basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 10

MATHEMATICS P2

NOVEMBER 2016

MARKS: 100

TIME: 2 hours

This question paper consists of 10 pages and a 16-page answer book.

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 in the SPECIAL ANSWER BOOK provided.

3. Clearly show ALL calculations, diagrams, graphs et cetera that you used to determine the answers.

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

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

6. Diagrams are NOT necessarily drawn to scale.

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

8. Write neatly and legibly.

                                            Please turn over

QUESTION 1

The heights of 20 children were measured (in centimetres) and the results were recorded. The data collected is given in the table below.

127	128	129	130	131	133	134	134	135	136
137	138	139	140	141	142	142	143	144	145

1.1 Write down the median height measured. (1)

1.2 Determine:

      1.2.1 The mean height (2)

      1.2.2 The range (1)

      1.2.3 The interquartile range (3)

1.3 Draw a box and whisker diagram to represent the data. (2)

[9]

QUESTION 2

The intelligence quotient score (IQ) of a Grade 10 class is summarised in the table below.

IQ INTERVAL	FREQUENCY
$90 \leq x < 100$	4
$100 \leq x < 110$	8
$110 \leq x < 120$	7
$120 \leq x < 130$	5
$130 \leq x < 140$	4
$140 \leq x < 150$	2

2.1 Write down the modal class of the data. (1)

2.2 Determine the interval in which the median lies. (2)

2.3 Estimate the mean IQ score of this class of learners. (3)

[6]

QUESTION 3

3.1   Show that a triangle ABC, with vertices A(1 ; 1); B(3 ; 6) and C(6 ; 3), is an isosceles triangle.   (4)

3.2   In the diagram below, ADCB is a kite with A(3 ; 5) and B(–1 ; –4). AD = DC and AB = BC. D is a point such that AD is parallel to the x-axis and AD = 5 units. CD is perpendicular to the x-axis. The diagonals intersect at P.
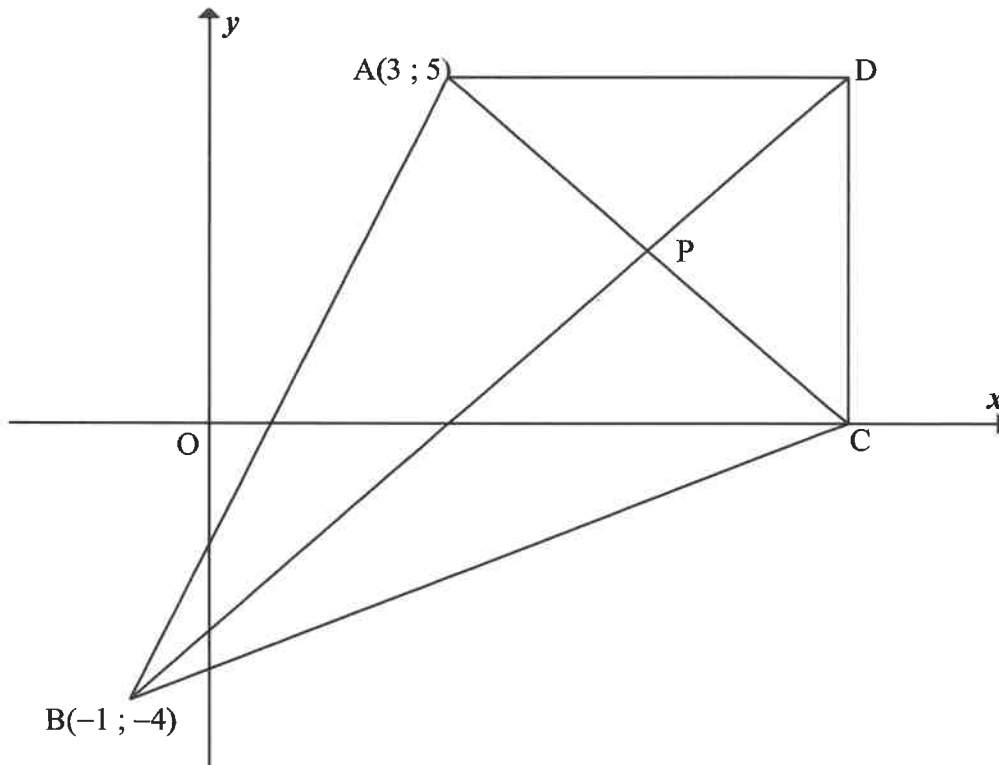
3.2.1   Show that the coordinates of C are (8 ; 0).   (2)

