

NATIONAL SENIOR CERTIFICATE EXAMINATION **NOVEMBER 2015**

MATHEMATICS: PAPER II

EXAN	MINATION NUMBER
Time:	3 hours 150 marks
PLEA	SE READ THE FOLLOWING INSTRUCTIONS CAREFULLY
1.	This question paper consists of 27 pages and an Information Sheet of 2 pages $(i - ii)$. Please check that your paper is complete.
2.	Read the questions carefully.
3.	Answer ALL the questions on the question paper and hand this in at the end of the examination. Remember to write your examination number on the space provided.
4.	Number your answers exactly as the questions are numbered.
5.	Diagrams are not necessarily drawn to scale.
6.	You may use an approved non-programmable and non-graphical calculator, unless otherwise stated.
7.	Ensure that your calculator is in DEGREE mode.
8.	Round off your answers to one decimal digit where necessary, unless otherwise stated.
9.	All the necessary working details must be clearly shown.
10.	It is in your own interest to write legibly and to present your work neatly.

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Q8

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Q9

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Q10

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Q11

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Q12

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Q1

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 $\mathbf{Q2}$

Q3

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Q4

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Q6

Q13 TOTAL

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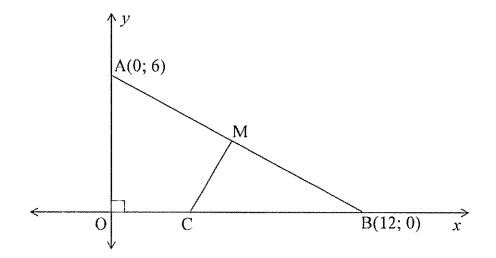
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SECTION A

QUESTION 1

In the diagram below:

- AB is drawn with A(0; 6) and B(12; 0).
- M is the midpoint of AB.
- AMCO is a cyclic quadrilateral.



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(1)	Show that the area of \triangle MCB is 11,25 units ² .	
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(2)	Determine the own of AMCO	
(2)	Determine the area of AMCO.	
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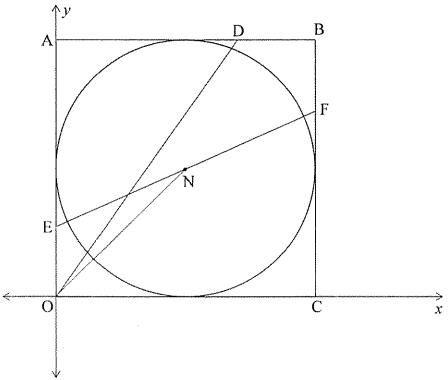
In the diagram below, circle centre N is drawn.

The equation of OD is 7y = 10x.

The equation of ON is y = x.

The equation of EF is $y = \frac{1}{2}x + 4$.

OABC is a square that touches the circle at four points on the circumference.



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Write down the coordinates of	of B.		

Page 5 of 27

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(2)

QUESTION 3

1	(a)) Sim	nlify tl	ie fol	lowing	expression	as far	ลร	nossihla	e
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(2)	Hence	determine	tor	which	value(s)	ot

$\theta \in [0^\circ; 360^\circ], $	$\frac{\sin(180^\circ - \theta).\cos(}{\cos(-\theta)}$	$\frac{90^{\circ}-\theta)-1}{\theta}$ will	be real.
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(b) Prove the following identity:

(1)	$\tan\theta\sin\theta + \cos\theta =$	$\frac{1}{\cos \epsilon}$
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(3)

(2) Hence; determine the general solution to:

