



FACULTY OF SCIENCE  
FAKULTEIT NATUURWETENSKAPPE

DEPARTMENT OF MATHEMATICS / DEPARTEMENT WISKUNDE

|         |                          |
|---------|--------------------------|
| MODULE  | MA1BFET                  |
|         | MATHEMATICS FOR TEACHERS |
|         | WISKUNDE VIR ONDERWYSERS |
| CAMPUS  | APK                      |
| KAMPUS  | APK                      |
| EXAM    | 17 NOVEMBER 2014         |
| EKSAMEN | 17 NOVEMBER 2014         |

ASSESSOR: MS. S. RICHARDSON  
MR T MOHUBEDU

MODERATOR: MS R DURANDT  
MODERATOR

DURATION: 2 HOURS  
TYDSDUUR: 2 URE

MARKS: 100  
PUNTE: 100

SURNAME AND INITIALS  
VAN EN VOORLETTERS

STUDENT NUMBER  
STUDENTENOMMER

CONTACT NR  
KONTAK NO

NUMBER OF PAGES: 18 PAGES (including front page)

AANTAL BLADSYE: 18 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]

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:**

|     |   |   |   |   |   |
|-----|---|---|---|---|---|
| 1.1 | A | B | C | D | E |
| 1.2 | A | B | C | D | E |
| 1.3 | A | B | C | D | E |
| 1.4 | A | B | C | D | E |
| 1.5 | A | B | C | D | E |

1.1 In  $\Delta ABC$ ,  $AC = BC$ . Which statement is FALSE?

*In  $\Delta ABC$  is  $AC = BC$ . Watter stelling is ONWAAR?*

- a)  $a = \frac{b \sin A}{\sin B}$
- b)  $b = \frac{c \sin A}{\sin C}$
- c)  $a = \frac{c \sin B}{\sin C}$
- d)  $b = \frac{a \sin B}{\sin C}$
- e) They are all true. / Almal is waar.

1.2  $\sec(2\pi - \theta) \cdot \sin\left(\frac{\pi}{2} - \theta\right) =$

- a) 1
- b)  $\cos^2 \theta$
- c) -1
- d)  $\frac{\operatorname{cosec} \theta}{\cos \theta}$
- e) None of the above. / Geen een van die bovenoemde

1.3 If  $5 \sin x - 4 = 0$  and  $x \in \left[\frac{\pi}{2}; 2\pi\right]$ , then  $\cot x =$   
As  $5 \sin x - 4 = 0$  en  $x \in \left[\frac{\pi}{2}; 2\pi\right]$ , dan is  $\cot x =$

- a)  $\frac{3}{4}$
- b)  $\frac{-3}{4}$
- c)  $\frac{5}{4}$
- d)  $\frac{-4}{3}$
- e) None of the above. / Geen een van die bogenoemde

1.4 The maximum value of  $y = -\sin x$  is:

Die maksimumwaarde van  $y = -\sin x$  is:

- a)  $-1$
- b)  $0$
- c)  $1$
- d)  $\infty$
- e) None of the above. / Geen een van die bogenoemde

1.5 If  $x = 30^\circ$  and  $y = 45^\circ$  then  $\frac{1}{2} \sin(2x + 4y) =$

As  $x = 30^\circ$  en  $y = 45^\circ$  dan is  $\frac{1}{2} \sin(2x + 4y) =$

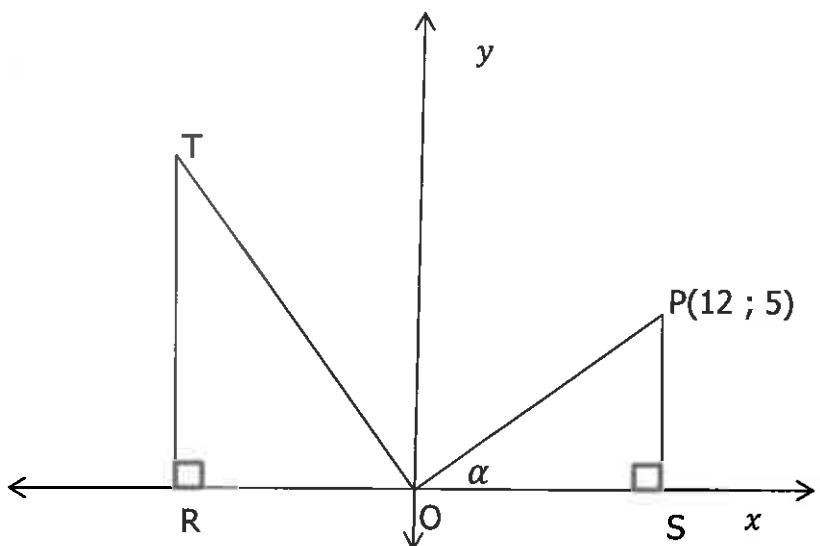
- a)  $\frac{-\sqrt{3}}{4}$
- b)  $\frac{\sqrt{3}}{2}$
- c)  $\frac{\sqrt{3}}{4}$
- d)  $\frac{-1}{4}$
- e) None of the above. / Geen een van die bogenoemde