3.2.2   Write down the coordinates of point P.   (2)

3.2.3   Calculate the gradient of line BD.   (2)

3.2.4   Calculate the length of line AC.   (2)

3.2.5   Calculate the area of the kite ADCB.   (3)
                                                                                                                        [15]

QUESTION 4

4.1   A right-angled triangle has sides a, b and c and the angle θ, as shown below.
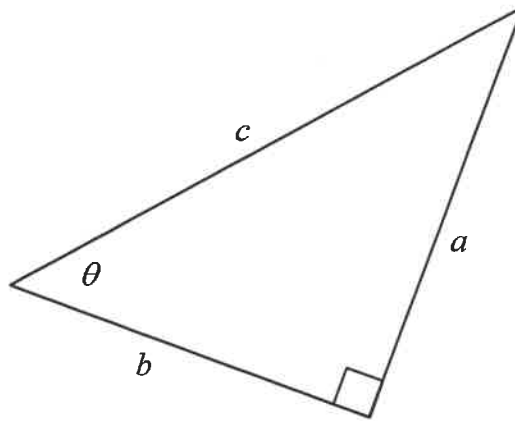
4.1.1   Write the following in terms of a, b and c:

(a) $\cos\theta$ (1)

(b) $\tan\theta$ (1)

(c) $\sin(90° - \theta)$ (2)

4.1.2   If it is given that $a = 5$ and $\theta = 50°$, calculate the numerical value of b.   (2)

4.2   Given that $\hat{A} = 38{,}2°$ and $\hat{B} = 146{,}4°$.

Calculate the value of $2\operatorname{cosec}A + \cos 3B$.   (3)

4.3   Simplify fully, WITHOUT the use of a calculator:

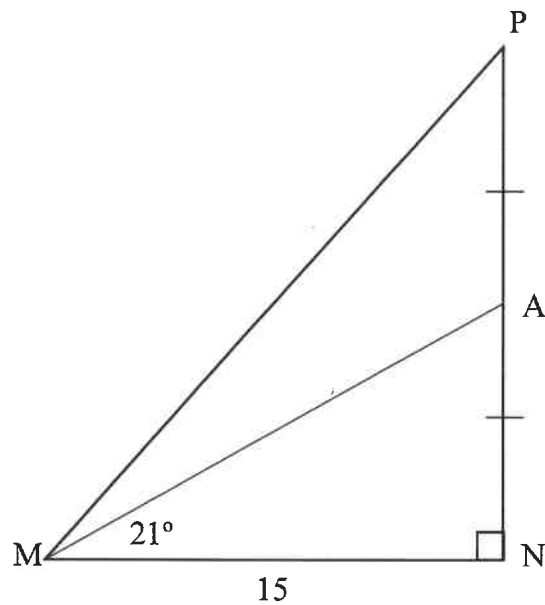$$\frac{\sin 45°.\tan^2 60°}{\cos 45°}$$ (4)

4.4   Given that $5\cos\beta - 3 = 0$ and $0° < \beta < 90°$.

If $\alpha + \beta = 90°$ and $0° < \alpha < 90°$, calculate the value of $\cot\alpha$.   (4)

                                                                                                              [17]

