

# **GAUTENG DEPARTMENT OF EDUCATION**



## **JOHANNESBURG NORTH DISTRICT**

**2021**

**GRADE 12**

**MATHEMATICS**

**PAPER 2**

**PRE-MOCK EXAM**

**MARKS: 150**

**TIME: 3 HOURS**

This paper consists of 10 printed pages.

## **INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.
4. Answers only will not necessarily be awarded full marks.
5. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
6. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. An information sheet with formulae is included at the end of this question paper.
9. Number the answers correctly according to the numbering system used in this question paper.
10. Write neatly and legibly.

## QUESTION 1

The following table shows the assignment marks ( in % ) of Grade 11 D learners in North Gauteng High School.

INTERVALS OF ASSIGNMENT MARKS	NUMBER OF LEARNERS
$0 \leq x < 20$	4
$20 \leq x < 40$	5
$40 \leq x < 60$	9
$60 \leq x < 80$	13
$80 \leq x < 100$	10
<b>TOTALS</b>	<b>41</b>

- 1.1 Write down the modal class. (1)
  - 1.2 Calculate the estimated mean. (3)
  - 1.3 Complete Cumulative frequency table provide in the ANSWER BOOK. (2)
  - 1.4 Draw a cumulative frequency curve (ogive) to represent the data on the grid provided In the ANSWER BOOK. (3)
  - 1.5 Use the cumulative frequency curve (ogive) to determine the interquartile range for the data. (3)
- [12]**

## QUESTION 2

A mathematics teacher wants to create a model by which she can predict learner's final mark. She decided to used her 2020 results to create the model.

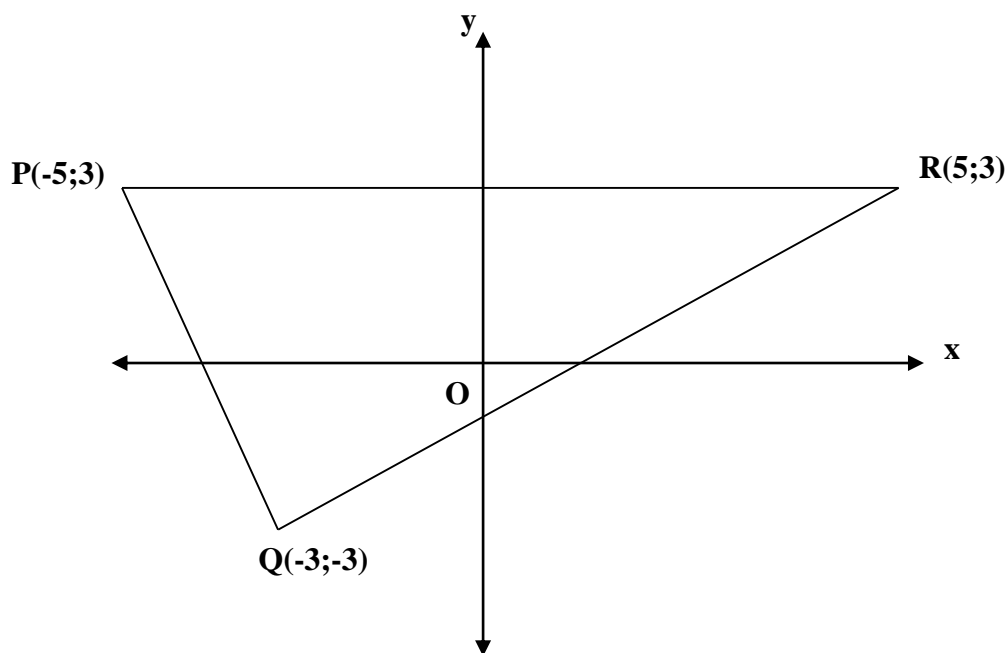
Preparatory Exam(x)	55	35	67	85	91	48	78	72	15	75	69	37
FINAL exam (y)	57	50	74	80	92	50	80	81	23	80	75	42

- 2.1 Determine the equation of the least squares regression line in the form  $y = a + bx$ . (3).
- 2.2 Use the equation of the regression line to predict the final exam mark for a learner who attained 46% in the preparation exam? Give a reason for your answer. (2)

- 2.3 Could you use this equation to estimate the preparation exam mark for a learner who attained 73% in the final exam? Give reason for your answer. (2)
- 2.4 Show that the point  $(\bar{x}; \bar{y})$  lies on the regression line. (4)
- 2.5 Determine the correlation coefficient of the data. (1)
- 2.6 Describe the correlation between preparatory and final exam results. (2)
- [14]**

### QUESTION 3

In the diagram PQR is a triangle with vertices P( -5 ; 3), Q( -3 ; -3 ) and R( 5 ; 3 ).

