LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL SENIOR CERTIFICATE

**GRADE 12**

# MATHEMATICS PRACTICE ASSIGNMENT 2025

**MARKS : 100**

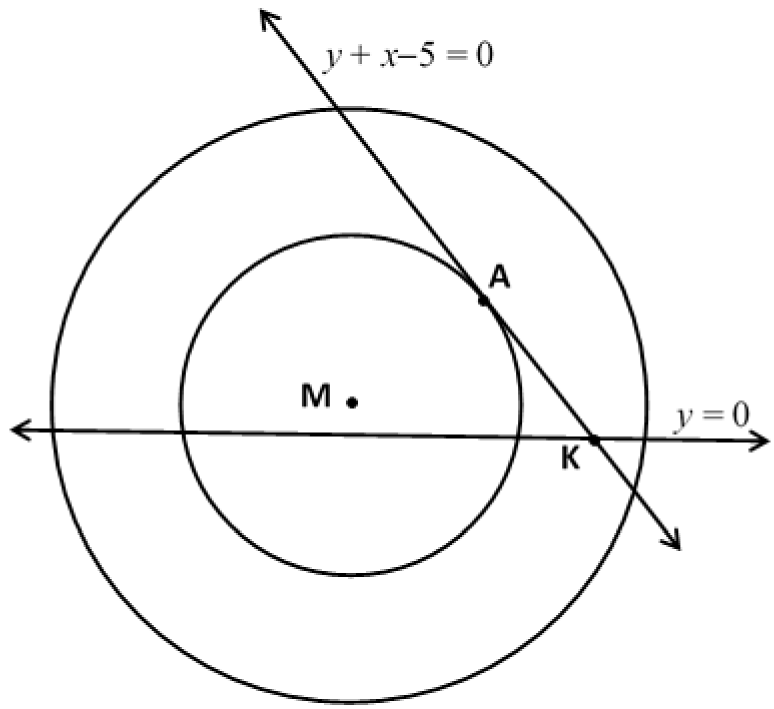
**DURATION : 2 Hours**

**Read the following instructions carefully before answering the questions.**

1. This question paper consists of 7 questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, and etcetera that you have used in determining your answers.
4. ANSWER ONLY will not necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphic), unless stated otherwise.
6. Round off to TWO decimal places unless stated otherwise.
7. Diagrams are not necessarily drawn to scale.
8. Number the answers correctly according to the numbering system in this question paper.
9. Write legibly and present your work neatly.

**QUESTION 1**

In the figure, M is the Centre of concentric circles. The larger circle has an equation $x^2 + y^2 = 4y - 2x + 44$. The smaller circle touches the straight line $y + x - 5 = 0$ at point A. The straight line $y = 0$ cuts both circles.




1.1. Determine the coordinate of M. (3)

1.2. Determine the coordinate of A (4)

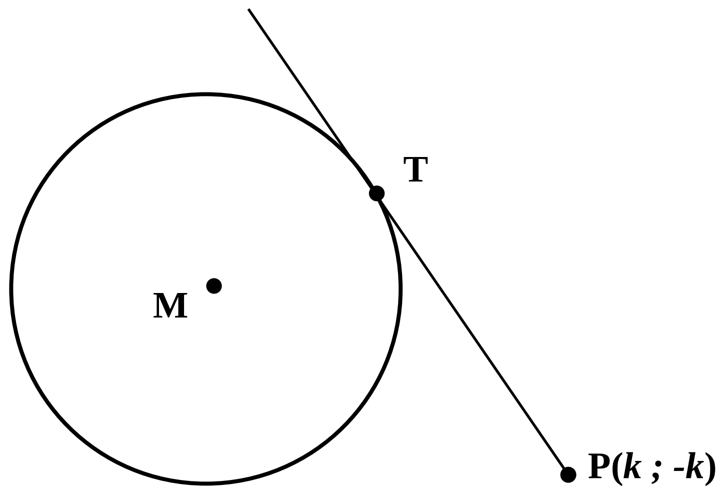
1.3. Determine the equation of the smaller circle (2)