$$\tan\theta\sin\theta + \cos\theta = \frac{3}{\sin\theta}$$

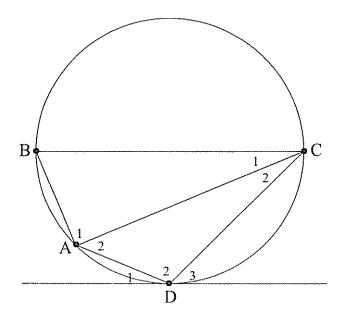
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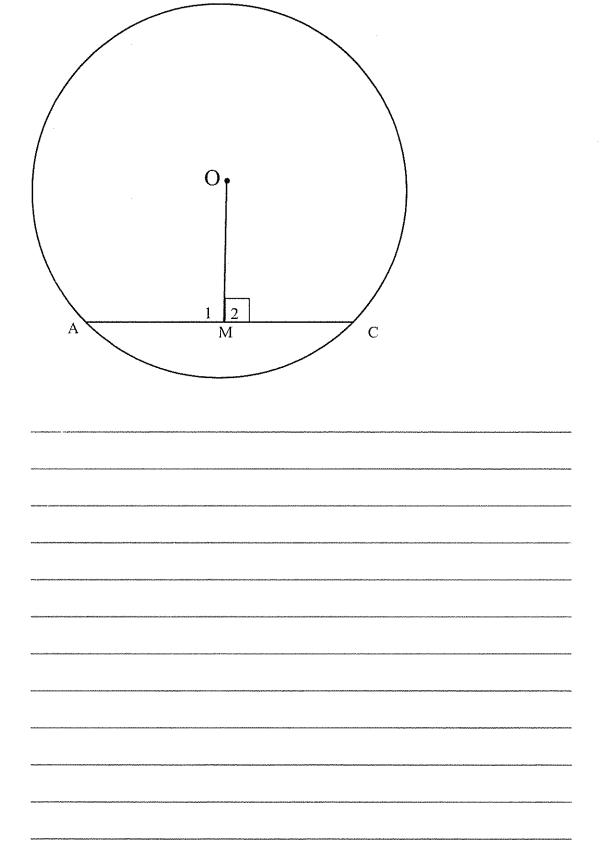
In the diagram below:

- Points A, B, C and D lie on the circle.
- A tangent is drawn at point D with a chord drawn from A to C.

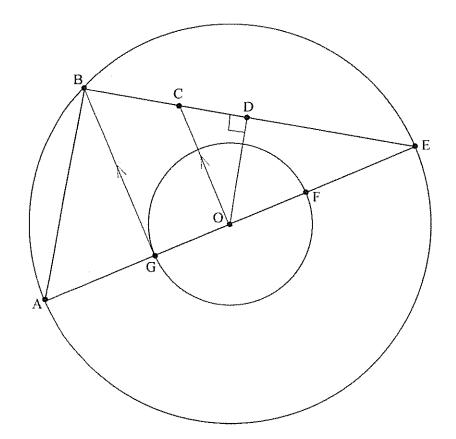


Prove that $\hat{C}_2 + \hat{D}_3 = \hat{B}$.				
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(a) Use the diagram below to prove the theorem that states that the line drawn from the centre of a circle and perpendicular to the chord, bisects the chord.



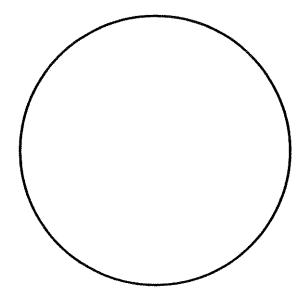
- (b) In the diagram below, O is the centre of two concentric circles.
 - AE is a diameter of the larger circle and is 20 units long.
 - GF is a diameter of the smaller circle and is 8 units long.
 - Chord AB has a length of 12 units.
 - OD is perpendicular to BE.
 - OC//GB.



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(a) In the circle below, draw any two chords (not diameters), AB and CD intersecting at E, a point inside the circle.



(1)

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(a) Study the table below and answer the questions that follow.

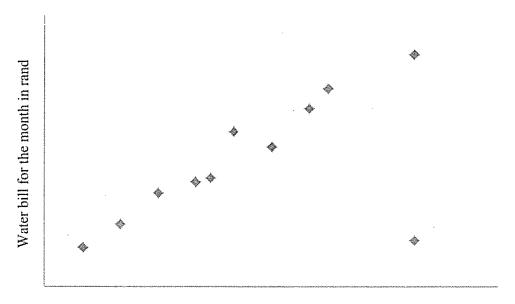
х	1,3	2,1	4,2	5	6,8	9
у	3,2	6,4	14,8	18	25,2	34

_____(3)

(2) Comment on your answer in (1) by first calculating the correlation co-efficient.