**Question 2 / Vraag 2**

[6]

In the diagram, P is the point (12 ; 5).  $OT \perp OP$ . PS and TR are perpendicular to the  $x$ -axis.  $P\hat{O}S = \alpha$  and  $OR = 5$  units.

In die diagram is P die punt (12 ; 5).  $OT \perp OP$ . PS en TR is loodreg op die  $x$ -as.  $P\hat{O}S = \alpha$  en  $OR = 5$  eenhede.



Determine / Bepaal:

2.1  $\cos \alpha$

(2)

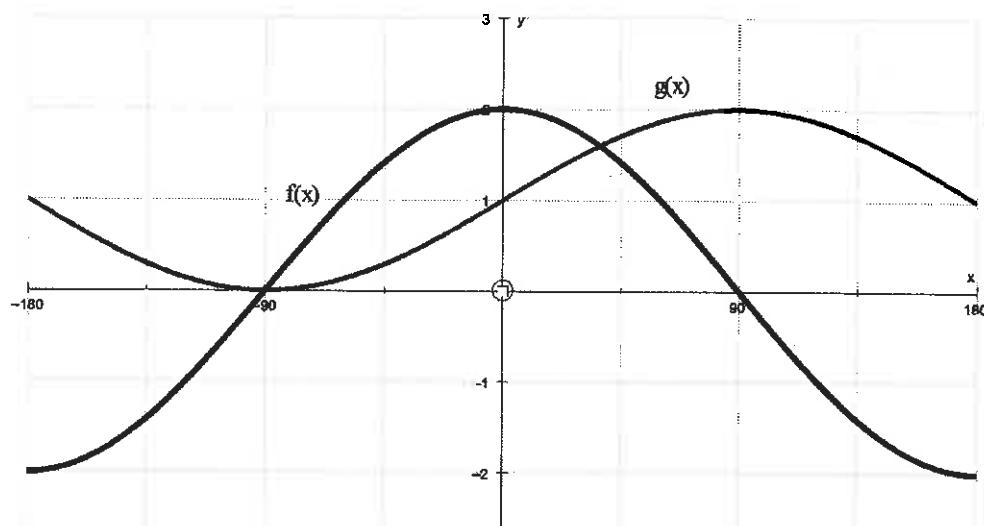
2.2  $T\hat{O}R$ , in terms of  $\alpha$  / in terme van  $\alpha$

(1)

2.3 The length of OT. / Die lengte van OT.

(3)

- 3.1 Refer to the diagram and answer the questions that follow.  
*Verwys na die diagram om die vrae te beantwoord.*



- 3.1.1 Write down the equation of  $f(x)$  / Skryf neer die vergelyking van  $f(x)$

(1)

- 3.1.2 The equation of  $g(x)$  is  $g(x) = \sin ax + b$ . Write down the value of  $a$  and  $b$ .  
*Die vergelyking van  $g(x)$  is  $g(x) = \sin ax + b$ . Skryf neer die waardes van  $a$  en  $b$ .*

(2)

