



**CORE MATHEMATICS EXAM: PAPER 2**  
**ST. ANNE'S DIOCESAN COLLEGE**

- NB:**
- Unless otherwise stated, give all answers correct to 1 decimal place.
  - Show all working details.
  - Answer all the questions in the spaces provided.
  - Approved calculators may be used, unless otherwise stated.
  - It is in your interest to write legibly and to present your work clearly.
  - This paper consists of 16 pages, 7 questions and a formula sheet.
  - Diagrams are not drawn to scale.
  - WRITE YOUR NAME AT THE BOTTOM OF THIS PAGE AND HIGHLIGHT THE RELEVANT TEACHER BOX

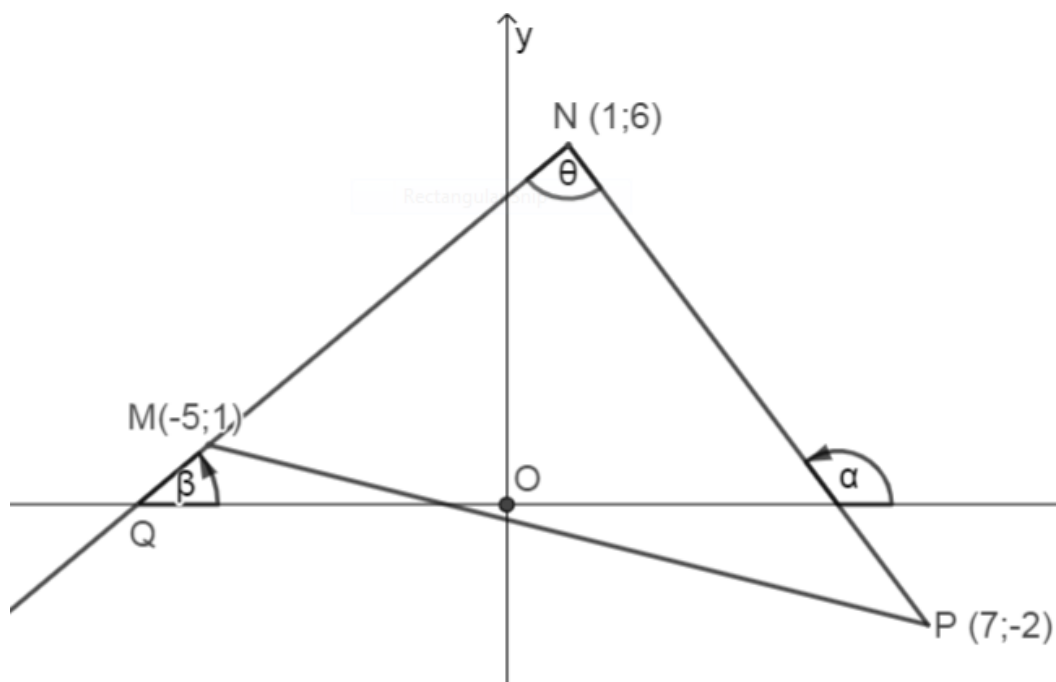
For Official use only:

Analytical Geometry	Analytical Geometry	Data Handling	Trigonometry	Trig graphs	Triangles, measurement and Circles	Euclidean Geometry	Total
1	2	3	4	5	6	7	
12	13	16	29	9	16	15	110

<b>NAME</b>				
<b>TEACHER</b> (Highlight your teachers name)	MORGAN	MOLEME	THOMPSON	VAN DER MERWE

### QUESTION 1

In the diagram below,  $M(-5; 1)$ ,  $N(1; 6)$  and  $P(7; -2)$  are vertices of  $\triangle MNP$  with  $MN$  produced to  $Q$ , on the  $x$ -axis.



Determine:

- a. the length of  $MP$ .

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(2)

- b. the equation of line  $NP$ .

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(3)

