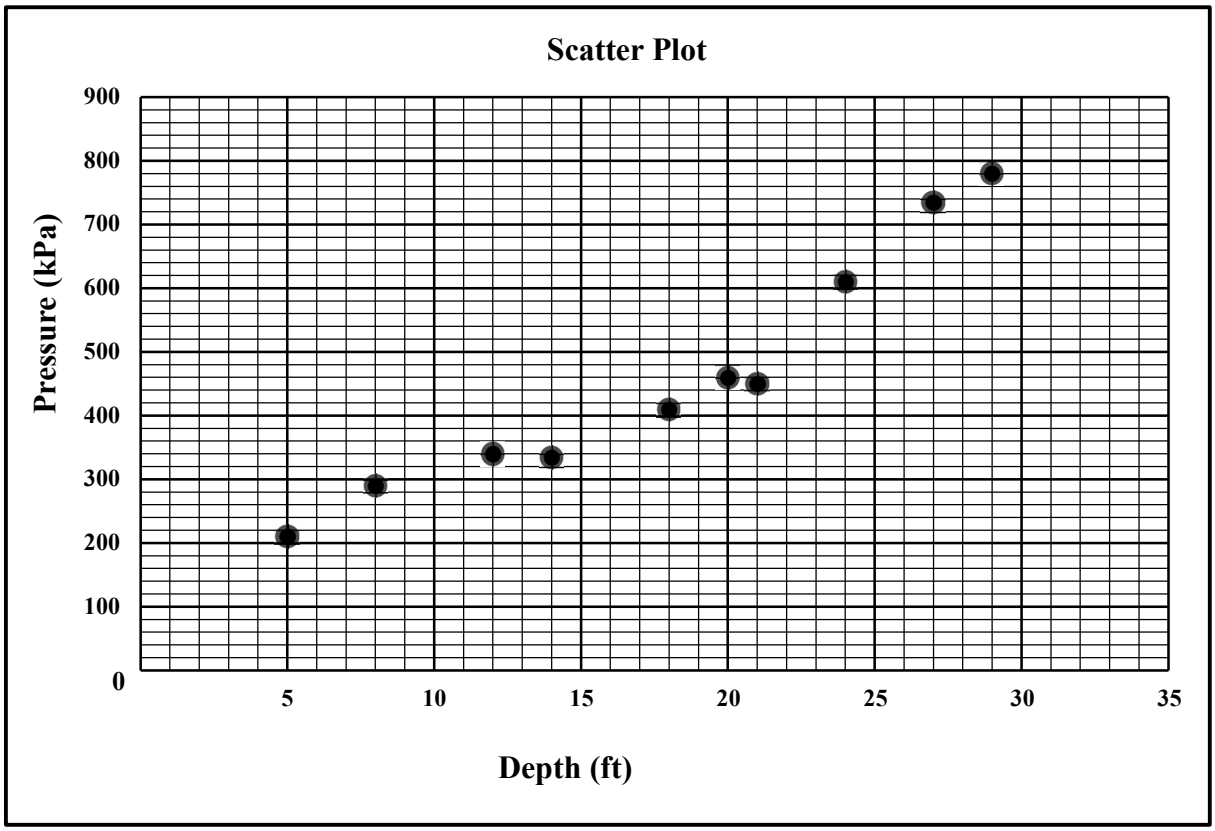
[11]

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QUESTION 2

2.1 A town manager conducted a survey to measure the pressure of the sea level in his coastal city. The table and the scatter plot below shows the results of the survey:

Depth (ft)	5	8	12	14	18	20	21	24	27	29
Pressure (kPa)	210	290	340	335	410	460	450	610	735	780



2.1.1	Determine the equation of the least squares regression line for the data.	(3)
2.1.2	Use the scatter plot provided above to draw the least squares regression line.	(2)
2.1.3	Write down the correlation coefficient.	(1)

2.2 Research was conducted to measure the testosterone levels in runners at the Olympic Games. The table below shows the results of five runners who were tested for testosterone.