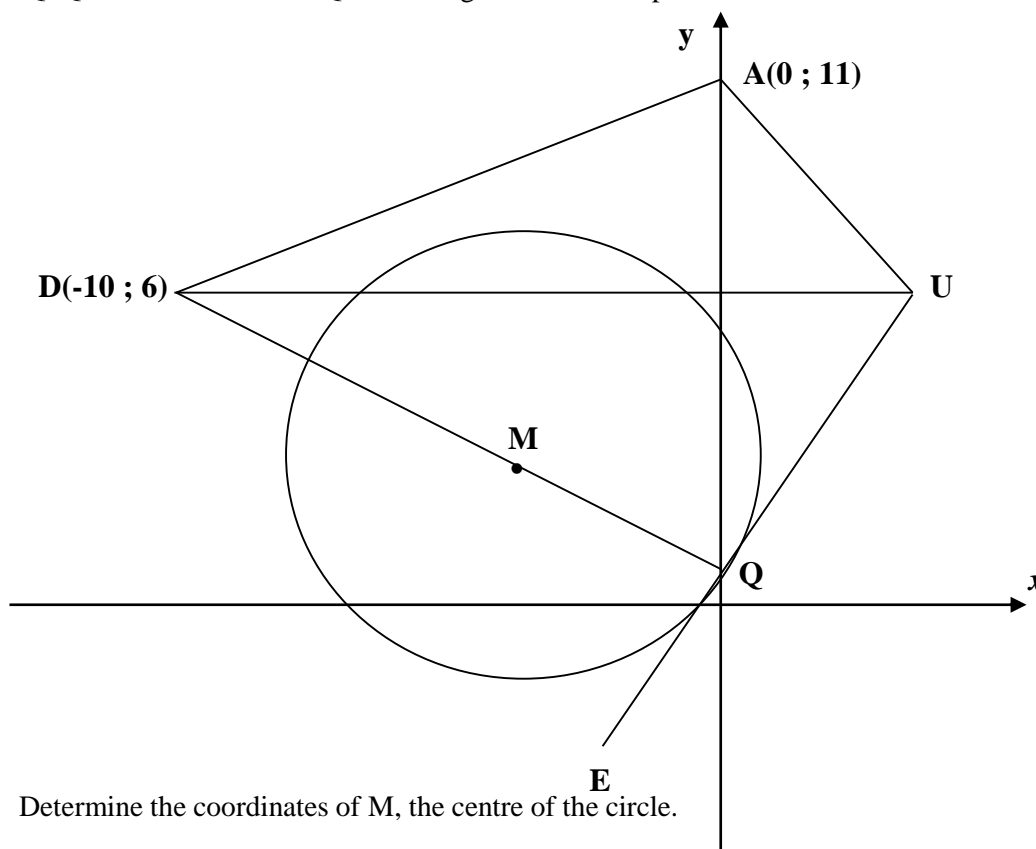


- 3.1 Calculate the length of QR. (2)
- 3.2 Determine M, the midpoint of QR. (2)
- 3.3 Determine the equation of the line passing through P and M. (3)
- 3.4 Determine the equation of the circle which has QR as a diameter. (3)
- 3.5 Does the point P lies inside, or outside the circle in **QUESTION 3.4**? Motivate your answer with relevant calculation. (3)
- 3.6 Determine the coordinate of S, if PQRS is a parallelogram, with S in the first quadrant. (2)
- 3.7 Calculate the size of  $\widehat{QPR}$ . (4)

**[19]**

#### QUESTION 4

$x^2 + y^2 + 8x - 6y = -5$ , is the equation of the circle with centre with centre M. EU is a tangent to the circle at Q. QMD, DA, AU and UQE are straight lines. DU is parallel to the x-axis.



- 4.1 Determine the coordinates of M, the centre of the circle. (4)
- 4.2 Calculate the coordinates of Q, if  $y < 2$ . (3)
- 4.3 Calculate the equation of the tangent UE. (4)
- 4.4 Write down the equation of DU. (1)
- 4.5 Calculate the coordinates of U. (2)
- 4.6 Prove that QUAD is a circle quadrilateral. (6)

**[20]**

#### QUESTION 5

- 5.1 Given :  $\cos 25^\circ = \sqrt{1 - k^2}$ .

Express each of the following in terms of  $k$ .

