



BERGVLIET HIGH SCHOOL
MATHEMATICS DEPARTMENT

JUNE EXAMINATION

GRADE 12

MATHEMATICS PAPER 2

9 JUNE 2016

MARKS: 150

TIME: 3 HOURS

This question paper consists of 11 pages and 14 questions.

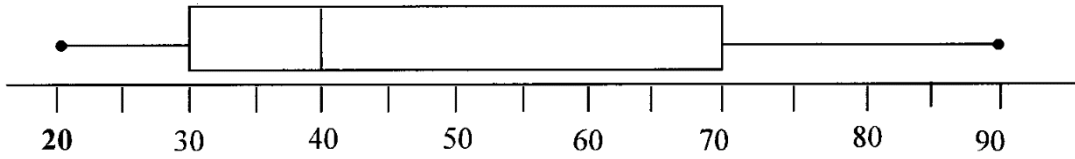
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of FOURTEEN questions.
2. Answer ALL the questions, in the answer booklet, in the spaces provided.
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. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
6. If necessary, round off answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Number the questions correctly according to the numbering system used in this question paper.
9. Write neatly and legibly.
10. The “additional space” in your answer booklets may be used to complete any question that you require more space for, simply indicate clearly which page you have continued the question on and also number the continued question clearly.

QUESTION 1

The box and whisker diagram below shows the marks (out of 90) obtained in a Mathematics test by a class of nine learners.



- 1.1 Comment on the skewness of the data. (1)
- 1.2 Write down the interquartile range of the marks obtained. (2)
- 1.3 If the learners had to obtain 30 marks to pass the test, estimate the percentage of the class that passed the test. (2)
- 1.4 In ascending order, the second and third marks are the same, the sixth mark is 58, the seventh mark is 66 and the eighth mark is 74. The average mark for this test is 49. Fill in the remaining marks in ascending order in your answer books. (7)

					58	66	74	
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[12]

QUESTION 2

A potato packing company does a survey to determine whether a consistent number of potatoes is being packed in each 7kg bag that is sold. A sample of 15 bags was taken and the number of potatoes in each was counted. The results are in the table below:

Number of bags	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Number of potatoes	41	48	31	40	46	45	45	45	50	52	44	57	35	27	36

Determine:

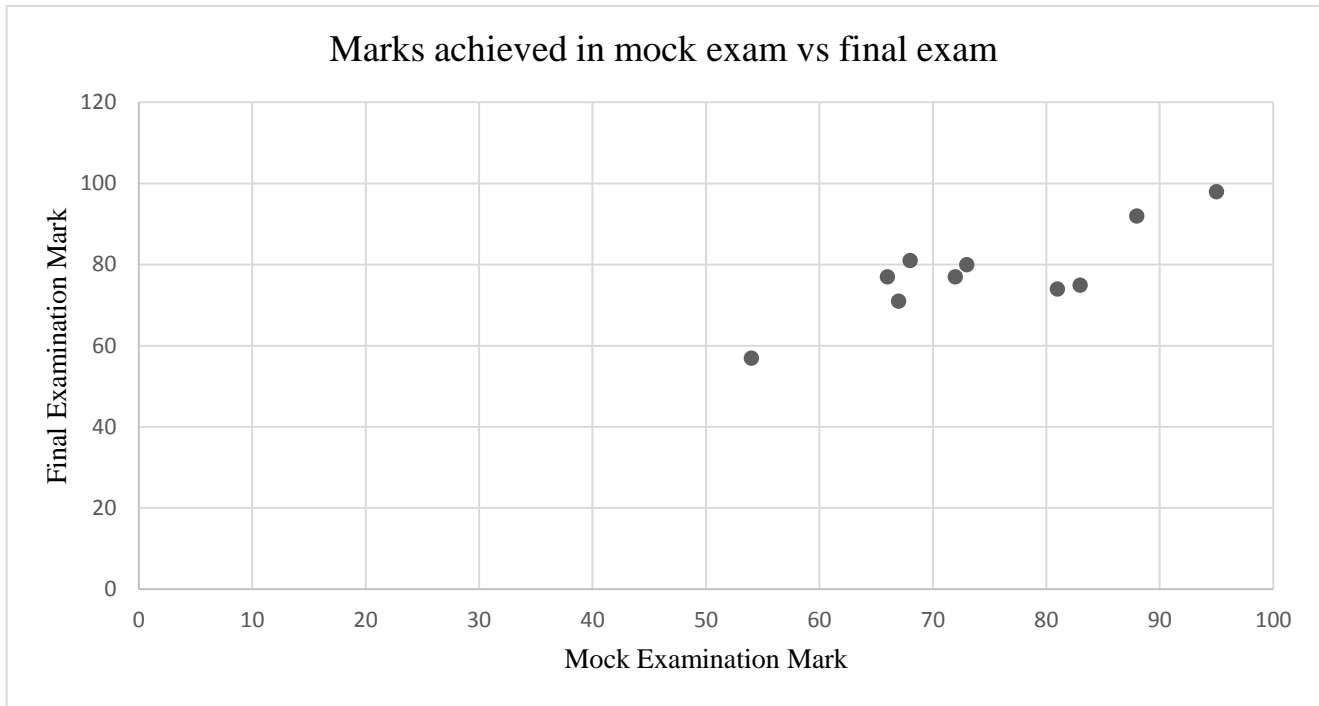
- 2.1 The mean number of potatoes per bag. (2)
- 2.2 The standard deviation of the data (2)
- 2.3 How many bags from this group would be rejected if the company only sells bags in which the number of potatoes are within one standard deviation of the mean? (3)

