UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE

FAKULTEIT NATUURWETENSKAPPE

DEPARTMENT OF MATHEMATICS / DEPARTEMENT WISKUNDE

MODULE	**MA1BFET**
	MATHEMATICS FOR TEACHERS
	WISKUNDE VIR ONDERWYSERS
CAMPUS	**APK**
KAMPUS	APK
EXAM	**DECEMBER 2014**
EKSAMEN	DESEMBER 2014

ASSESSOR: MS. S. RICHARDSON
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MODERATOR: MS R DURANDT
MODERATOR

DURATION: **2 HOURS** **MARKS: 100**
TYDSDUUR: **2** URE PUNTE: 100

SURNAME AND INITIALS
VAN EN VOORLETTERS

STUDENT NUMBER
STUDENTENOMMER

CONTACT NR
KONTAK NO

NUMBER OF PAGES: 17 PAGES (including front page)

AANTAL BLADSYE: **17** BLADSYE (insluitend voorblad)

INSTRUCTIONS: **ANSWER ALL THE QUESTIONS, CALCULATORS ARE NOT ALLOWED.**

INSTRUKSIES: BEANTWOORD AL DIE VRAE, SAKREKENAARS WORD NIE TOEGELAAT NIE.

SECTION A: TRIGONOMETRY/ *AFDELING A: TRIGONOMETRIE*

Question 1 / *Vraag 1* **[10]**

Give a short answer to the following questions: / *Gee 'n kort antwoord vir die volgende vrae:*

Question / *Vraag*	**Answer / *Antwoord***
Find the exact value of the trigonometric function: $\sin^{-1}(-1)$ *Bepaal die spesifieke waarde van die trigonometriese funksie:*	
Convert to radian measure: $-120°$ *Herlei na radiale meeteenheid:*	
Find the exact value of the composite function: $\sin\left(\cos^{-1}\frac{1}{2}\right)$ *Bepaal die spesifieke waarde van die saamgestelde funksie:*	
Find the exact value of the trigonometric function: $\cos 40° \sin 20° + \sin 40° \cos 20°$ *Bepaal die spesifieke waarde van die trigonometriese funksie:*	
Solve for / *Los op vir* θ if / *as* $\theta \in [0°; 90°]$ $\tan\theta = \frac{2\sin 45°}{\sqrt{2}}$	

Question / *Vraag* 2: **[10]**

The following questions are multiple choice questions. There is only one correct answer from the choices given. Select the correct option by marking the option with an **X**. /
Die volgende vrae is veelkeusige vrae. Daar is slegs een korrekte antwoord uit al die opsies gegee. Merk die korrekte antwoord met 'n ***X.***

MARK YOUR ANSWERS HERE: / *MERK U ANTWOORDE HIEROP:*

2.1	A	B	C	D	E
2.2	A	B	C	D	E
2.3	A	B	C	D	E
2.4	A	B	C	D	E
2.5	A	B	C	D	E

2.1 $\theta \in [-360° ; 0°]$; $\sin\theta$ is negative and $\tan\theta$ is positive. Then $\theta \in$ .....
$\theta \in [-360° ; 0°]$; *$\sin\theta$ is negatief en $\tan\theta$ is positief. Dan is* $\theta \in$ .....