- 5.1.1  $\sin 25^\circ$  (2)
- 5.1.2  $\sin 50^\circ$  (2)

5.2 Simplify the following **without the use of a calculator**.

Show ALL calculations.

$$5.1.1 \quad \frac{\sin 110^\circ \cdot \tan 60^\circ}{\cos 540^\circ \tan 250^\circ \sin 380^\circ} \quad (7)$$

$$5.1.2 \quad (1 - \sqrt{2} \sin 22,5^\circ)(\sqrt{2} \sin 22,5^\circ + 1) \quad (4)$$

$$5.3 \quad \text{Prove the following identity: } \frac{\cos x + \sin x}{\cos x - \sin x} - \frac{\cos x - \sin x}{\cos x + \sin x} = 2 \tan 2x \quad (5)$$

5.4 Determine the general solution of :

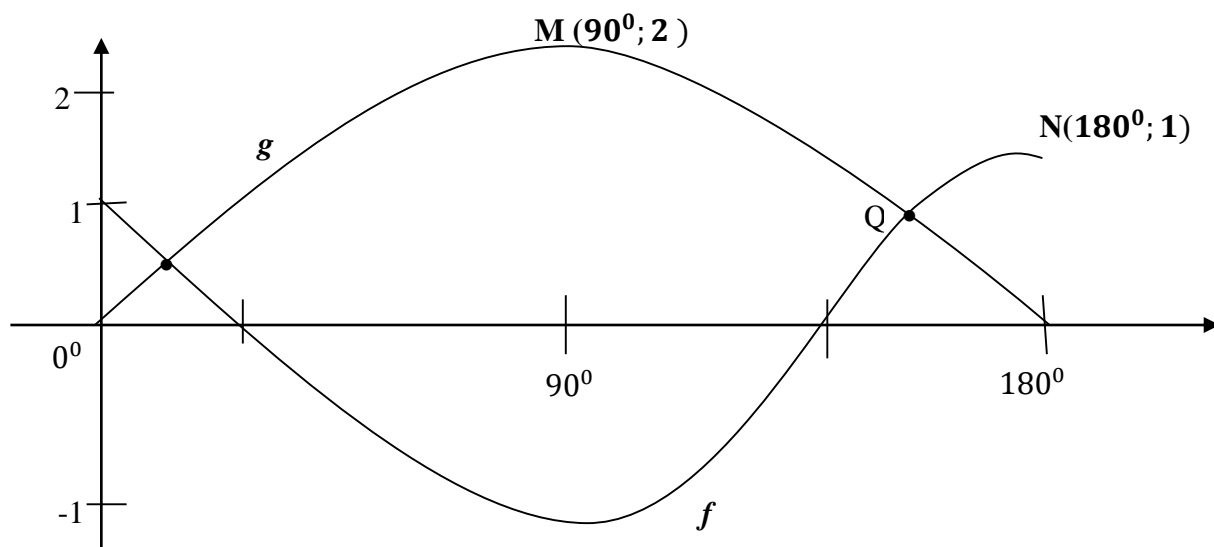
$$\sin \theta \sin \frac{3\theta}{2} + \cos \frac{3\theta}{2} \cos \theta = -\frac{\sqrt{3}}{2} \quad (4)$$

$$5.5 \quad \text{Given : } \sin \theta \cdot \cos \beta = -1$$

$$5.5.1 \quad \text{Write down the maximum and the minimum value of } \cos \beta \quad (2) \quad [26]$$

## QUESTION 6

The diagram below shows the graph of  $f(x) = a \cos bx$  and  $g(x) = c \sin dx$  in the interval  $x \in [0^\circ; 180^\circ]$ . The graph of  $f$  and  $g$  intersect at points P and Q. M( $90^\circ; 2$ ) is the turning point of  $g$  and N( $180^\circ; 1$ ) is an end point of  $f$ .