[7]

QUESTION 3

The data below shows the marks of the Grade 12 mock examinations and the corresponding final examination marks for 10 learners. The corresponding scatterplot is also drawn.

Mock exam mark	81	67	95	72	73	83	54	68	66	88
Final exam mark	74	71	98	77	80	75	57	81	77	92

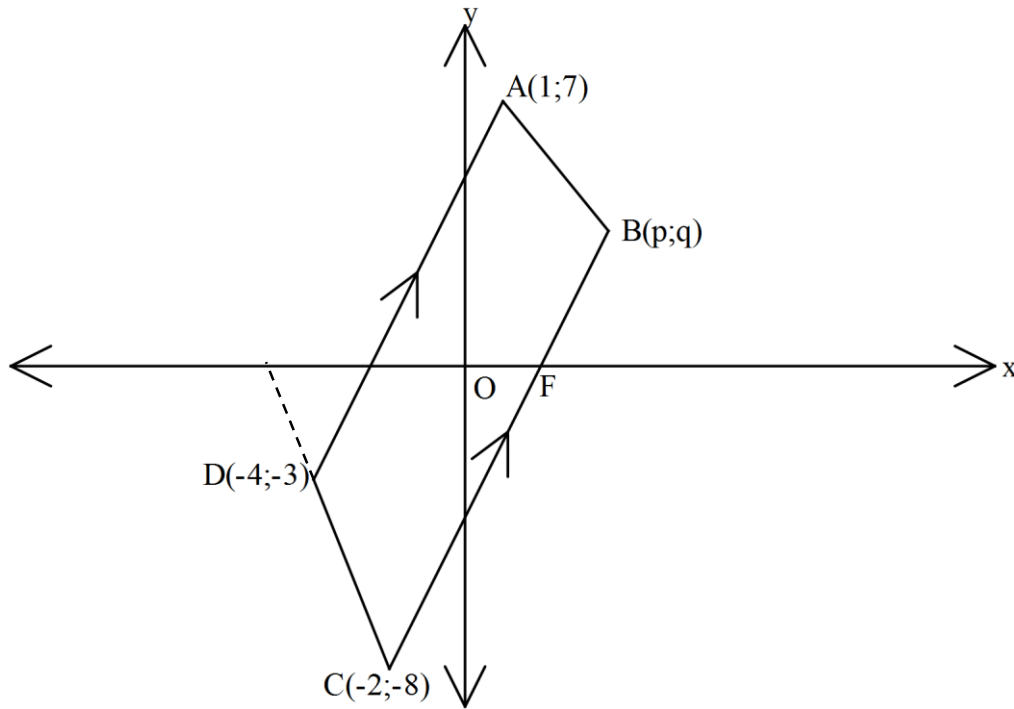


- 3.1 Calculate the equation of the least squares regression line for this data. (2)
- 3.2 Draw the least squares regression line for this data onto the scatter plot in your answer books. (2)
- 3.3 Calculate the correlation co-efficient for the above data. (2)
- 3.4 What will the predicted final examination mark be for a learner averaging 75 in the mock exam? (2)

[8]

QUESTION 4

In the diagram alongside, trapezium ABCD with $AD \parallel BC$ is drawn. The co-ordinates of the vertices are $A(1;7)$, $B(p;q)$, $C(-2;-8)$ and $D(-4;-3)$. BC intersects the x – axis at F.