Runners	**1**	**2**	**3**	**4**	**5**
Level of testosterone	6,7	$2k + 2{,}4$	p	3,8	4,3

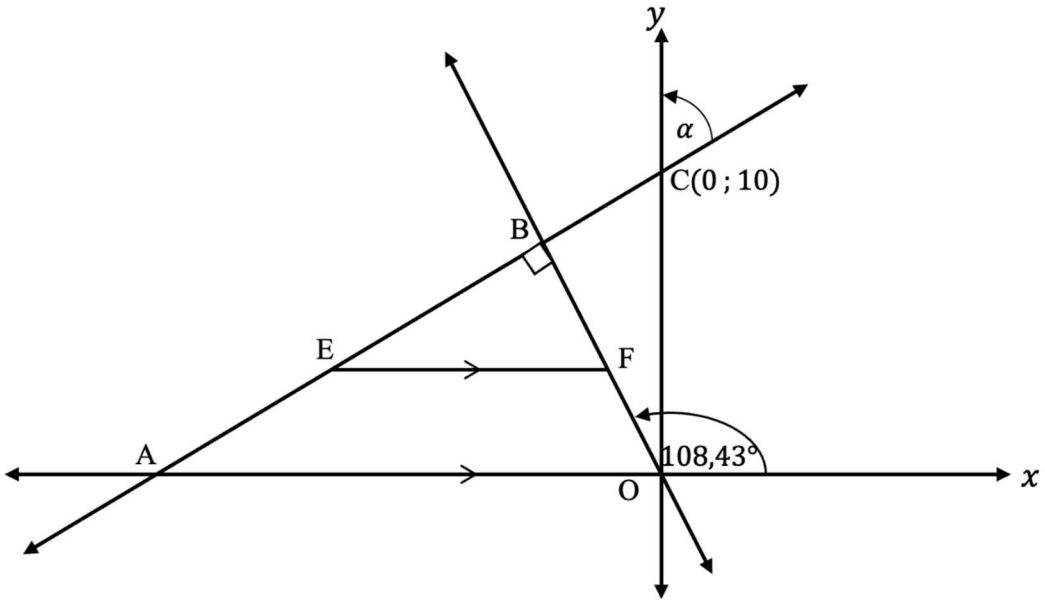
The mean of the five runners is 7,7 and the values of the last three runners form an arithmetic sequence. Determine the value of k and p.

(5)

[11]

QUESTION 3

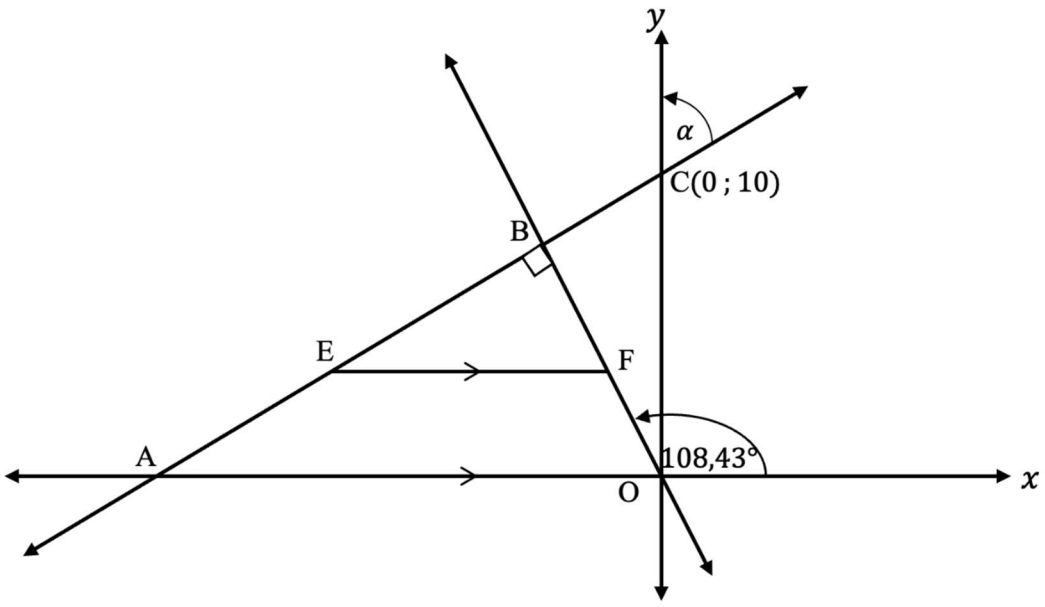
In the diagram, ΔABO is drawn. E is the midpoint of AB which is produced to C. A is the *x*-intercept and C(0 ; 10) is the *y*-intercept of AC. Line EF is drawn parallel to the *x*-axis. AB⊥OB and the angle of inclination of OB is $108,43^{\circ}$. The angle formed by AC and the *y*-axis is α.