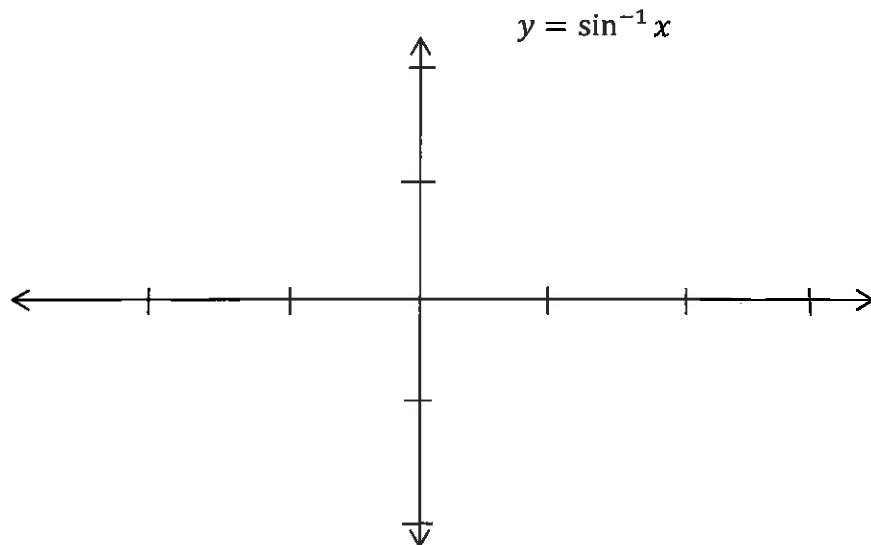
- 3.1.3 What is the amplitude of  $g$ ? / Wat is die amplitude van  $g$ ?

(1)

- 3.1.4 Write down the range of  $f(x)$  / Skryf neer die waardeversameling van  $f(x)$ .

(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.

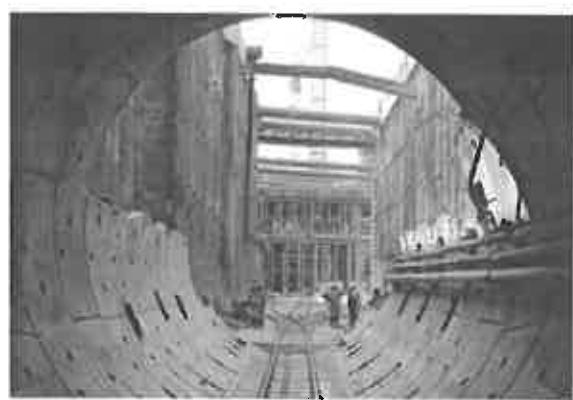
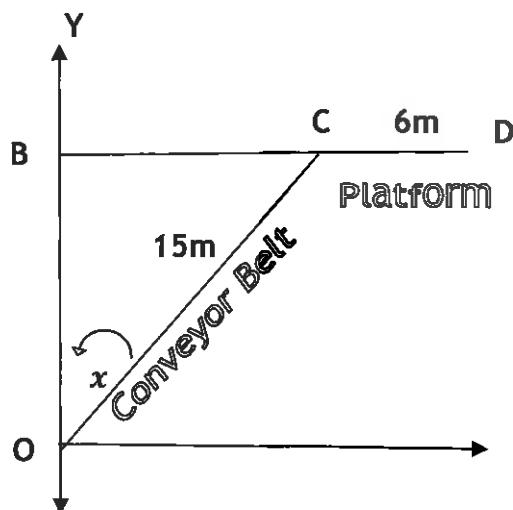


(3)

**Question 4 / Vraag 4 [16]**

- 4.1 During the construction of the **Gautrain** tunnel, a conveyor belt (OC) is used to remove soil and rubble from the tunnel excavations. It runs **15m** to an exit point at C and then to a **6m** wide fixed storage platform (CD). The conveyor belt makes an angle of  $x$  degrees with the vertical (OB). BD is perpendicular to the  $y$ -axis.

*Gedurende konstruksie van die **Gautrein** tonnel, is 'n voerband (OC) gebruik om grond en rommel van die tonnel se uitgravings te verwijder. Die voerband loop **15 m** na 'n uitgangspunt by C en dan na 'n **6 m** wye vaste bergingsplatform (CD). Die voerband maak 'n hoek van  $x$  grade met die vertikaal (OB). BD is loodreg op die  $y$ -as.*