a) $(-90°;0°)$

b) $(-180°;-90°)$

c) $(-270°;-180°)$

d) $(-360°;-270°)$

e) None of the above/ *Geen een van die bogenoemde*

2.2 In ΔABC, AB = BC.
Which statement is FALSE? / *Watter stelling is ONWAAR?*

a) $b^2 = 2a^2(1 - \cos B)$

b) $b^2 = 2a^2(1 + \cos B)$

c) $b^2 = 2a\ (a - c.\cos B)$

d) $b^2 = 2a\ (c - a.\cos B)$

e) They are all true / *Hulle is almal waar*

2.3 $\frac{\tan 37^0}{\sin 217^0} = \ldots.$

a) $-\sec 37°$

b) $\cos 37°$

c) -1

d) 1

e) None of the above/ *Geen een van die bogenoemde*

2.4 Which statement is FALSE? / *Watter stelling is ONWAAR?*

$$\frac{\sin x \cos x}{\cot x} = \ldots$$

a) $sin^2 x$

b) $1 - cos^2 x$

c) $cos^2 x$

d) $\frac{1}{cosec^2 x}$

e) They are all true / *Hulle is almal waar*

2.5 If $5 \cot \theta - 12 = 0$ and $\frac{\pi}{2} < \theta < 2\pi$ then $\sec \theta = \ldots\ldots$

As $5 \cot \theta - 12 = 0$ *en* $\frac{\pi}{2} < \theta < 2\pi$ *dan is* $sec\,\theta = \ldots\ldots$

a) $\frac{13}{12}$

b) $\frac{-12}{13}$

c) $\frac{-12}{5}$

d) $\frac{-13}{12}$

e) None of the above / *Geen een van die bogenoemde*

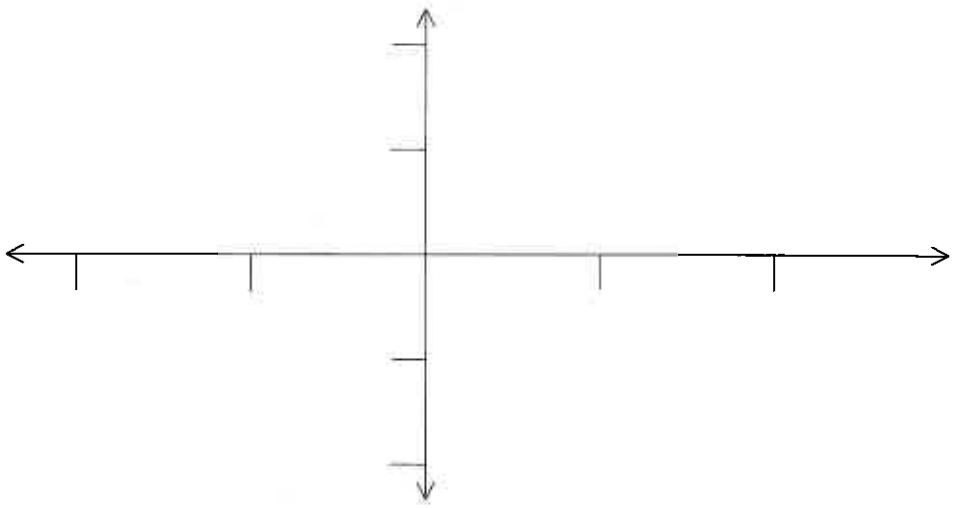
Question 3 / *Vraag 3* **[7]**

3.1.1 Graph the function (use the provided set of axes). Show clear readings on both axes. / *Skets die grafiek van die funksie (gebruik die gegewe assestelsel). Toon duidelike aflesings aan op beide asse.*

$$f(x) = -2\cos\left(x + \frac{\pi}{2}\right) \; ; \quad x \in [-\pi \; ; \; \pi]$$

(4)

DO YOUR CALCULATIONS HERE:



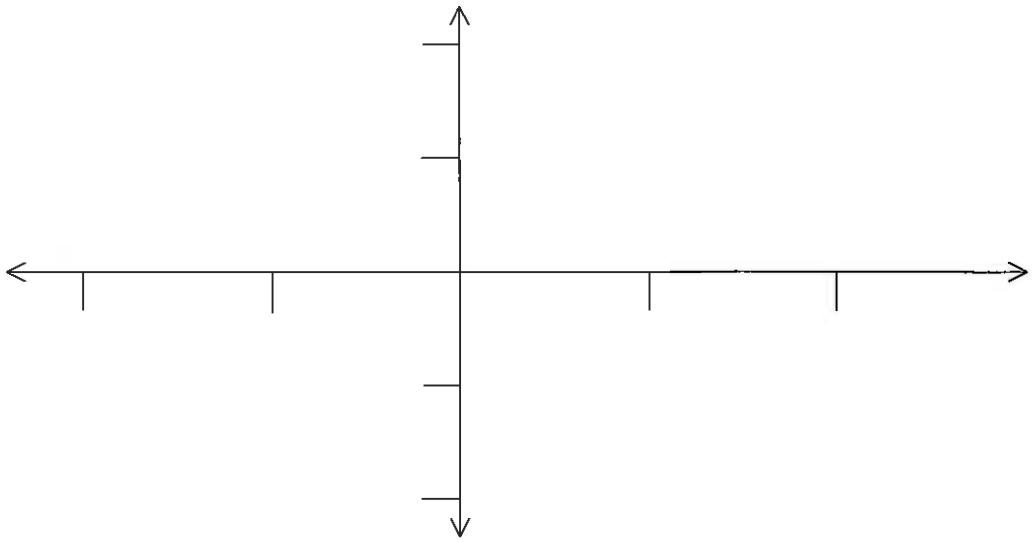
3.1.2 Give the maximum value of $f(x) - 1$. */Skryf neer die maksimumwaarde van* $f(x) - 1$

(1)

3.2 Graph the function (use the provided set of axes). Show clear readings on both axes. / *Skets die grafiek van die funksie (gebruik die gegewe assestelsel). Toon duidelike aflesings aan op beide asse.*

$$y = \cos^{-1} x$$

(2)



Question 4 / *Vraag 4* **[15]**

4.1 Verify the identity / *Bewys die identiteit:*

$$\frac{1-\cos x}{\sin x} + \frac{\sin x}{1-\cos x} = 2\csc x$$

(4)

4.2 Simplify the expression: / *Vereenvoudig die uitdrukking:*

$$\frac{\sin\left(A-45^{o}\right)}{\cos\left(A+45^{o}\right)}$$

(5)

4.3 Simplify to a single trigonometric ratio:/ *Vereenvoudig tot 'n enkele trigonometriese verhouding:*

$$2\cos^2 3A-\sin^2 A-\cos^2 A$$

(3)

4.4 Evaluate: / *Evalueer:*

$$\sqrt{4^{\sin 150^\circ}\times 2^{3\tan 225^\circ}}$$

(3)

Question 5 / *Vraag 5* **[8]**

5.1 Find the general solution for x: / *Vind die algemene oplossing vir* x:

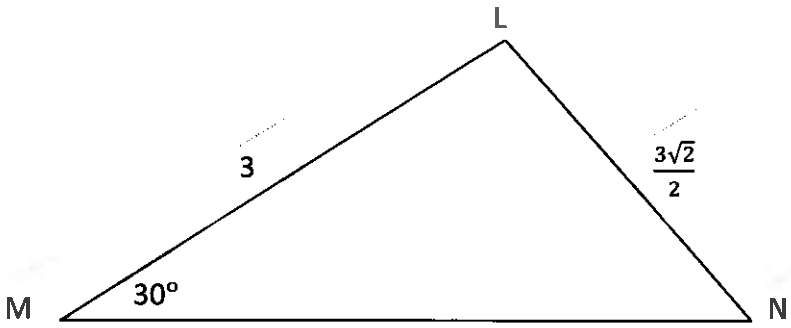
$$\sin\left(2x - \frac{\pi}{3}\right) = \frac{1}{2}$$

(4)

5.2 In the figure, $LM = 3\ cm$,

$LN = \frac{3\sqrt{2}}{2}\ cm$ and $\widehat{M} = 30°$.

Find $\widehat{N}$.



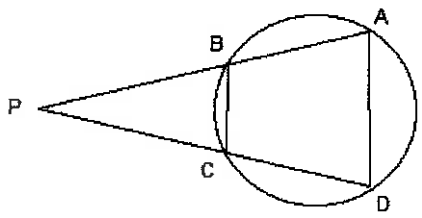
In die figuur is $LM = 3\ cm$, $LN = \frac{3\sqrt{2}}{2}\ cm$ *en* $\widehat{M} = 30°$. *Vind* $\widehat{N}$.