QUESTION 5

5.1   In the sketch below, ΔMNP is drawn having a right angle at N and MN = 15 units. A is the midpoint of PN and $A\hat{M}N = 21°$.
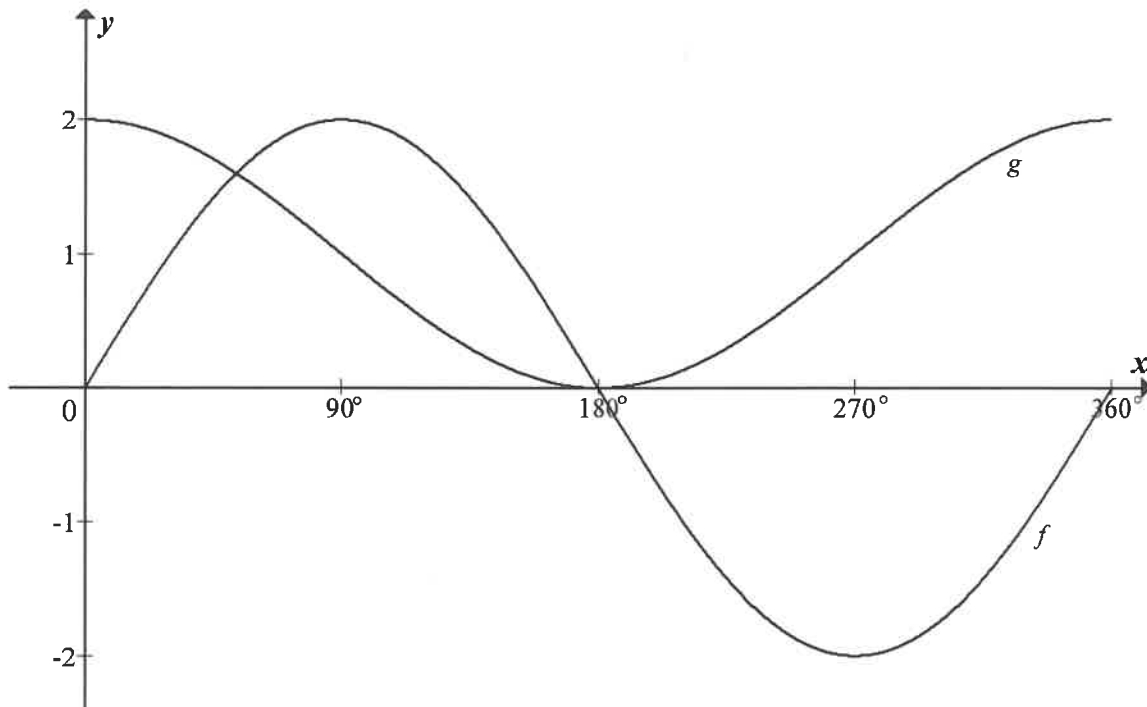

Calculate:

5.1.1   AN   (3)

5.1.2 $P\hat{M}N$ (3)

5.1.3   MP   (3)

5.2   Calculate θ if $2\sin(\theta + 15°) = 1,462$ and $0° \leq \theta \leq 90°$.   (3)

    [12]

QUESTION 6

The graphs of $f(x) = a \sin x$ and $g(x) = \cos x + 1$ for $x \in [0 \; ; 360]$ are sketched below.

| 6.1 | Write down the value of a. | (1) |
6.2	Write down the period of f.	(1)
6.3	Write down the range of g.	(2)
6.4	For which values of x for $x \in [0° \; ; 360°]$ will $f(x).g(x) > 0$?	(2)
6.5	The graph g is reflected about the x-axis and then shifted 2 units upwards to obtain the graph h. Write down the equation of h.	(2)
		[8]

QUESTION 7

The diagram below represents a cross-section of the peaks of Table Mountain, T, and Lions Head, L, above sea level. Points M and N are directly below peaks L and T respectively, such that MPN lies on the same horizontal plain at sea level and P is directly below C.