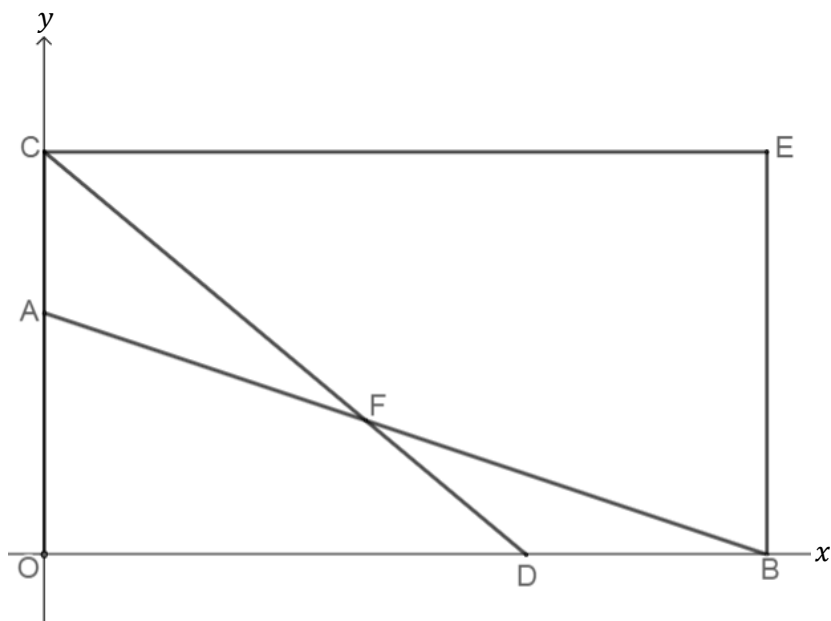


## QUESTION 2

Given the Cartesian plane below. The line AB intersects line CD at F.

A, C, B and D are points on the axes.

The area of rectangle OCEB is 45 units<sup>2</sup> and the equation of CD is  $6y = -5x + 30$ .



a. Calculate the coordinates of:

i. point C, the y-intercept of CD.

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(1)

ii. point B.

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(2)

b. If  $AC = 2$ , show that the equation of AB is  $3y = -x + 9$ .

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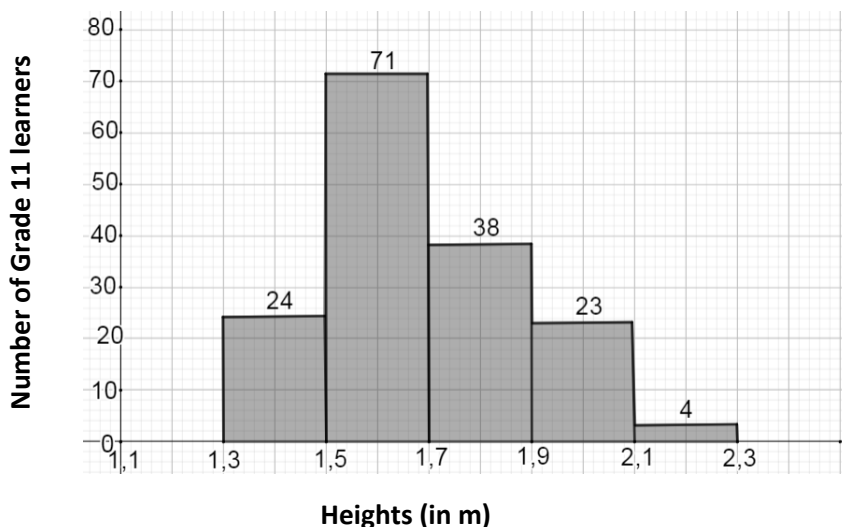
(3)



### QUESTION 3

- a. The heights of 160 Grade 11 learners are measured. The shortest learner is 1,39m and the tallest learner is 2,21m. The heights are represented in a histogram below.

**Histogram showing the heights of Grade 11 learners**



- i. Draw a frequency polygon for this data, on the same axes as the histogram above. (1)
- ii. Hence, describe the skewness of the graph. (1)

- iii. Calculate the range of heights. (2)

- iv. The person measuring the learners' heights realised that her data was not correct. She had measured the heights of the learners with their school shoes on. The average girls' school shoe has a heel of 4 cm.

How does this error influence:

1. The mean of the data set. (1)

2. The standard deviation of the data set. (1)

- b. The following information was taken from a group of 7 000 Grade 11 learners across the province. They were asked how many minutes they spend in front of a screen each day. Blank columns are provided for working. The results are summarised in the table below.

Minutes spent in front of a screen/day	Frequency			
$50 \leq x < 100$	500			
$100 \leq x < 150$	900			
$150 \leq x < 200$	1500			
$200 \leq x < 250$	1600			
$250 \leq x < 300$	1400			
$300 \leq x < 350$	700			
$350 \leq x < 400$	400			

- i. Calculate an estimate for the mean number of minutes spent in front of a screen per day.

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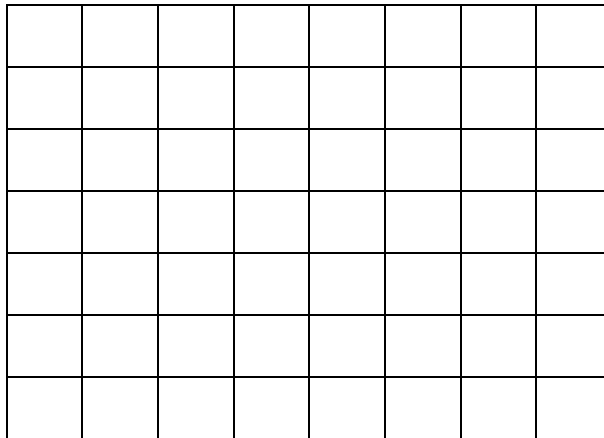
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(3)

- ii. Sketch a cumulative frequency curve (ogive) to represent the data above.