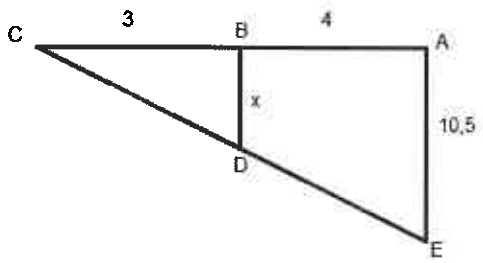
(4)

SECTION B: GEOMETRY / *AFDELING B: MEETKUNDE*

Question / *Vraag 6* **[10]**

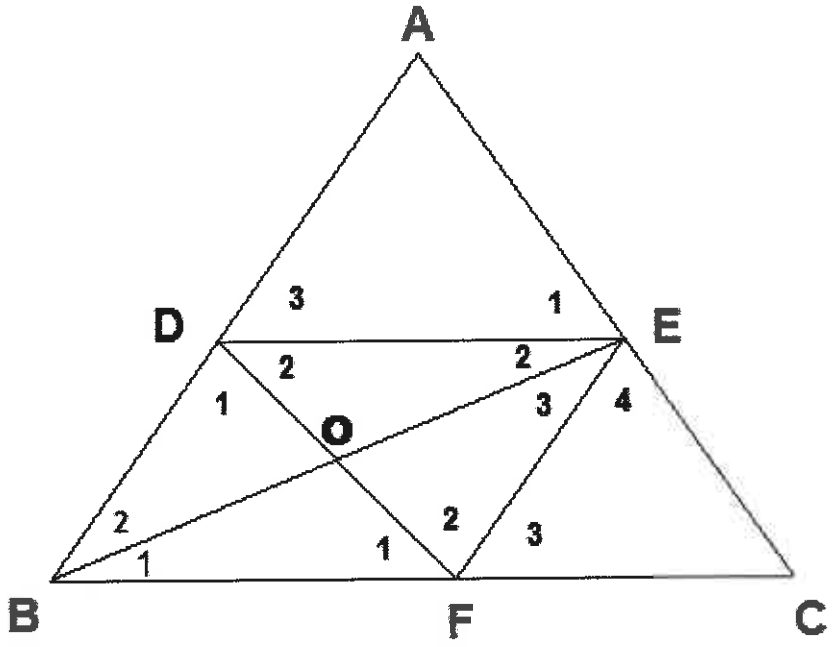
Give a short answer to the following questions: / *Gee 'n kort antwoord vir die volgende vrae:*

Question / *Vraag*	Answer / *Antwoord*
In a regular polygon, every exterior angle is 36°. How many sides does the polygon have? *In 'n reelmatige veelhoek, is elke buitehoek gelyk aan* 36°. *Hoeveel sye het die veelhoek?*	
What is the size of each of the interior angles of the polygon in the previous question? *Wat is die grootte van elke binnehoek van die veelhoek in die vorige vraag?*	
Which statement is FALSE? *Watter stelling is ONWAAR?*  A. $\Delta PCB \,|||\, \Delta PAD$ B. $\frac{PC}{PA} = \frac{PB}{PD}$ C. $CB.PA = PC.AD$ D. $PB.PD = CB.AD$ E. They are all true. */Almal is waar.*	

Complete the statement: *The angle between the tangent and the chord ...* *Voltooi die stelling:* *Die hoek tussen die raaklyn en die koord...*	
In the figure, AB = 4 , BC = 3 , AE = 10,5 , BD = x and BD ∥ AE. *In die figuur is AB = 4 , BC = 3 , AE = 10,5 , BD = x en BD ∥ AE.*  x = ... A. 1,5 B. 3,5 C. 4,5 D. 5,25 E. None of these / *Geeneen van hierdie nie*	