_____(2)

(b) The scatter plot below is a graphical representation of the relationship between a household's monthly electricity bill and their monthly water bill within the same suburb. *Electricity bills between R100 and R1 000 were used in the study.* 



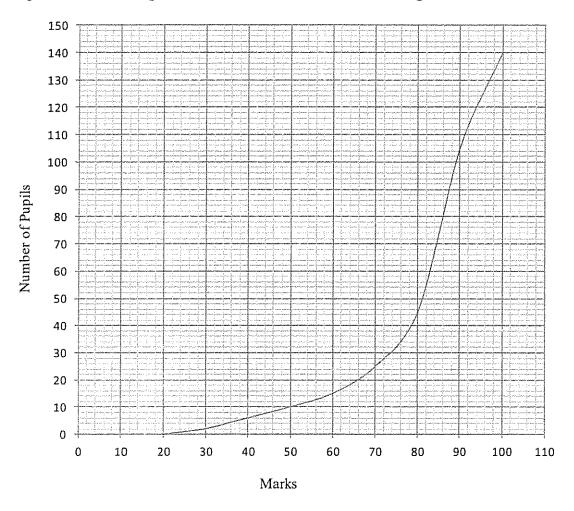
Electricity bill for the month in rand

(1) Label the outlier on the diagram above with the letter T.

(1)

If the outlier correlation c	was removed from the data above, how would this affect the oefficient?
	for the line of best fit is $y = A + Bx$ (including the outlier). It as excluded, what would happen to the value of B?
If a househol	d has a monthly electricity bill of <b>R3 000</b> , can you estimate th
amount that	will appear on the water bill for the month by using the ve? (Explain your answer.)

The diagram below is an ogive for the mark distribution of a certain grade.



(a)	On the same grid as the ogive, sketch the histogram for the mark distribution of the	
	grade. Assume 8 equal class intervals.	(5)

(b) Describe the skewness of the mark distrib	bution.
-----------------------------------------------	---------

(1)

(c) State whether the statement is TRUE or FALSE. Explain.

The median is closer to the upper quartile than the lower quartile.

(2)

[8]

75 marks

#### **SECTION B**

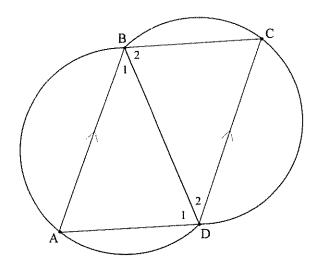
# **QUESTION 9**

(a) What statement can be deduced from all of the following statements?

$$\hat{A} + \hat{B} + \hat{C} = 180^{\circ}$$
.  
 $\hat{D} + \hat{E} + \hat{F} = 180^{\circ}$ .  
 $\hat{A} = \hat{E}$ .

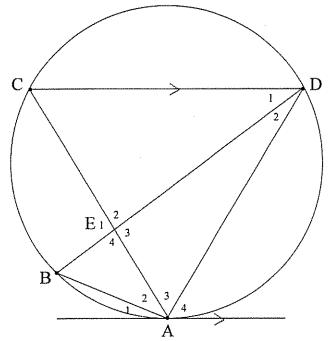
______(1)

- (b) In the diagram below:
  - Two major segments of circles are drawn with BD a common chord.
  - Both circles have equal diameters.
  - Chord AB is parallel to chord CD.



Prove that ABCD is a parallelogram.	
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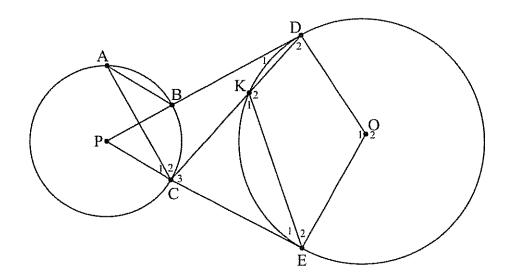
(a) In the diagram below, the tangent at point A is parallel to chord CD. C; D; A and B lie on the circumference of the circle.



If $\hat{B} = 55^{\circ}$ statements.	and $\widehat{A}_1 =$	18°, then	calculate	the size	of $\widehat{E}_2$ , giv	ing reasons	for your
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(8)

- (b) In the diagram below, circles with centres P and O are drawn.
  - Tangents PD and PE to circle O cut the circle P at B and C respectively.
  - A is a point on the major arc BC.
  - DC cuts circle O at K.