3.1	Determine the gradient of line OB.	(2)
3.2	Determine the equation of line AB in the form $y = mx + c$.	(2)

3.3	Calculate the coordinates of B.	(3)
3.4	Calculate the length of BF.	(4)

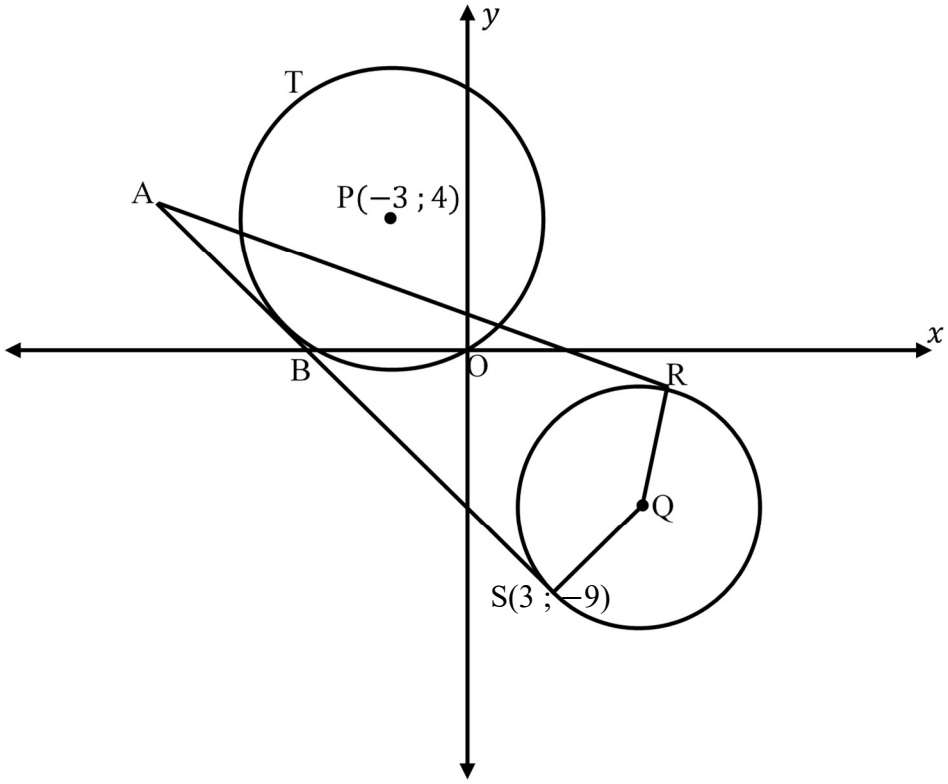
3.5	Calculate the area of ΔCBO.	(4)
3.6	Determine the size of α.	(3)
		[18]



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QUESTION 4

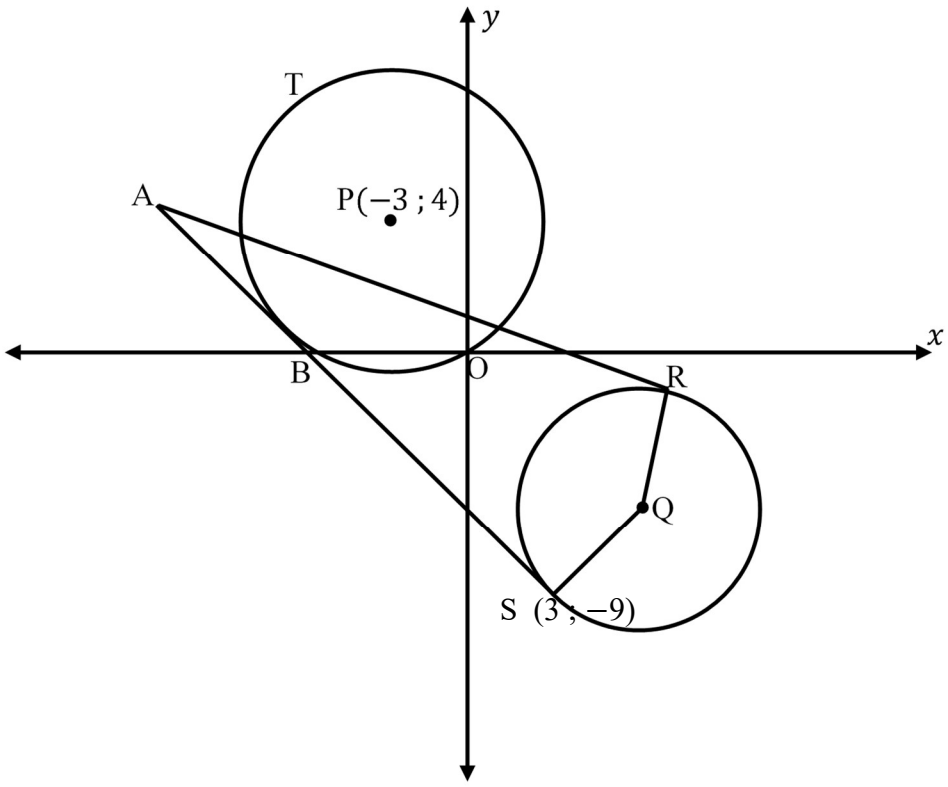
In the diagram, P$(-3\,;4)$ is the centre of the circle passing through points B, T and the origin. A second circle is drawn, with centre Q and equation $x^2 - 12x + y^2 + 12y + 54 = 0$. Points R and S$(3\,;-9)$ lie on the circle. AS and AR are both tangents to the circle with centre Q. B is the *x*-intercept of AS.