Question / *Vraag 7* **[10]**

Study the given diagram and give the conclusion for each statement: / Bestudeer die gegewe diagram en maak 'n gevolgtrekking vanuit die bewering:



Statement / *Bewering*	**Conclusion/ *Gevolgtrekking***
For example: $\hat{D}_1 + \hat{D}_2 + \hat{D}_3 = 180^\circ$	*For example:* *ADB is a straight line*
$\hat{E}_1 = \hat{C}$	
$BD = EF$ *and* $BD \parallel EF$	

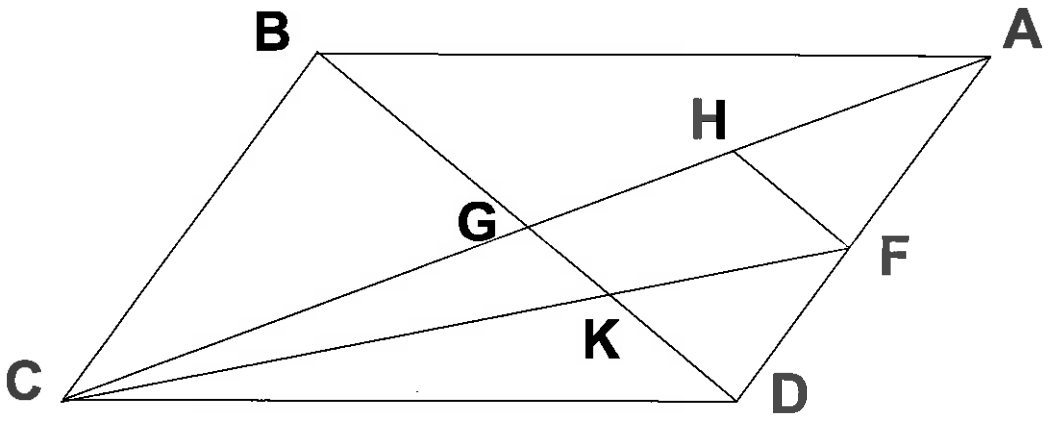
$\widehat{D}_2 = \widehat{F}_1$	
$AD = AE$	
$DO = OF$ and $BO = OE$	
$\widehat{B}_1 + \widehat{B}_2 = \widehat{C}$	
$AD = DB$ and $AE = EC$	
Area $\triangle DBF$ = Area $\triangle EBF$	
$DO \perp BE$ and DF and BE bisect each other	

$\hat{B}_1 + \hat{B}_2 = \hat{E}_2 + \hat{E}_3$ *and* $\hat{D}_1 + \hat{D}_2 = \hat{F}_1 + \hat{F}_2$	

Question / *Vraag 7* **[8]**

Given: / *Gegee:*
$ABCD$ is a parallelogram with diagonals BD and CA, $HF \parallel BD$ and $CG = 72\ units$, $DF = 24\ units$, $FA = 40\ units$. Find (**no reasons required in this question**):

ABCD is 'n parallelogram met diagonale BD en CA, $HF \parallel BD$ en $CG = 72$ eenhede, $DF = 24$ eenhede, $FA = 40$ eenhede. Bepaal (**geen redes benodig in hierdie vraag**):



7.1 The length of / *Die lengte van* GA.

(1)

7.2 The length of / *Die lengte van* GH.

(3)

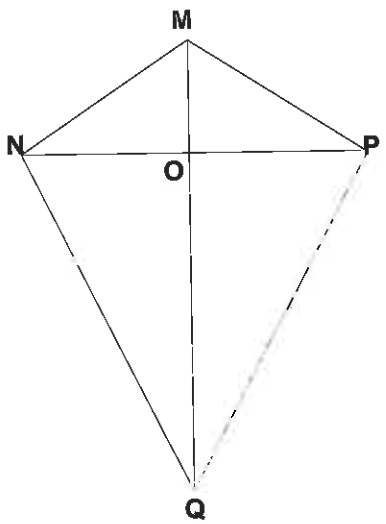
7.3 The value of: / Die waarde van:

$$\textbf{Area } \triangle AHF : \textbf{Area } \triangle ACD$$

(4)