1.4. The straight line $y + x - 5 = 0$ , meets the straight line $y = 0$ at point K. Find the area of $\Delta AMK$. (4)

**[13]**

**QUESTION 2**

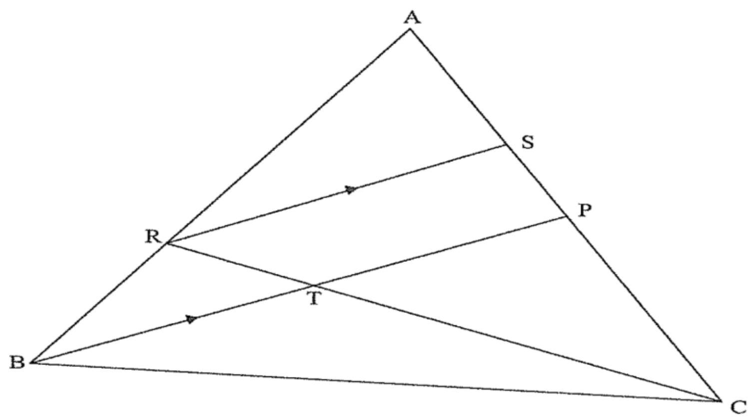
2.1 M is the centre of a circle with equation $(x-1)^2+(y-2)^2=2$. P is the point outside the circle with coordinates $(k\,;\,-k)$. A tangent PT is drawn from P touching the circle at T.




2.1.1 Show that $PT^2 = 2k^2 + 2k + 3$ (5)

2.1.2. Determine the length (Rounded off to one decimal digit) of the shortest possible tangent that can be drawn from P to the circle. (5)

2.2. In the diagram below, $P$ is the midpoint of $AC$ in $\triangle ABC$. $R$ is a point on $AB$ such that RS $\parallel$ $BP$ and $\frac{AR}{AB} = \frac{3}{5}$. RC intersects $BP$ in $T$.




Determine, with reasons, the following ratios:

2.2.1 $\frac{AS}{SC}$ (3)

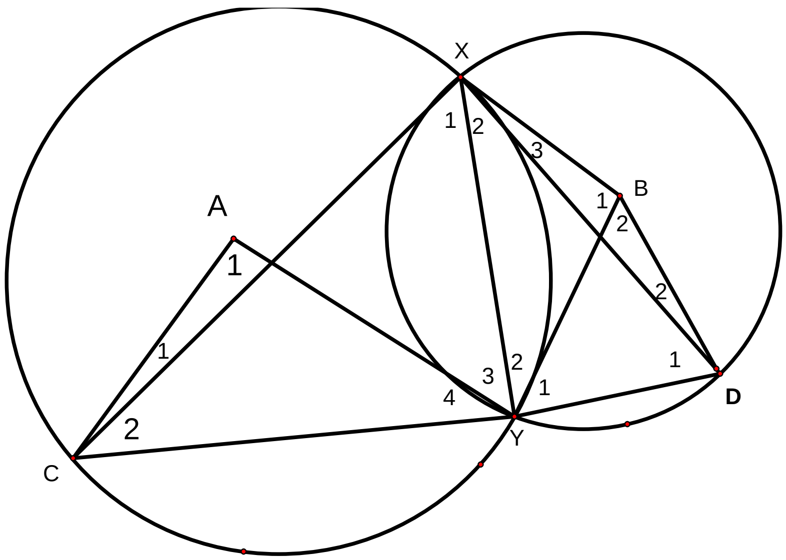
2.2.2 $\frac{RT}{TC}$ (3)

2.2.3 $\frac{\text{Area of } \triangle RAS}{\text{Area of } \triangle RSC}$ (2)

2.2.4 $\frac{\text{Area of } \triangle TPC}{\text{Area of } \triangle RSC}$ (3)

**QUESTION 3**

Two circles, with a Centre at A and B, intersect at $X\ and\ Y$. The radius of the larger circle, with centre A is R and the radius of a smaller circle, with centre B is r, CX is a tangent to a circle B at X and DX is a tangent to circle A at X. Prove with reasons that:




3.1 $XY^2 = DY.YC$ (5)

3.2 $\hat{A}_1 = \hat{B}_1$ (5)

3.3 $\Delta CAY\ ///\ \Delta YBX$ (5)

3.4 $\dfrac{r^2}{R^2} = \dfrac{DY}{CY}$ (4)

**[19]**

**QUESTION 4**

4.1. Simplify without the use of a calculator

$$\frac{2cos\ (180^0 + x)\ sin\ (180^0 - x)\ sin\ 74^0}{sin\ (x + 360^0)\ sin\ 37^0\ sin\ 53^0\ \ sin\ (x - 90^0)}$$ (6)

