Province of the
EASTERN CAPE
EDUCATION

EC CURRICULUM: FET MATHEMATICS, MATHEMATICAL LITERACY AND TECHNICAL MATHEMATICS

# NATIONAL SENIOR CERTIFICATE

# GRADE 12

# MATHEMATICS TOPIC TEST 2 OF 2020: ANALYTICAL GEOMETRY

**MARKS:** **40**

**TIME:** **48 Minutes Strictly!**

This question paper consists of 9 pages, including Information Sheet and ANSWER SHEETS.

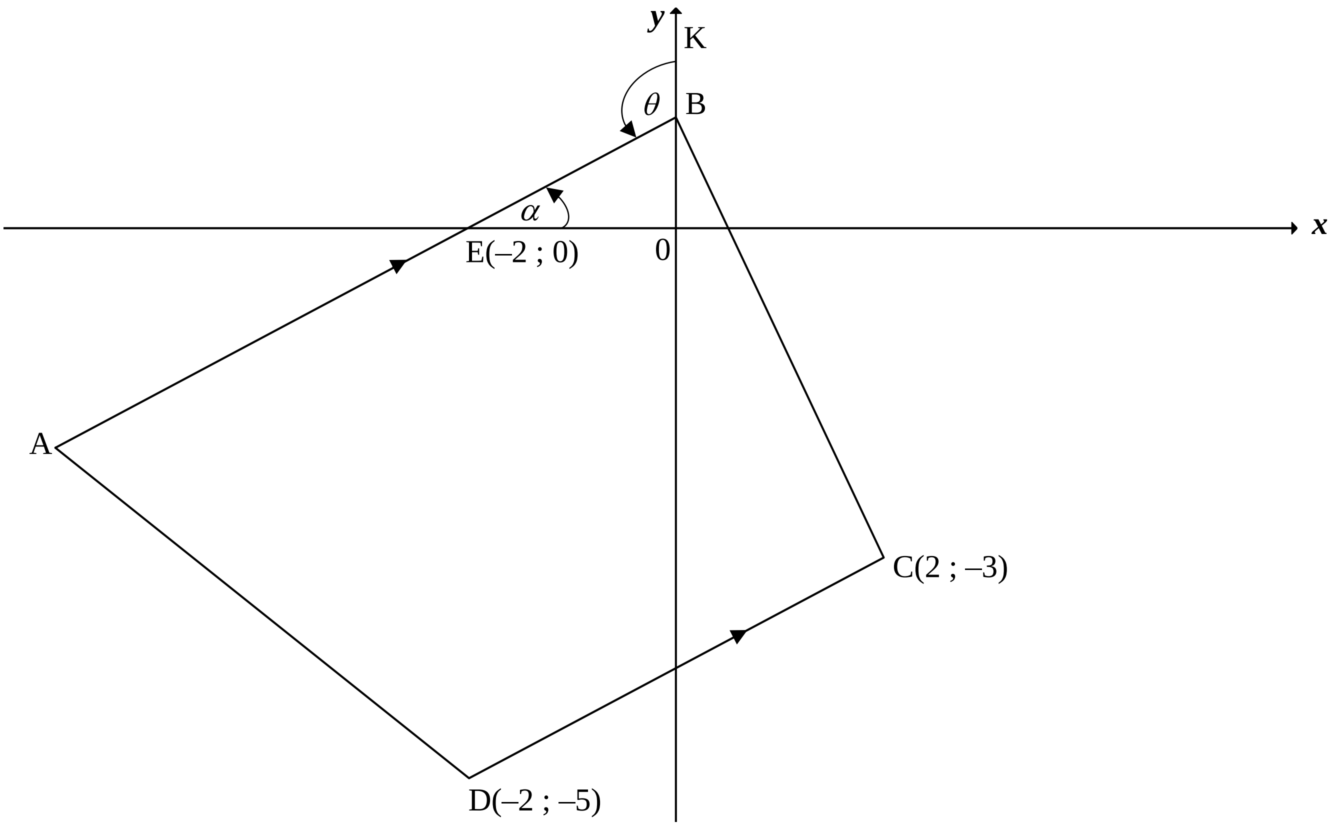
**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

1. This question paper consists of 2 questions. Answer ALL questions in ANSWER SHEETS.
2. Clearly show ALL calculations, diagrams, graphs, et cetera 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 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. Write neatly and legibly.

**QUESTION 1**

In the diagram, A, B, C(2 ; –3) and D(–2 ; –5) are vertices of a trapezium with AB || DC. E(–2 ; 0) is the $x$-intercept of AB. The inclination of AB is $\alpha$. K lies on the $y$-axis and $K\hat{B}E = \theta$.