- 4.1 Calculate the gradient of AD. (2)
- 4.2 Determine the equation of BC in the form $ax + by + c = 0$ (3)
- 4.3 Determine the co-ordinates of B if ABCD is a parallelogram. (2)
- 4.4 Determine the value of k if A, C and $E(-3; k)$ are collinear. (3)
- 4.5 Calculate the size of \widehat{DCB} , rounded off to ONE decimal place. (5)
- 4.6 Calculate the area of $\triangle DCF$ (4)

[19]

QUESTION 5

Given the circle with equation $x^2 + y^2 + 4x - 6y + 3 = 0$

5.1 Determine the center and radius. (5)

5.2 Will the straight line $y = -3x + 7$ be a tangent to the circle? Justify. (5)

[10]

QUESTION 6

A circle with centre A and equation $(x - 3)^2 + (y - 6)^2 = 4$ and another circle with centre B with equation $x^2 + y^2 + 2x - 6y + k = 0$ touch externally.

Determine the value of k .

[7]

QUESTION 7

7.1 Answer the question without using a calculator and the aid of a sketch.

If $\sin 35^\circ = p$, express each of the following in terms of p :

7.1.1 $\sin 325^\circ$ (3)

7.1.2 $\sin^2 215^\circ + \cos 180^\circ \cdot \cos 240^\circ + \cos 755^\circ$ (5)

7.2 Simplify fully:

$$\frac{\cos(90^\circ - A) \tan(180^\circ + A)}{\tan(180^\circ - A) \cdot \sin(180^\circ - A)} + \frac{\cos(90^\circ + A)}{\sin(360^\circ - A)} \quad (8)$$

[16]

QUESTION 8

8.1 Prove the identity:

$$\frac{\cos^4 x - \sin^4 x}{(\cos x - \sin x)(1 + \tan x)} = \cos x \quad (5)$$

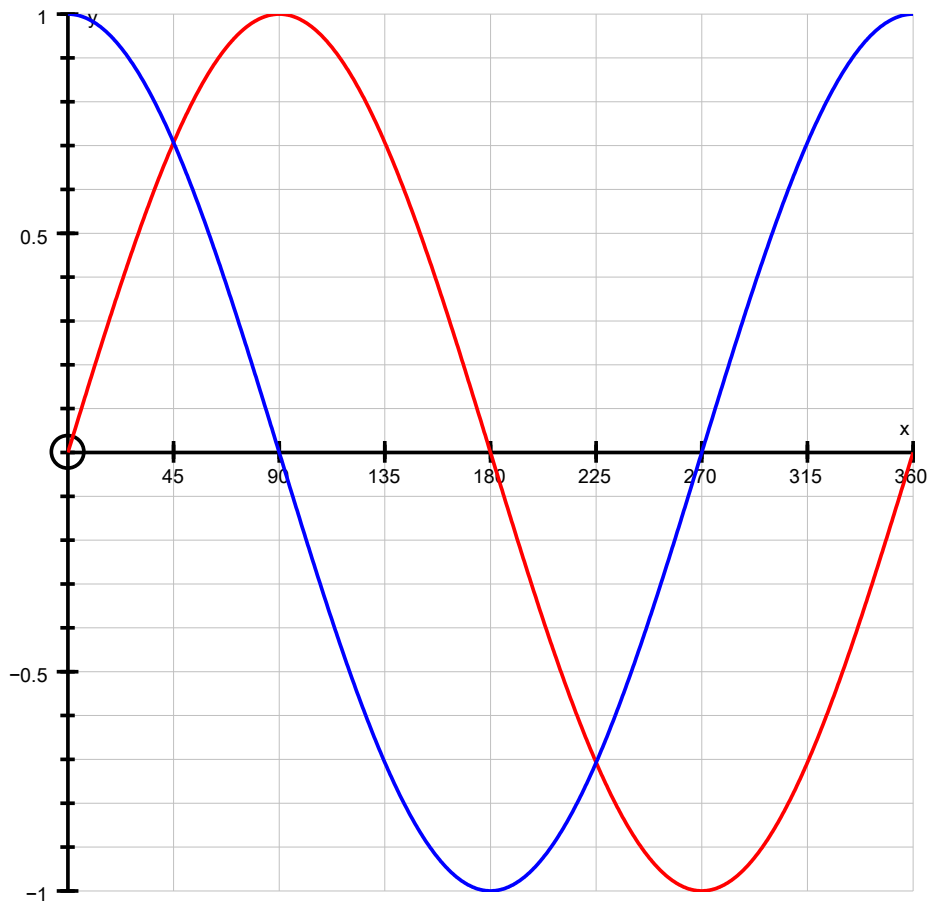
8.2 Determine the general solution of the equation $\sin(B + 20^\circ) = -0,842$ (5)

8.3 Determine the values of x in the following equation $\cos(3x + 40^\circ) = \sin x$, $x \in [-180^\circ; 0^\circ]$. (4)

[14]

QUESTION 9

In the diagram below the graphs of $f(x) = \sin x$ and $g(x) = \cos x$ are sketched.