4.1	Determine the equation of the circle with centre P.	(3)
4.2	OT is the diameter of the circle with centre P. Determine the coordinates of T.	(3)

4.3	Calculate the coordinates of Q.	(3)
4.4	Determine the equation of AS in the form $y = mx + c$.	(5)
4.5	Identify the type of quadrilateral that ASQR is and substantiate your answer.	(2)

4.6	Determine the scale factor k by which the radius of the circle with centre Q should be increased such that the two circles touch once.	(4)
		[20]



QUESTION 5

5.1	Given: $\sin\beta = \frac{12}{13}$, where $\tan\beta < 0$. With the aid of a diagram, and **without the use of a calculator**, determine the value of $\sin 2\beta$.	(4)
5.2	Given: $\cos(\alpha - \theta) = \cos\alpha\cos\theta + \sin\alpha\sin\theta$	
5.2.1	Use the above identity to deduce that $\sin(\alpha - \theta) = \sin\alpha\cos\theta - \cos\alpha\sin\theta$	(3)
5.2.2	Hence, or otherwise, evaluate $\sin 76°.\sin 44° - \sin 14°.\sin 46°$	(3)

5.3	Given: $f(x) = \sin x$	
	Show that $\frac{f(x+h)-f(x)}{h}$ can be written as $\sin x\left(\frac{\cos h-1}{h}\right)+\cos x\left(\frac{\sin h}{h}\right)$.	
		(4)
		[14]

QUESTION 6

6.1 Simplify the following to a single trigonometric term, **without the use of a calculator**:

$$\frac{\tan(180° - x)\cos(180° - x)}{\cos 240° \left(\tan^2 y - \frac{1}{\cos^2 y}\right)}$$

(7)