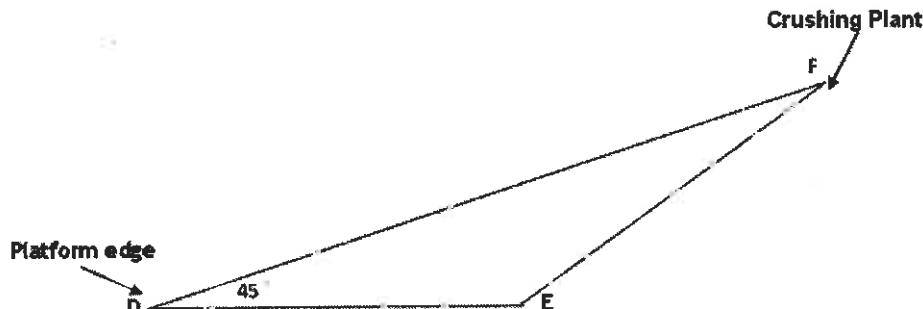


- 4.1.1 Find the length of BD in terms of  $x$ .  
*Vind die lengte van BD in terme van x.*

(3)

- 4.1.2 From the platform edge at D, trucks remove the rubble  $\sqrt{2}$  km along a road to point E. From point E, the soil and rubble have to be moved a further 2 km to the Crushing Plant at point F.  
 $F\hat{D}E = 45^\circ$

*Vanaf die platform rand by D, beweeg trokke die rommel  $\sqrt{2}$  km padlangs na punt E. Van punt E moet die grond en rommel 'n verdere 2 km vervoer word na die vergruisingsaanleg by F.  
 $F\hat{D}E = 45^\circ$*



- (a) Use the Sine Rule to find  $\hat{F}$ . / Gebruik die Sinusreël om  $\hat{F}$  te vind.

(3)

- (b) Give the size of  $\hat{E}$ . / Gee die grootte van  $\hat{E}$ .

(1)

(c) Calculate the area of  $\Delta DEF$ . / Bereken die oppervlakte van  $\Delta DEF$

(5)

4.2 Find the value of: / Bepaal die waarde van:

$$\cos\left(2 \tan^{-1} \frac{12}{5}\right)$$

(4)

**Question 5 / Vraag 5** [10]

5.1 Prove that / Bewys dat

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

(3)

5.2 Given: / Gegee:

$$\sin x = \cos 2x - 1$$

5.2.1 Use this equation and show that / Gebruik hierdie vergelyking en toon aan dat:

$$2 \sin^2 x + \sin x = 0$$

(1)

5.2.2 Determine the general solution of / Bepaal die algemene oplossing van

$$2 \sin^2 x + \sin x = 0$$

(6)

**SECTION B: GEOMETRY / AFDELING B: MEETKUNDE**

**Question 6 / Vraag 6 [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:**

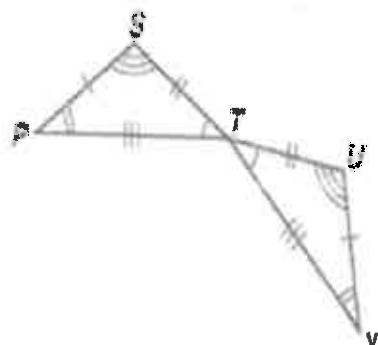
|     |   |   |   |   |   |
|-----|---|---|---|---|---|
| 6.1 | A | B | C | D | E |
| 6.2 | A | B | C | D | E |
| 6.3 | A | B | C | D | E |
| 6.4 | A | B | C | D | E |
| 6.5 | A | B | C | D | E |

- 6.1 Complete the congruence statement

$$\Delta PST \equiv \underline{\hspace{2cm}}.$$

Voltooи die kongruensie stelling  $\Delta PST \equiv \underline{\hspace{2cm}}$

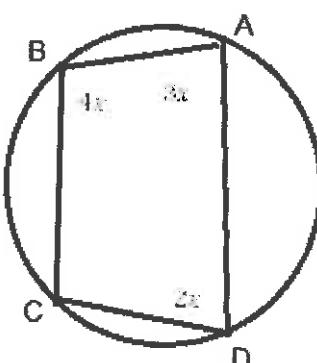
- a)  $\Delta TUV$
- b)  $\Delta UTV$
- c)  $\Delta VUT$
- d)  $\Delta VTU$
- e) None of these / Geeneen nie



- 6.2 Which statement is TRUE?

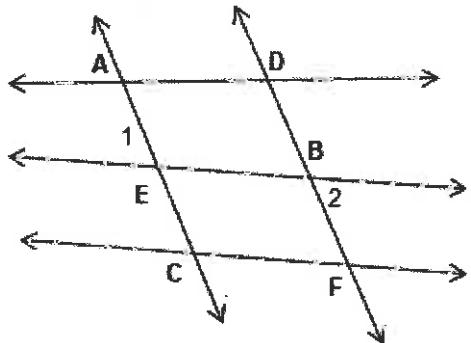
Watter stelling is WAAR?