Question / *Vraag 8* **[22]**

8.1 Given kite: / Gegee vlieër: $MNQP$, $MO = 5$, $MP = 13$, $OQ = 25$, $OP = x$



8.1.1 Calculate the length of x, giving reasons. / Bereken, met redes, die lengte van x.

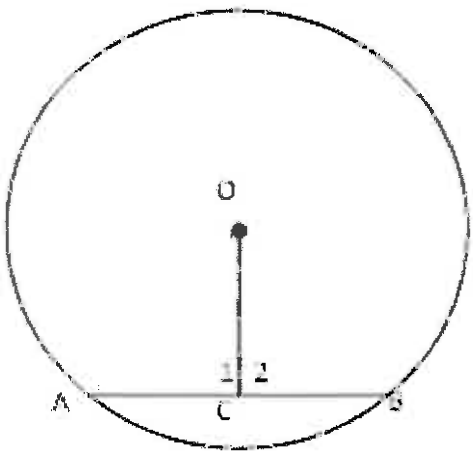
(2)

8.1.2 Calculate the area of the kite. / Bereken die oppervlakte van die vlieër.

(3)

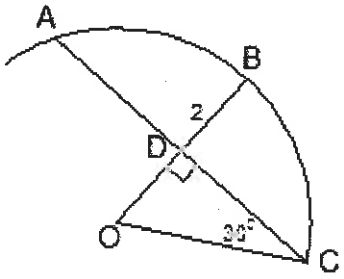
8.2 Prove the theorem: / *Bewys die stelling:*

The line segment drawn from the centre of a circle to the mid-point of a chord is perpendicular to the chord. / *Die lyn vanaf die middelpunt van 'n sirkel na die middelpunt van 'n koord is loodreg op die koord.*



(5)

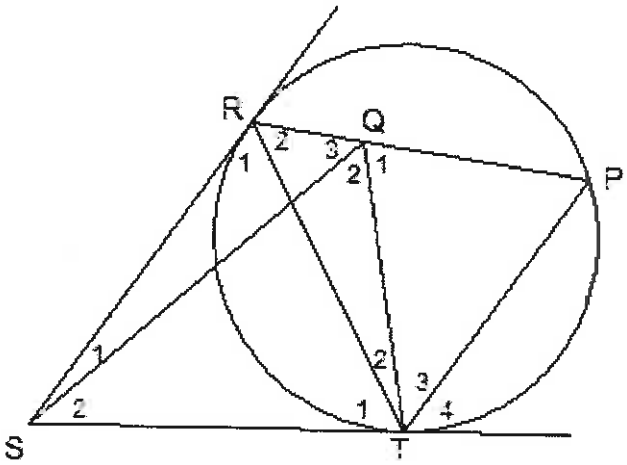
8.3 ABC is an arc of a circle with centre O.
ODB $\perp$ AC. $\hat{C} = 30°$ and BD = 2 units.
Calculate the length of chord AC, giving reasons.
ABC is 'n boog van 'n sirkel met middelpunt O.
ODB $\perp$ AC. $\hat{C} = 30°$ en BD = 2 eenhede.
Bereken, met redes, die lengte van koord AC.



(4)

8.4 SR and ST are tangents to the circle.
$\hat{Q}_3 = \hat{R}_1$ = x.
SR en ST is raaklyne aan die sirkel.
$\hat{Q}_3 = \hat{R}_1$ = x.

8.4.1 Prove, giving reasons / *Bewys, met redes*
SQ // TP



(2)

8.4.2 Prove, giving reasons QRST is a cyclic quadrilateral./ *Bewys, met redes, QRST is 'n koordevierhoek.*

(3)

8.4.3 Prove QS is a tangent to a circle passing through P, Q and T. / *Bewys QS is 'n raaklyn aan die sirkel deur P, Q en T.*

(3)