1.1 Determine:

1.1.1 The midpoint of EC (2)

1.1.2 The gradient of DC (2)

1.1.3 The equation of AB in the form $y = mx + c$ (3)

1.1.4 The size of $\theta$ (3)

1.2 Prove that AB $\perp$ BC. (3)

1.3 The points E, B and C lie on the circumference of a circle. Determine:

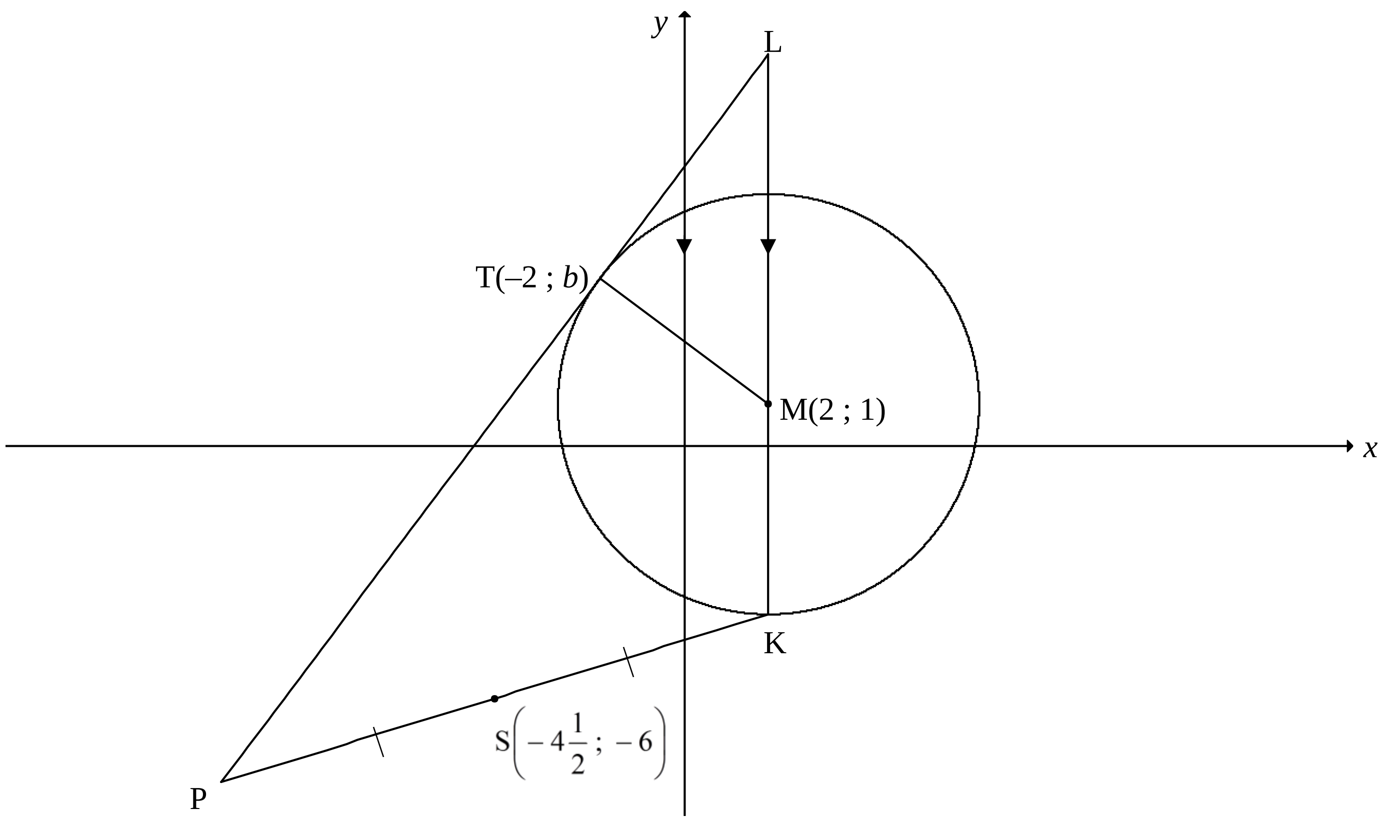
1.3.1 The centre of the circle (2)

1.3.2 The equation of the circle in the form $(x-a)^2 + (y-b)^2 = r^2$ (4)

**[19]**

## QUESTION 2

In the diagram, the circle is centred at M(2 ; 1). Radius KM is produced to L, a point outside the circle, such that KML ∥ $y$-axis. LTP is a tangent to the circle at T(–2 ; $b$). $S\left(-4\frac{1}{2}\,;\,-6\right)$ is the midpoint of PK.