MN = 3 100 m.

The angle of elevation of L from N is β and the angle of elevation of T from M is θ.

It is given that $\tan \theta = 0{,}35$ and $\tan \beta = 0{,}21$.
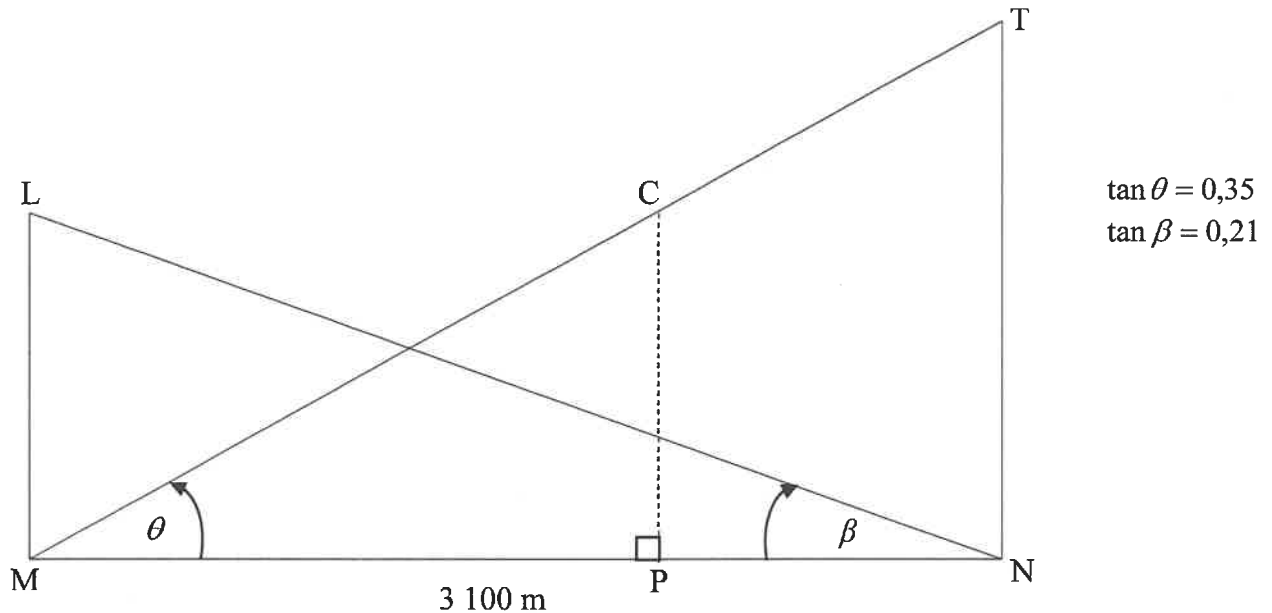
7.1   Calculate the ratio of LM : TN.   (4)

7.2   A cable car, C, travelling from the top of Table Mountain, T, follows a path along TCM.

    7.2.1   Calculate the angle formed ($M\hat{T}N$) between the cable and the vertical height TN.   (2)

    7.2.2   If the cable car, C, travels along the cable, such that TC = 400 m, calculate the height of the cable car above sea level at that instant.   (5)

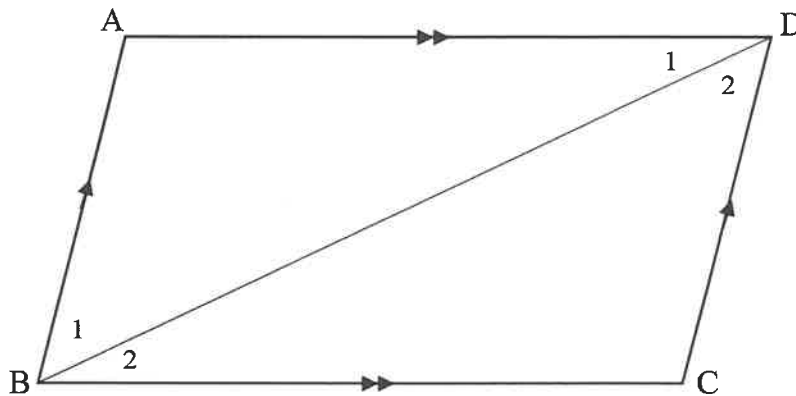   [11]