- a)  $x = 36^\circ$
- b)  $\hat{D} = 90^\circ$
- c)  $\hat{B} = 90^\circ$
- d)  $x = 30^\circ$
- e) They are all true. / Almal is waar.



6.3 If  $\hat{E}_1 = \hat{B}_2$ , which lines must be parallel?  
 As  $\hat{E}_1 = \hat{B}_2$ , watter lyne moet ewewydig wees?

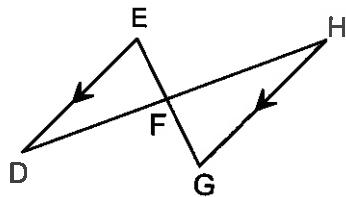
- a)  $AE \parallel BF$
- b)  $CF \parallel AD$
- c)  $EB \parallel CF$
- d)  $AD \parallel EB$
- e) None of these / Geeneen nie



6.4 In the figure ,  $DE \parallel GH$  and  $DH$  intersect  $GE$  in  $F$ .

In die skets is  $DE \parallel GH$  en  $DH$  sny  $GE$  by  $F$ .

$\Delta DEF \sim \Delta GFH$ .....



- a)  $\Delta GFH$
- b)  $\Delta HGF$
- c)  $\Delta GHF$
- d)  $\Delta FHG$
- e) None of the above / Geeneen van bogenoemde nie

6.5 Which statement is FALSE? / Watter stelling is ONWAAR?

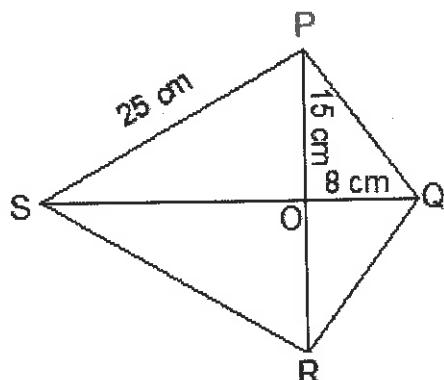
- a) Every rhombus is a quadrilateral. / Elke ruit is 'n vierhoek.
- b) Every rhombus is a parallelogram. / Elke ruit is 'n parallelogram.
- c) Every rhombus is a square./ Elke ruit is 'n vierkant.
- d) Every square is a rhombus./ Elke vierkant is 'n ruit.
- e) They are all true. / Almal is waar.

**Question 7 / Vraag 7 [15]**

- 7.1 It is given that quadrilateral PQRS is a kite and PR and SQ are diagonals of PQRS.

$PO = 15\text{cm}$ ,  $OQ = 8\text{ cm}$  and  $PS = 25\text{cm}$ .

Calculate the area of PQRS.



PQRS is 'n vlieër en PR en SQ is die hoeklyne.

$PO = 15\text{cm}$ ,  $OQ = 8\text{ cm}$  en  $PS = 25\text{cm}$ .

Vind die oppervlakte van PQRS.

- 7.2 Complete the wordings of the following theorems: / Voltooi die bewoording van die volgende stellings:

- 7.2.1 The angle which an arc of a circle subtends at the centre is .....  
*Die hoek wat 'n boog van 'n sirkel by die middelpunt onderspan is...*

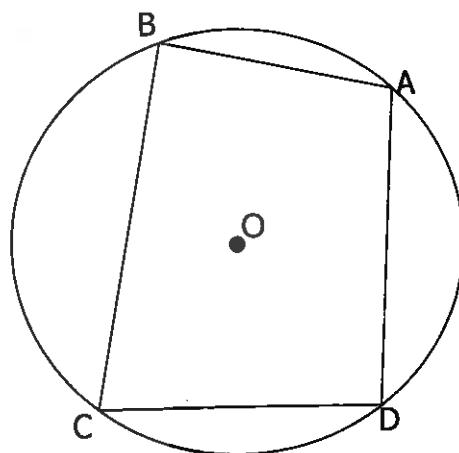
- 7.2.2 A line parallel to one side of a triangle....  
*'n Lyn ewewydig aan een sy van 'n driehoek....*

(4)

(2)