2.1 Given that the radius of the circle is 5 units, show that $b = 4$. (4)

2.2 Determine:

2.2.1 The coordinates of K (2)

2.2.2 The equation of the tangent LTP in the form $y = mx + c$ (4)

2.2.3 The area of $\Delta$LPK (7)

2.3 Another circle with equation $(x-2)^2 + (y-n)^2 = 25$ is drawn. Determine, with an explanation, the value(s) of $n$ for which the two circles will touch each other externally. (4)

**[21]**

**TOTAL: 40**

**INFORMATION SHEET: MATHEMATICS**

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

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

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

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

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

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

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

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

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

In $\Delta$ABC: $\quad \frac{a}{\sin \text{A}} = \frac{b}{\sin \text{B}} = \frac{c}{\sin \text{C}}$

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

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

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

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

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

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

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

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

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

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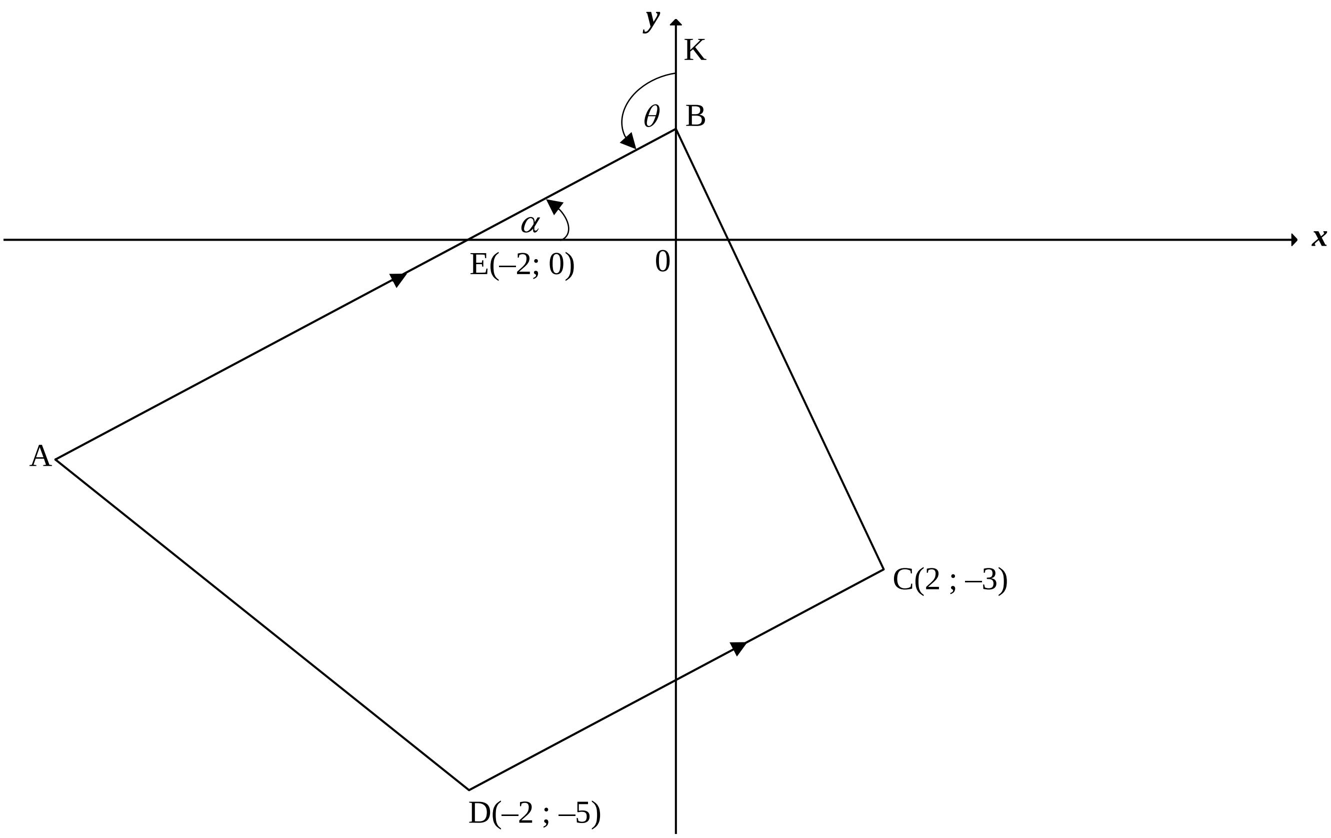
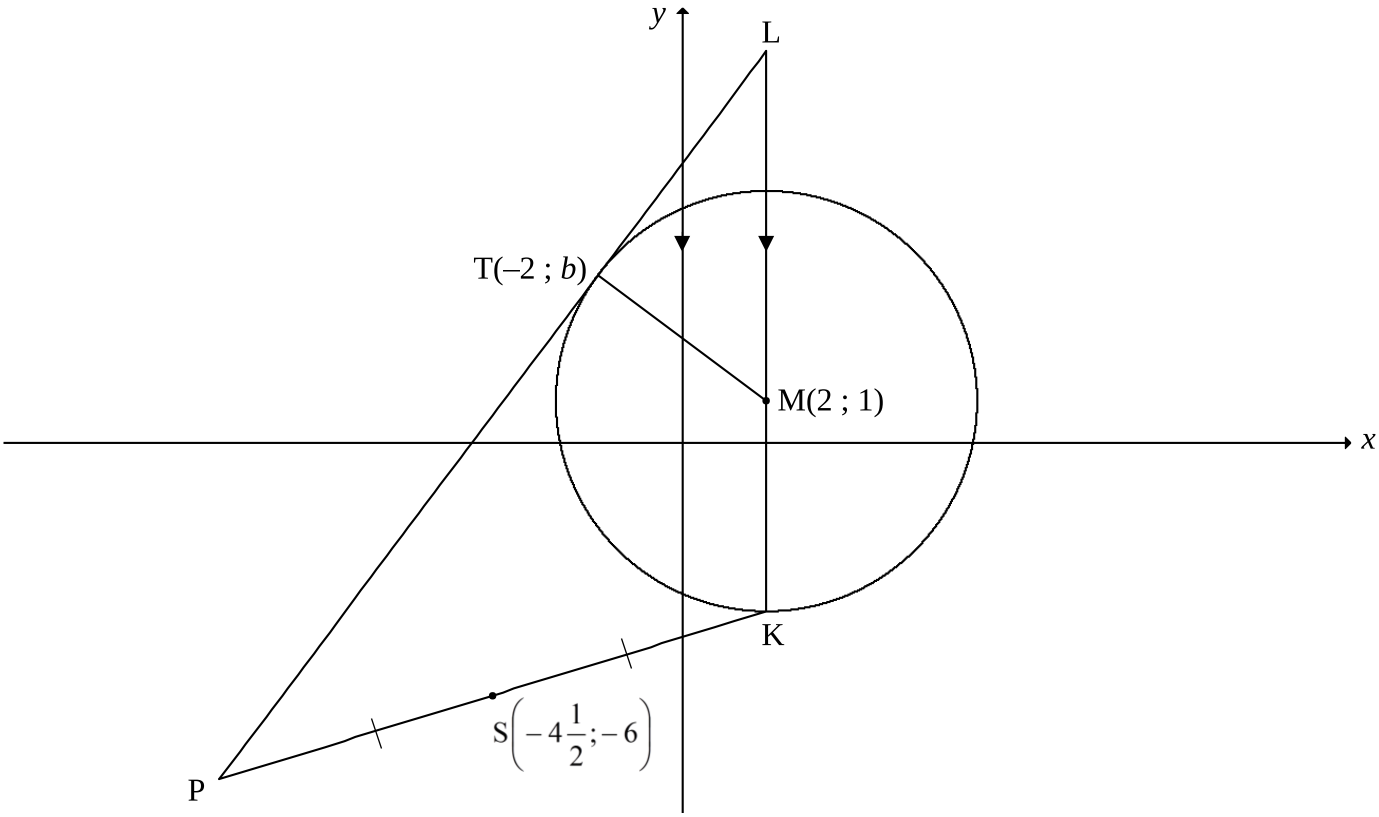
**QUESTION/*VRAAG* 1**




| | **Solution/*Oplossing*** | **Marks *Punte*** |
|---|---|---|
| 1.1.1 | | (2) |
| 1.1.2 | | (2) |

| | **Solution/*Oplossing*** | **Marks *Punte*** |
|---|---|---|
| 1.1.3 | | (3) |
| 1.1.4 | | (3) |
| 1.2 | | (3) |
| 1.3.1 | | (2) |
| 1.3.2 | | (4) |
| | | **[19]** |

**QUESTION/*VRAAG* 2**




| | **Solution/*Oplossing*** | **Marks *Punte*** |
|---|---|---|
| 2.1 | | (4) |
| 2.2.1 | | (2) |

| | **Solution/*Oplossing*** | **Marks** ***Punte*** |
|---|---|---|
| 2.2.2 | | (4) |
| 2.2.3 | | (7) |
| 2.3 | | (4) |
| | | **[21]** |

**TOTAL: 40**