Give reasons for your statements in QUESTIONS 8 and 9.
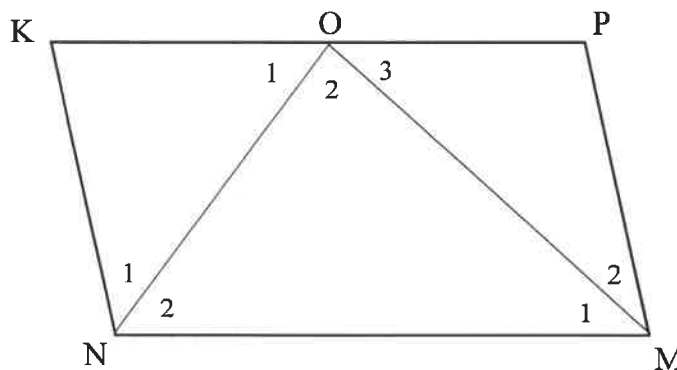
QUESTION 8

8.1 Complete the following statement:

If the opposite angles of a quadrilateral are equal, then the quadrilateral … (1)

8.2 Use the sketch below to prove that the opposite sides of a parallelogram are equal.

(6)

8.3 In the sketch below, KPMN is a parallelogram. ON bisects $K\hat{N}M$ and OM bisects $N\hat{M}P$.

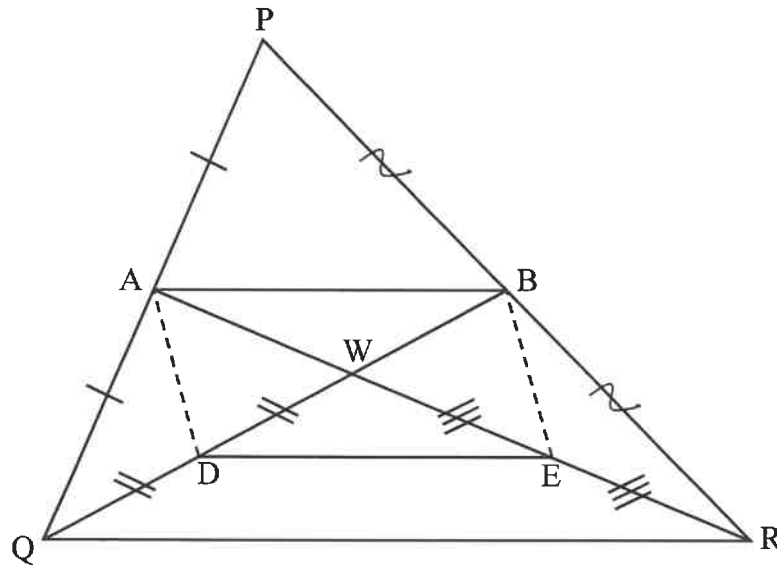

8.3.1 Show that $N\hat{O}M = 90°$. (3)

8.3.2 Prove that O is the midpoint of KP. (6)

[16]

QUESTION 9

9.1   Complete the following statement:

        The line through the midpoint of two sides in a triangle is parallel to and … the
        third side.   (1)

9.2   In ΔPQR, A and B are the midpoints of sides PQ and PR respectively. AR and
        BQ intersect at W. D and E are points on WQ and WR respectively such that
        WD = DQ and WE = ER.

        Prove that ADEB is a parallelogram.   (5)
                                                                                       [6]

                                                          TOTAL: 100