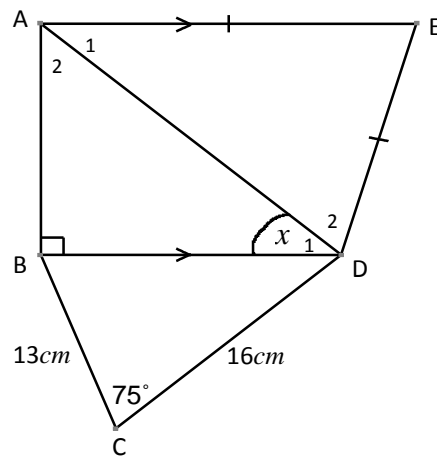


- 9.1 Show on your graph where you would read off the solution(s) to $\sin x = \cos x$ for $x \in [0^\circ; 360^\circ]$
Use capital letters A, B, C etc..... (2)
- 9.2 Use the graph to determine the values of $x \in [0^\circ; 360^\circ]$ which satisfy $\sin x - \cos x = 1$. (2)
- 9.3 Hence, write down the general solution to $\sin x - \cos x = 1$. (2)
- 9.4 Use the graph to determine the values of x where $f(x) \times g(x) < 0$. (3)

[9]

QUESTION 10

In the sketch below: $\triangle BCD$ has $\hat{C} = 75^\circ$, $BC = 13\text{cm}$ and $CD = 16\text{cm}$. In $\triangle ABD$, $\hat{A}BD = 90^\circ$, and the angle of elevation of A from D is x . E is the point so that $AE \parallel BD$, and $AE = ED$.



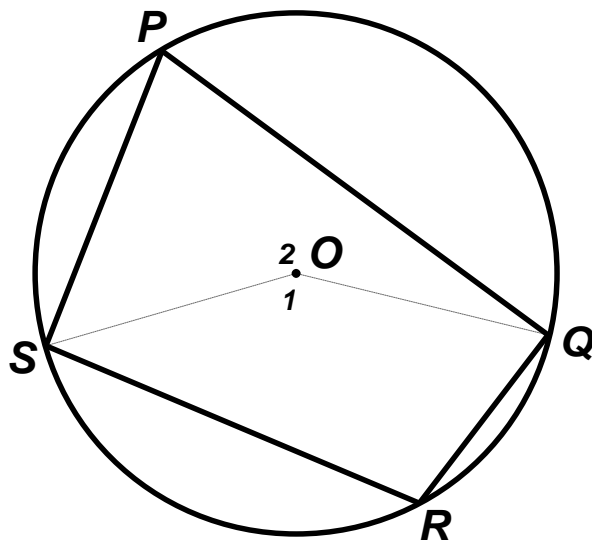
10.1 Show that the length of BD is 18cm (correct to the nearest whole number). (3)

10.2 Given that side $BD = 18\text{cm}$, determine AD and \hat{E} in terms of x , and then calculate the length of DE in terms of x . (5)

[8]

QUESTION 11

In the diagram below, P, Q, R and S are points that lie on the circumference of the circle with centre O. Given below is the partially completed proof of the theorem that states that $\hat{P} + \hat{R} = 180^\circ$. Complete the proof by filling in the missing sections (in your answer book).



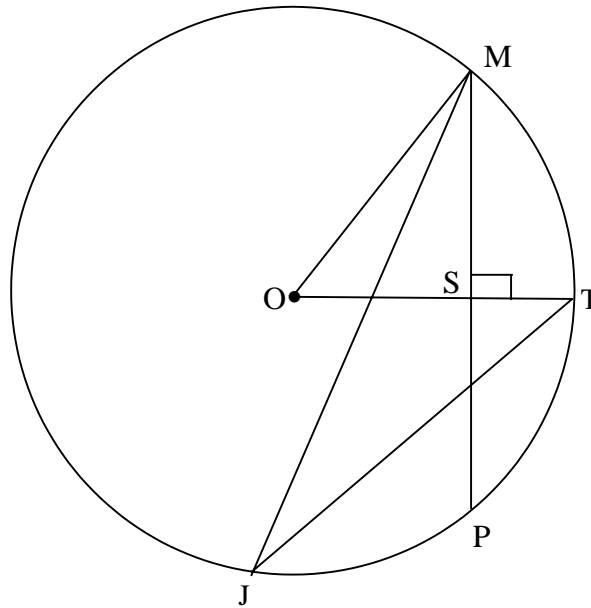
Construction: Join SO and QO.