(3)

- iii. Determine the median value from the curve above. Mark your answer with an M on the graph and write down your answer.

(2)

- iv. Experts are concerned about learners who spend more than 125 minutes in front of a screen each day. Use your cumulative frequency graph to determine what percentage of learners this would represent.

(2)

[16]

**QUESTION 4**

a. Given:  $\tan\theta = \frac{1}{2}$  and  $\cos\theta < 0$

i. What quadrant does  $\theta$  lie in?

\_\_\_\_\_ (1)

ii. Use a diagram to find the following, in surd form:

1.  $\cos(180^\circ - \theta)$

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ (4)

2.  $\tan(-\theta)$

\_\_\_\_\_  
\_\_\_\_\_ (1)

b. Simplify the following expression to a single trig ratio:

$$\frac{\cos(90^\circ + \theta) \cdot \sin(\theta - 360^\circ)}{\tan(-\theta) \cdot \sin\theta}$$

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ (4)

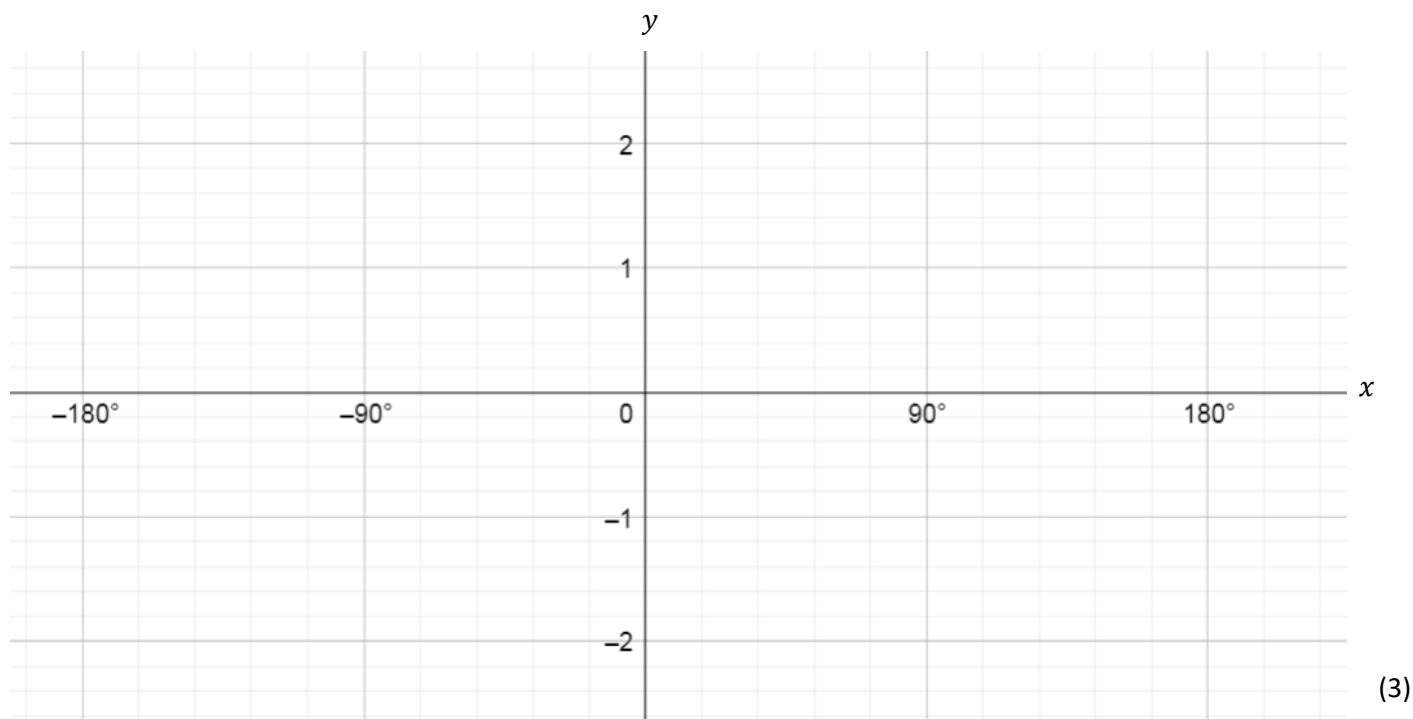






### QUESTION 5

- a. Draw the graph of  $f(x) = 2\sin 2x$  for the interval  $x \in [-180^\circ; 180^\circ]$  on the axes below. Show all  $x$  and  $y$  intercepts and turning points.