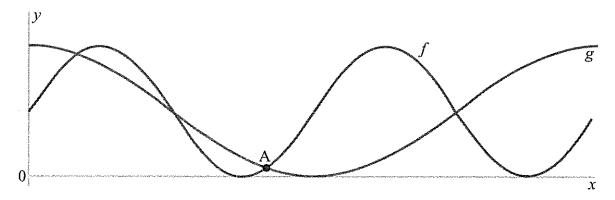
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- (a) The diagram below is a sketch of f(x) and g(x):
  - $f(x) = 2\sin 2x + 21$

•	) (4) =	2311127	سکدا	-x	=	0°	:	360°
•	g(x) =	$2\cos x +$	2 .			L	1	•

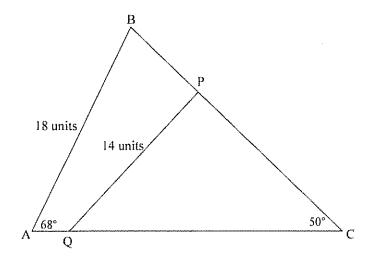


Calculate the coordinates of point A. (Show your working.)

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(7)

- (b) In the diagram below, an acute-angled triangle ABC is drawn:
  - A line PQ is drawn, where P lies on the line BC and Q lies on the line AC.
  - The length of PQ is 14 units and the length of AB is 18 units.
  - $\hat{A} = 68^{\circ} \text{ and } \hat{C} = 50^{\circ}$ .



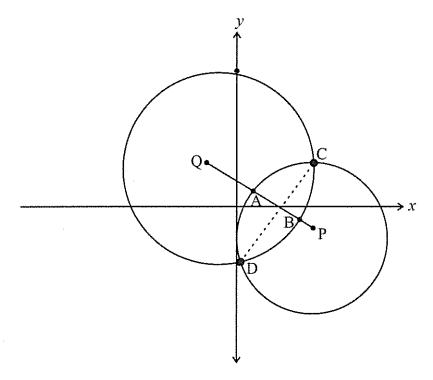
If the ratio of BP: PC is 2: 3 determine the size of PQC.

(6)

Prove that	1 + ain 2 A			
$\frac{\cos(A-45^\circ)}{\cos(A+45^\circ)}$	$=\frac{1+\sin 2A}{\cos 2A}.$			
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In the diagram below, P and Q are the centres of circles having equations:

$$(x-7)^2 + (y+2)^2 = 49$$
 and  $x^2 + y^2 + 10x - 6y = 30$ .



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Calculate the length of PQ.		of the control of the
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(3)

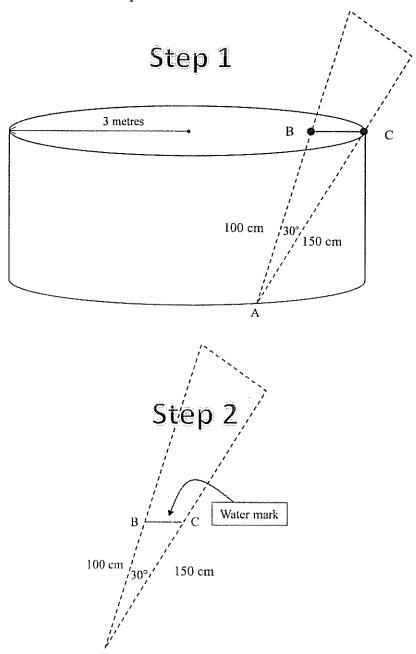
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PLEASE TURN OVER

A farmer has come up with an accurate way to measure the volume of water in his water tank:

- You place the triangular wedge with $\hat{A} = 30^{\circ}$ in the water tank until point A is touching the bottom of the tank. (Step 1)
- You pull the triangular wedge out of the tank and look for the water mark made on the wedge. This is indicated in Step 2 as line BC.



If the farmer's water tank has a radius of 3 metres, and he measures AB to be 100 cm and AC to be 150 cm, determine the volume of water in the water tank.

(Only round off at the end of your calculation.) $v = \pi r^2 h$

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Total: 150 marks