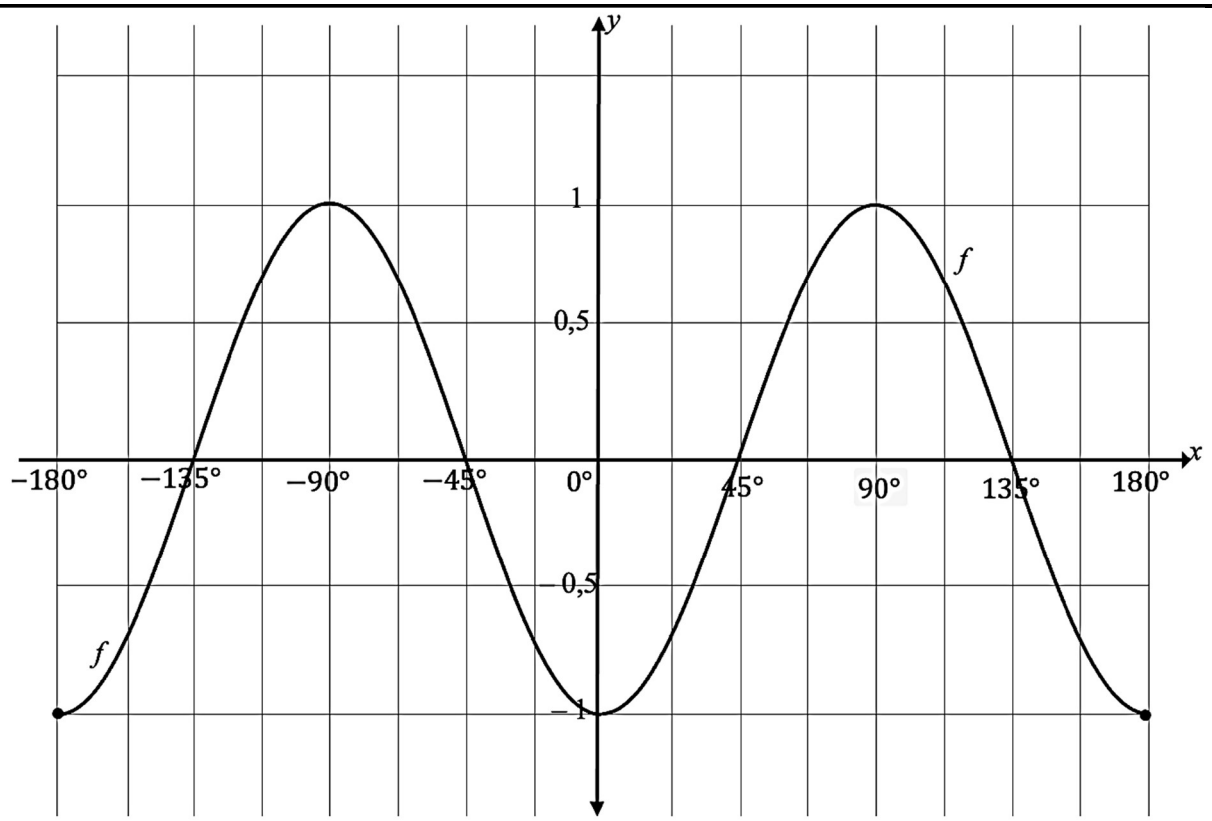
6.2 Prove the identity: $\frac{\sin 3x}{\sin x \cos x} = \frac{4\cos^2 x - 1}{\cos x}$

(5)

6.3	Determine the general solution of $\cos x + 1 = \sin x$.	
		(7)
		[19]

QUESTION 7

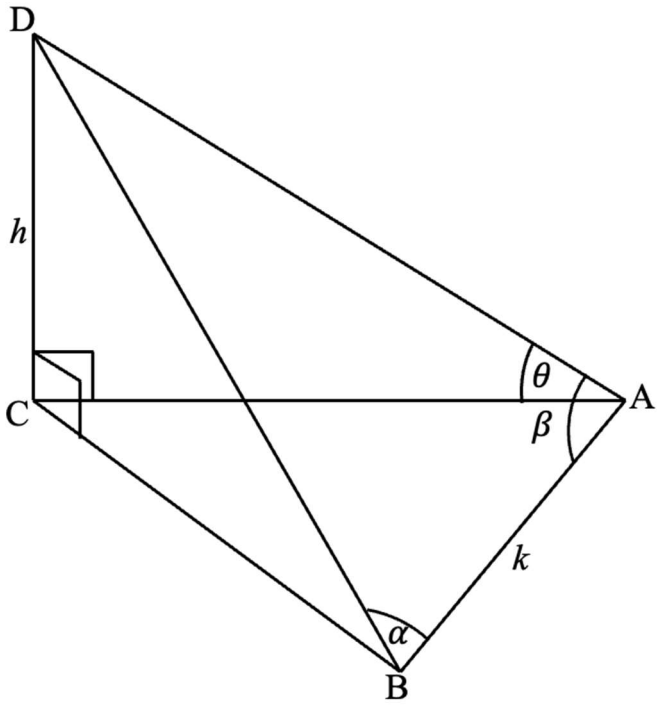
In the diagram below, the graph of $f(x) = -\cos 2x$ is drawn for the interval $x \in [-180° ; 180°]$.