4.2. If $2\ sin\ \theta\ cos\ \theta\ = \frac{2\sqrt{6}}{5}\ \ , 45^0 < \theta < 90^0$

Determine with the aid of diagram and without using a calculator the value of $sin\ \theta$ (6)

4.3. Prove the identity

4.3.1 $4sin\ \theta\ cos^3\theta - 4cos\ \theta\ sin^3\theta = sin\ 4\theta$ (4)

4.3.2 Hence, or otherwise solve the following (5)

$1 + 4sin\ \theta\ cos^3\theta = 4cos\ \theta\ sin^3\ \theta\ \ \ for\ \ \theta \epsilon (0^0; 360^0)$

**[21]**

**QUESTION 5**

The graph represents the curve of $f(x) = asin\,x\ + b\ \ \ and\ g(x) = c\ cos\ dx$ for $-180^0 \leq \theta \leq 180^0$

Answer the following questions with the aid of the graph for $-180^0 \leq \theta \leq 180^0$

5.1. Determine the value of $a\ , b\ \ , c\ and\ d$ (4)

5.2. Determine the minimum value of $g(x)$ (1)

5.3. Determine the:

5.3.1 Amplitude of $f$ (1)

5.3.2. Period of $f$ (1)

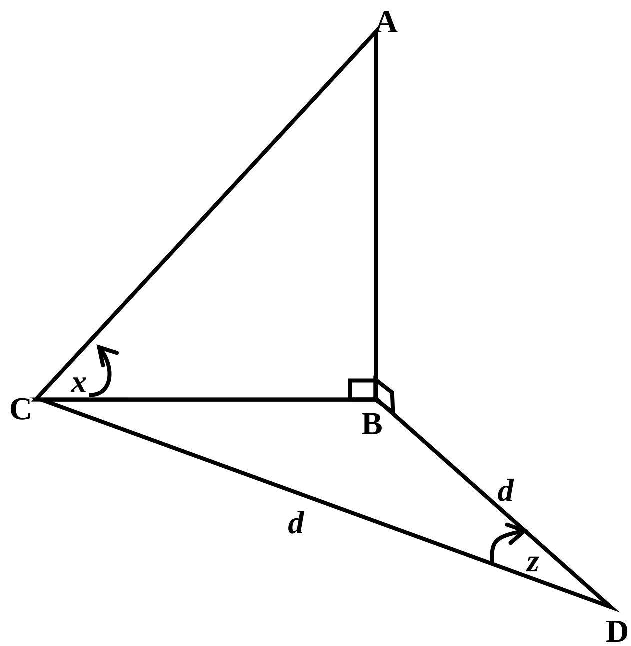
5.4. Calculate the length of $AB\ when\ x = 60^0$( Leave your answer in surd form) (4)

5.5. For which value(s) of $x$ is $g(x) \geq f(x)$ (2)

**[13]**

**QUESTION 6**

In the figure B is the foot of a vertical tower BA and the two points C and D are in the same horizontal plane. From C the angle of elevation of A is $x$. If $BD = CD = d$ and $B\hat{D}C = z$.




Prove that

6.1 $AB = d\sqrt{2(1 - cos\, z\,)}\,.\,tan\, x$ (6)

6.2. $AB = \dfrac{dsin\, z\, tan\, x}{cos\, \frac{z}{2}}$ (4)

6.3. Calculate the area of $\Delta BCD$ if it is given that $d = 500\ m$ and $\hat{D} = 80^0$. (3)

**[13]**

**INFORMATION SHEET: MATHEMATICS**

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

$$A=P(1+i)^n \qquad \sum_{i=1}^{n}1=n \qquad \sum_{i=1}^{n}i=\frac{n(n+1)}{2} \qquad T_n=a+(n-1)d$$

$$S_n=\frac{n}{2}\left(2a+(n-1)d\right) \qquad T_n=ar^{n-1} \qquad S_n=\frac{a\left(r^n-1\right)}{r-1}\ ; \quad r\neq 1 \qquad S_\infty=\frac{a}{1-r}\ ;\ -1<r<1$$

$$F=\frac{x\left[(1+i)^n-1\right]}{i} \qquad P=\frac{x[1-(1+i)^{-n}]}{i} \qquad f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$$

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

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

$$(x-a)^2+(y-b)^2=r^2 \qquad \text{In } \Delta ABC: \quad \frac{a}{\sin A}=\frac{b}{\sin B}=\frac{c}{\sin C} \qquad a^2=b^2+c^2-2bc.\cos A$$

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

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

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

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

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

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

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