6.1 Write down the numerical value of  $a$ ,  $b$ ,  $c$  and  $d$ . (4)

6.2 If  $(158,56^\circ; 0.73)$  are the coordinates of Q, write down the coordinates of P. (2)

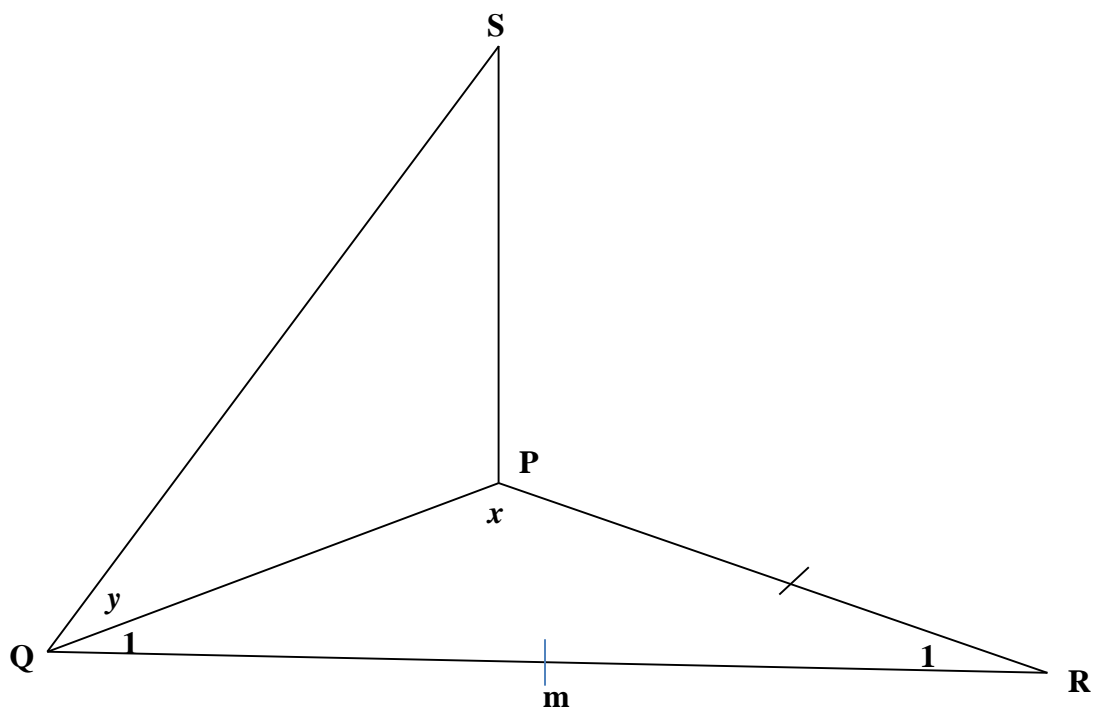
6.3 If  $x \in (0^\circ; 180^\circ)$ , determine the values of  $x$  for which :

$$6.3.1 \quad g(x) - f(x) = 3 \quad (1)$$

$$6.3.2 \quad f(x) \cdot g(x) \leq 0 \quad (2) \quad [9]$$

### QUESTION 7

In the diagram, P, Q and R are three points in the same horizontal plane..  $PR = QR = m$ ,  $\angle PQR = x$ . SP is perpendicular to PQ. The angle of elevation of S from Q is  $y$ .



7.1 Express the area of  $\Delta PQR$  in terms of  $x$  and  $m$ . (5)

7.2 Show that  $PQ = 2m \cos x$ . (4)

7.3 Hence prove that  $SP = 2m \cos x \tan y$ . (2)

[11]

### QUESTION 8

8.1 Complete the following theorems :

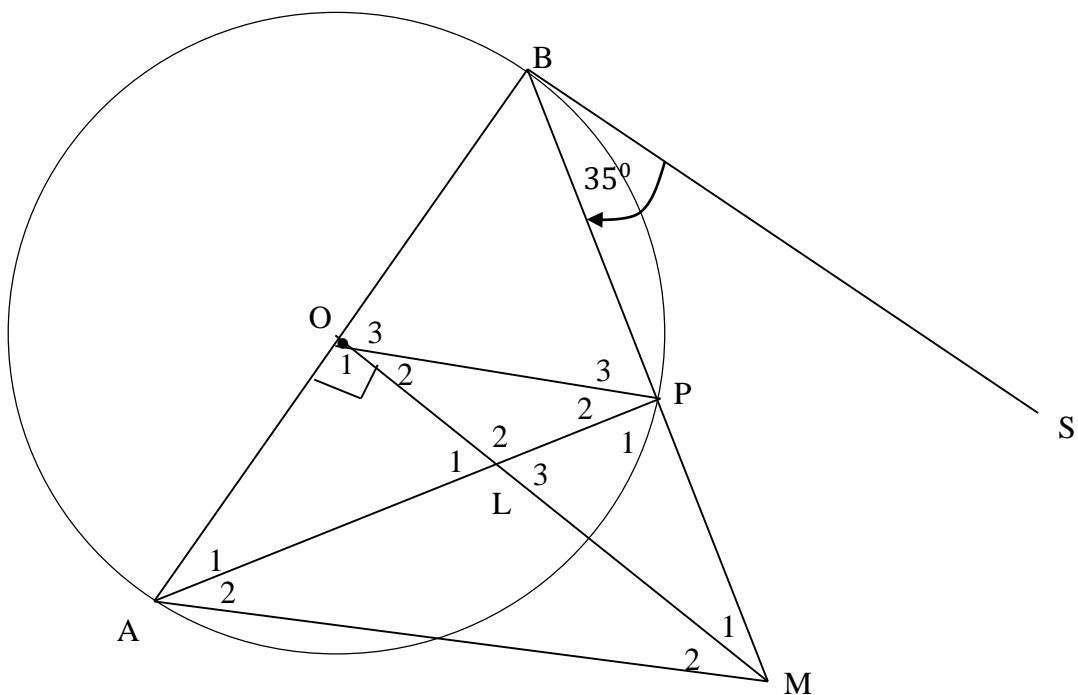
8.1.1 The angle in the semi-circle is equal to.. (1)