7.1	Write down the period of f.	(1)
7.2	Write down the range of f.	(1)
7.3	On the grid provided above, draw the graph of $g(x) = \tan(x - 45°)$ for the interval $x \in [-180° ; 180°]$. Clearly show the asymptotes and intercepts with the axes.	(3)
7.4	For which value(s) of x is $f(x) \leq g(x)$, for the interval $x \in [-180° ; 0°]$.	(2)
7.5	What is the maximum value of $h(x) = 4^{\,2\sin^2 x - 1}$ for $x \in \mathbb{R}$.	(2)
		[9]

QUESTION 8

In the diagram below, A, B and C lie in the same horizontal plane.
The vertical pole DC is h units and AB $= k$ units.
$C\widehat{A}D = \theta$, $B\widehat{A}D = \beta$ and $D\widehat{B}A = \alpha$.

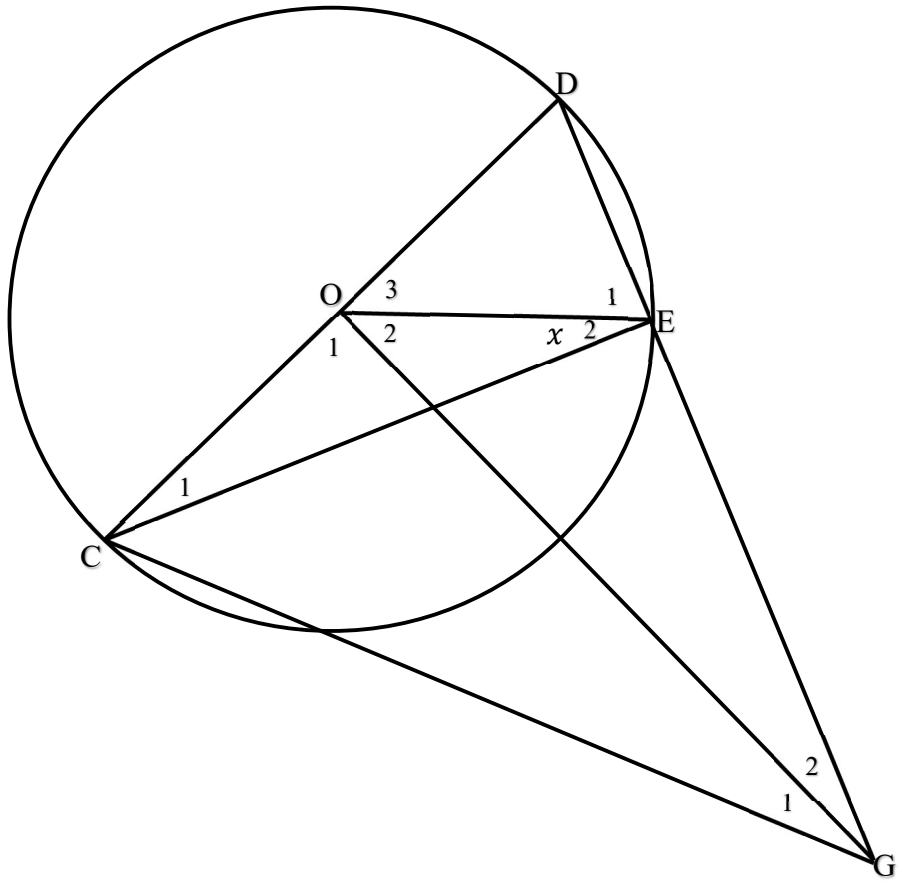


8.1	Determine the size of $C\widehat{D}A$ in terms of θ.	(1)
8.2	Determine the length of AD in terms of h and θ.	(2)

8.3	Show that CD can be written as: $$h = \frac{k \,.\sin\alpha \,.\sin\theta}{\sin(\alpha+\beta)}$$	(5)
8.4	Calculate the length of the vertical pole CD to the nearest metre, if $k = 95$ m, $\theta = 43{,}9°$, $\beta = 61°$ and $\alpha = 32{,}7°$.	(2)
		[10]

QUESTION 9

In the diagram below, CD is the diameter of the circle with centre O. E is a point on the circle such that DE is produced to G. OE, OG, CE and CG are drawn. Let $O\widehat{E}C = x$ and $C\widehat{O}G = 90°$.