- b. Use the graph to answer the following:

i. Write down the period of  $f$ . \_\_\_\_\_ (1)

ii. Write down the maximum value of  $f(x) - 3$ . \_\_\_\_\_ (1)

iii. Write down the equation of the new graph if  $f$  is:

1. Reflected about the  $x$ -axis. \_\_\_\_\_ (1)

2. Shifted  $45^\circ$  to the left. \_\_\_\_\_ (1)

iv. For what values of  $x$  is  $\frac{1}{f(x)} > 0$  for the interval  $(-180^\circ; 0^\circ]$  \_\_\_\_\_

(2)

[9]

**QUESTION 6**

The diagram represents a cylinder, with B the centre of the circular base.

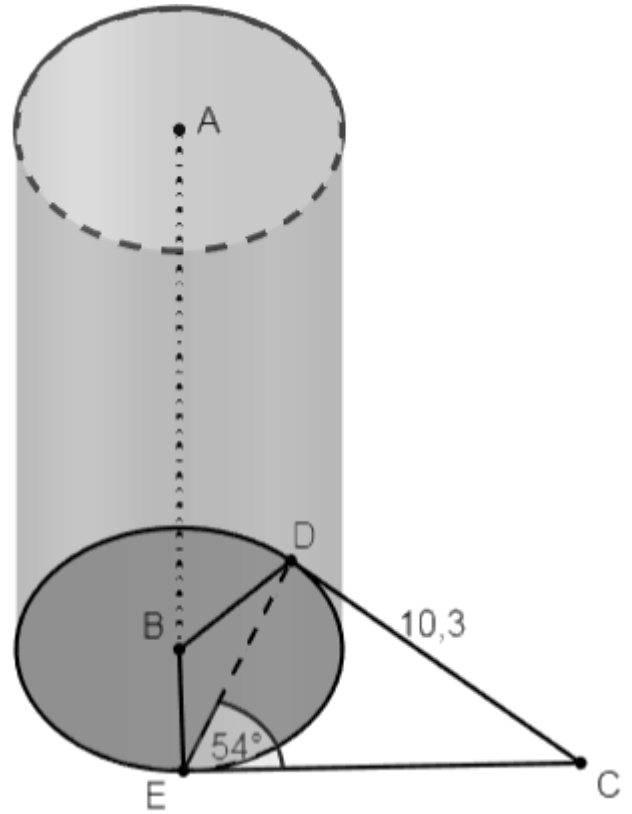
CE and CD are tangents to the base at E and D, respectively.

BD and BE are radii.

B, D, C and E lie in the same horizontal plane.

The vertical height of the cylinder, AB, is **36 metres**.

$DC = 10,3 \text{ m}$  and  $\widehat{DEC} = 54^\circ$



a. Complete: Tangents from the same point are

\_\_\_\_\_ (1)

b. Determine, with reasons, the size of :

i.  $\widehat{C}$

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ (2)

ii.  $\widehat{BEC}$

\_\_\_\_\_ (1)

c. Calculate the length of DE.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ (3)

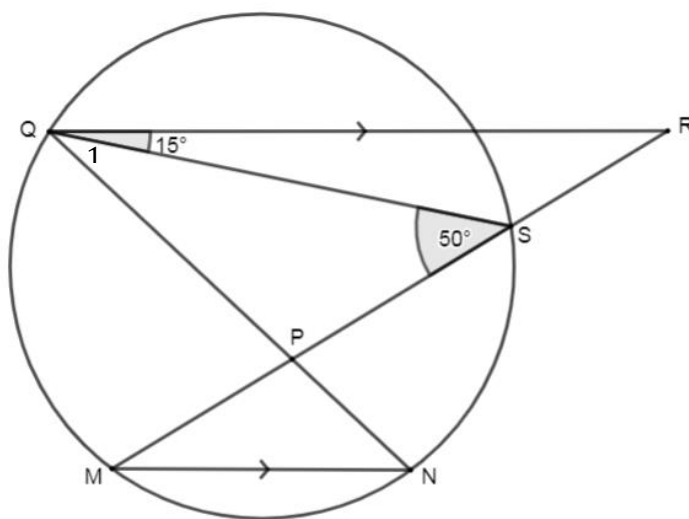
d. Explain why BDCE is a cyclic quadrilateral, give reasons to justify your answer.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ (3)



**QUESTION 7**

- a. M, N, S and Q are points that lie on the circle in the diagram below.  $QR \parallel MN$  with R on MS produced. QN and MS are chords that intersect at P.  $\widehat{RQS} = 15^\circ$  and  $\widehat{QSM} = 50^\circ$ .



- i. Calculate, with reasons, the size of:

1.  $\widehat{R}$

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(2)

2.  $\widehat{Q_1}$

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(3)

- ii. Prove, with a reason, that QP is a tangent to the circle that passes through the points Q, R and S.

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(2)