Statement	Reason
$\hat{O}_1 =$...
$\hat{O}_2 =$
$\hat{O}_1 + \hat{O}_2 = 2\hat{P} + 2\hat{R}$	
And $\hat{O}_1 + \hat{O}_2 =$...
$\therefore 2\hat{P} + 2\hat{R} = 360^\circ$	
$\therefore \hat{P} + \hat{R} = 180^\circ$	

[5]

QUESTION 12

In the diagram, O is the centre of the circle. Radius OT and chord PM intersect perpendicular at S. J is another point on the circumference of the circle. Chords MJ and JT are drawn. PM = 16 units, ST = 4 units and OS = k units.



12.1 Calculate, giving reasons, the length of radius OM. (7)

12.2 Calculate, giving reasons, the size of \hat{MJT} . (4)

[11]

QUESTION 13

TS is a tangent to the circle centre O. TPQ is a straight line and $SK \parallel TQ$. $\hat{T} = 44^\circ$ and $\hat{SQT} = 39^\circ$.

Calculate the value of each of the following, giving reasons.

13.1 \hat{K}

13.2 \hat{S}_1

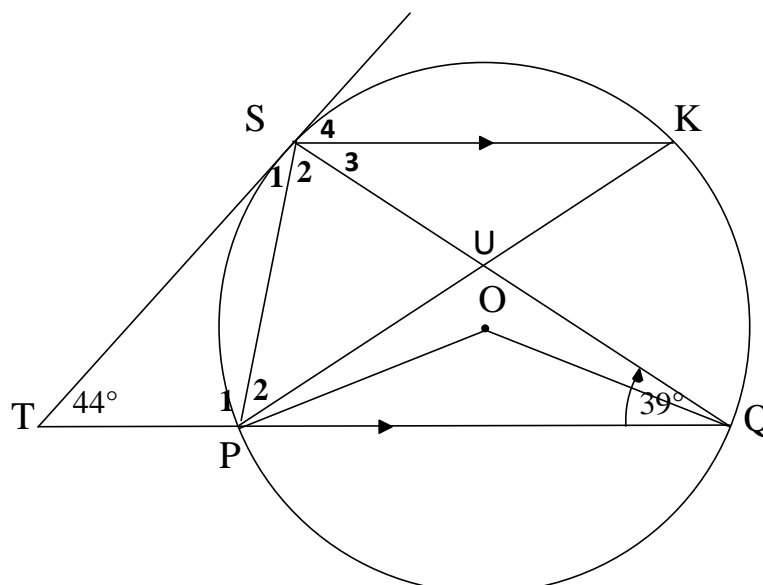
13.3 \hat{P}_1

13.4 \hat{KPQ}

13.5 \hat{P}_2

13.6 \hat{S}_2

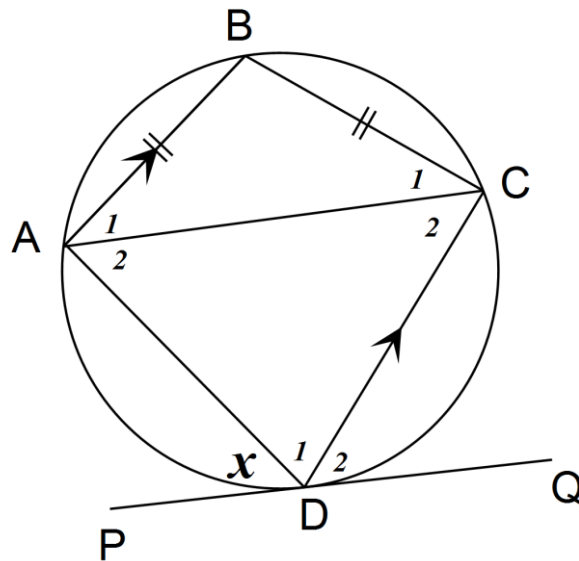
13.7 \hat{POQ}



[14]

QUESTION 14

PQ is a tangent at D to the circle. $AB = BC$ and $AB \parallel DC$. $\hat{ADP} = x$.



14.1 Show that $\hat{C}_1 = x$. (5)

14.2 Express \hat{D}_1 in terms of x only. (3)

14.3 Prove $AC = BD$. (2)

[10]