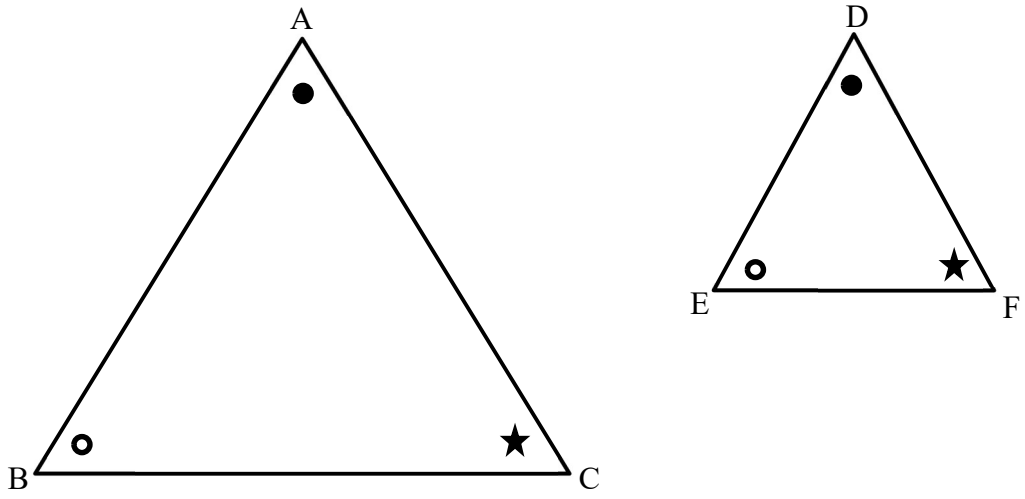


9.1	Prove that OCGE is a cyclic quadrilateral.	
		(3)

9.2	Name, with reasons, THREE other angles equal to x.	(3)
9.3	Determine the size of $D\widehat{O}E$ in terms of x.	(2)
		[8]

QUESTION 10

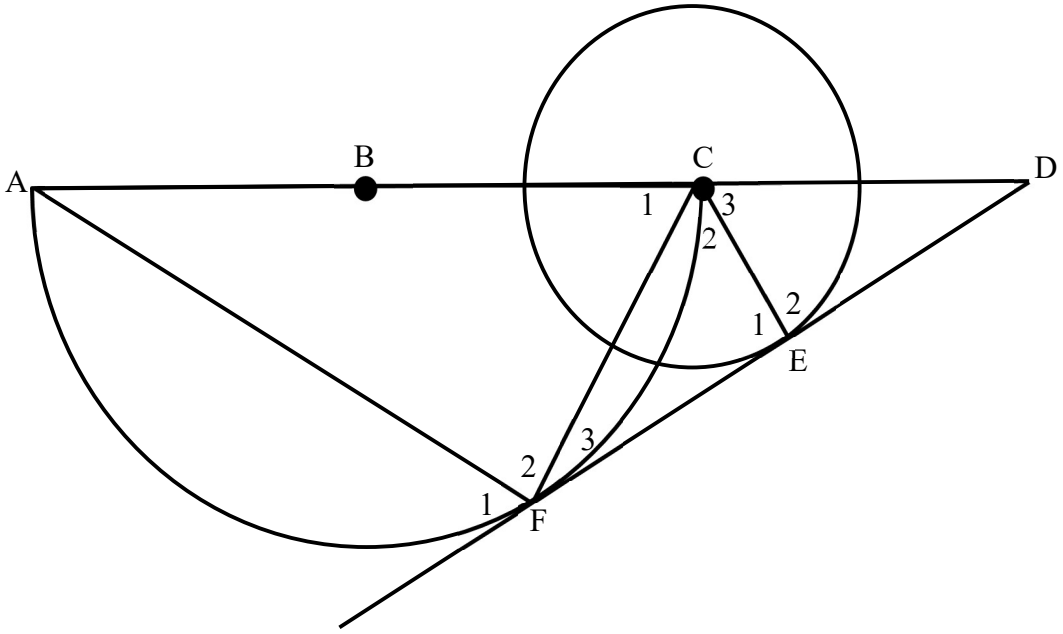
10.1 In the diagram below, ΔABC and ΔDEF are drawn with $\hat{A} = \hat{D}$; $\hat{B} = \hat{E}$ and $\hat{C} = \hat{F}$.



Use the diagram above to prove the theorem that states that if two triangles are equiangular, then their corresponding sides are in the same proportion, that is $\frac{DE}{AB} = \frac{DF}{AC}$	
	(6)

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10.2 In the diagram below A, C and F are points on a semi-circle with centre B. A circle with centre C is drawn. The radius of the semi-circle is twice the radius of circle C.
FED is a tangent to both circles at F and E respectively. ABCD is a straight line.