8.1.2 The opposite angle of a cyclic quadrilateral is.... (1)

8.2 O is the centre of the circle in the diagram. BP is produced to M such that

$$OM \perp AB.$$

- AP intersects OM at L.
- BS is a tangent to the circle at B.
- $\widehat{MBS} = 35^\circ$



8.2.1 Calculate , with reasons, the size of :

- $$\begin{aligned} \text{(a)} \quad & \widehat{A}_1 & (2) \\ \text{(b)} \quad & \widehat{O}_3 & (2) \\ \text{(c)} \quad & \widehat{P}_3 & (2) \\ \text{(d)} \quad & \widehat{M}_1 & (3) \end{aligned}$$

8.2.2 Prove that:

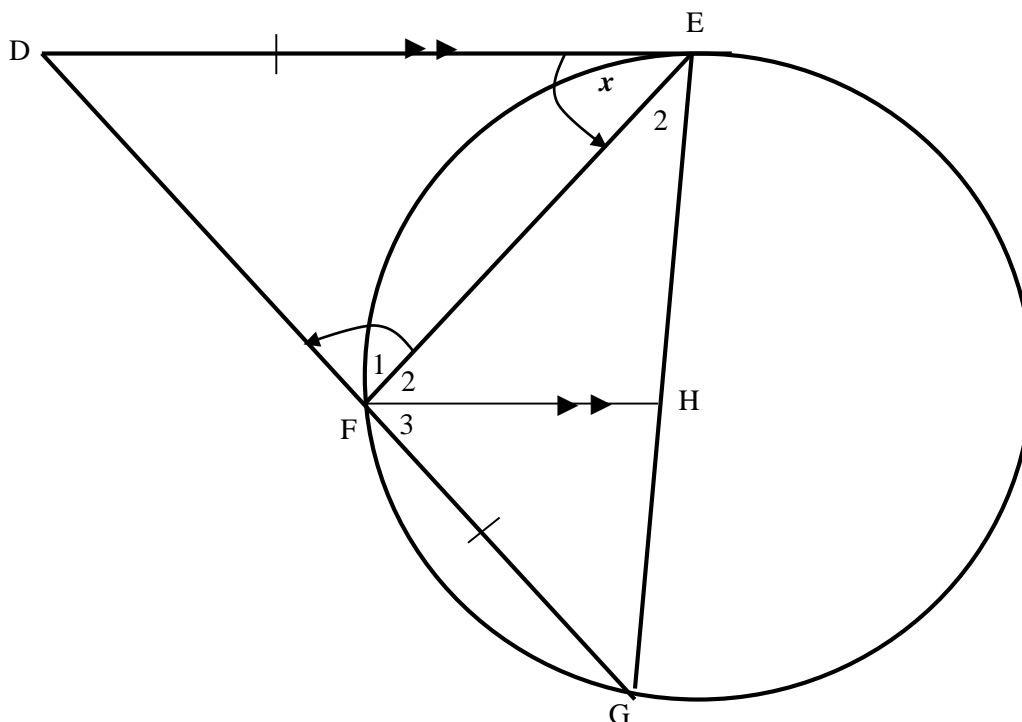
- (a) OLPD is a cyclic quadrilateral. (3)
- (b) BS // OM (2)
- (c) OP is a tangent to the circle through P, L and M. (3)

[19]



In the diagram, DE is a tangent to the circle at E. DFG is a straight line.

It is further given that  $\frac{DF}{DE} = y$ . Let  $D\hat{E}F = x$



- 9.2 Prove that:

### 9.2.2 $\hat{\mathbf{D}} = 72^0$

$$9.2.3 \quad \triangle DGE \text{ /// } \triangle DEF \quad (3)$$

$$9.2.4 \quad DE^2 = DF \cdot DG \quad (2)$$

$$9.2.5 \quad y^2 + y = 1 \tag{5}$$

**TOTAL 150 MARKS**