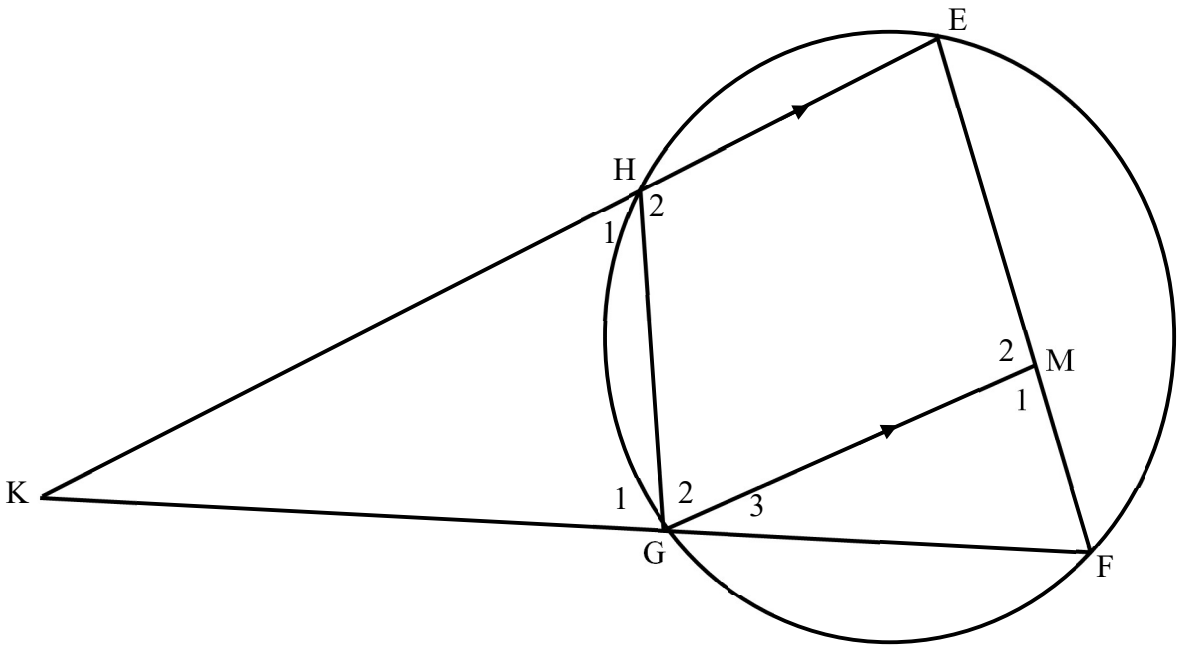


10.2.1	Prove that ΔAFC ||| Δ FEC.	
		(5)

10.2.2	If the radius of the smaller circle is p, determine the following in terms of p:	
(a)	The length of FC	(4)
(b)	The length of FD, if it is given that FE = ED	(3)
		[18]

QUESTION 11

In the diagram below, cyclic quadrilateral EFGH is drawn. Chords EH and FG are produced to meet at K. M is a point on EF such that MG ∥ EK. KG = EF.



11.1	Prove that:	
11.1.1	$EF^2 = KE \cdot GH$	(6)

11.1.2	$KG^2 = EM \,.\, KF$	
		(3)
11.2	If it is given that KE = 20 units, KF = 16 units and GH = 4 units, calculate the length of EM.	
		(3)
		[12]

Additional space

Additional space

Additional space

TOTAL: 150

END

INFORMATION SHEET

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$A = P(1+ni)$ $\quad A = P(1-ni)$ $\quad A = P(1-i)^n$ $\quad A = P(1+i)^n$

$T_n = a + (n-1)d$ $\quad S_n = \frac{n}{2}[2a + (n-1)d]$

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

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

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

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

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

$(x-a)^2 + (y-b)^2 = r^2$

In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

$a^2 = b^2 + c^2 - 2bc.\cos A$

$area\ \Delta ABC = \frac{1}{2}ab.\sin C$

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

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

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

$\sin 2\alpha = 2\sin\alpha.\cos\alpha$

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

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

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

PREPARATORY EXAMINATION
2025

MATHEMATICS PAPER 2 (10612)

MATHEMATICS: Paper 2

10612E

X05