7.3 Prove the theorem / Bewys die stelling

The opposite angles of a cyclic quadrilateral are supplementary. /  
Die teenoorstaande hoeke van 'n koordevierhoek is supplementêr

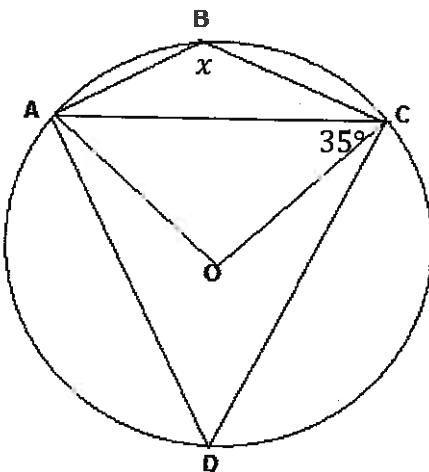


(4)

- 7.4 O is the midpoint of the circle.  $\hat{ACB} = 35^\circ$ ,  $\hat{B} = x$ . Find the value of  $x$ , giving reasons.

O is die middelpunt van die sirkel.  $\hat{ACB} = 35^\circ$ ,  $\hat{B} = x$ .

Vind die waarde van  $x$ , met redes.



(5)

**Question 8 / Vraag [25]**

- 8.1.1 Complete the statement: If a line is drawn from the midpoint of one side of a triangle to the midpoint of another side then it is....

*Voltooi die stelling:* As 'n lyn getrek word van die middelpunt van een sy van 'n driehoek na die middelpunt van 'n ander sy, dan is die lyn...

(1)

- 8.1.2 State the converse of the theorem in 8.1.1

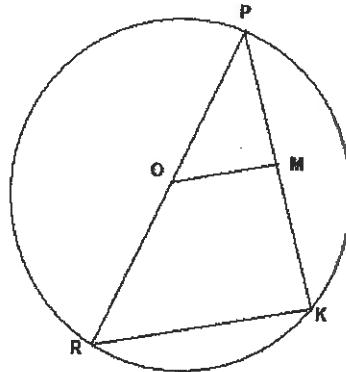
*Gee die omgekeerde van die stelling in 8.1.1*

(2)

- 8.2 In the figure, PR is a diameter of the circle with O as centre. K is a point on the circle and M is on PK such that  $OM \parallel RK$ .

In die figuur is PR 'n middellyn van die sirkel met O as middelpunt. K is 'n punt op die sirkel en M is op PK sodat  $OM \parallel RK$ .

- 8.2.1 Why is  $\hat{K}$  a right angle? / Waarom is  $\hat{K}$  'n regtehoek?



- 8.2.2 Name another right angle in the figure, giving a reason. / Noem nog 'n regte hoek in die figuur, en gee 'n rede. (1)

- 8.2.3 Why is  $PM = MK$ ? / Hoekom is  $PM = MK$ ? (2)

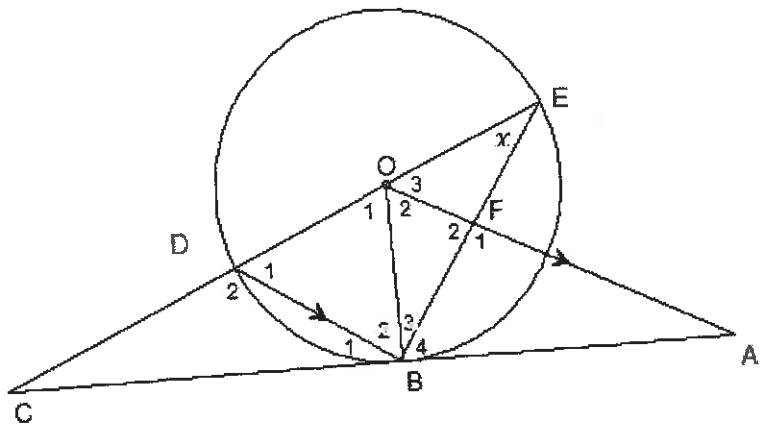
(1)

- 8.2.4 If  $PK = 8$  units and  $OM = 3$  units, calculate the length of the diameter of the circle.  
As  $PK = 8$  eenhede en  $OM = 3$  eenhede, bereken die lengte van die middellyn van die sirkel.

(4)

- 8.3 ED is a diameter of the circle, with centre O.  
 ED is produced to C.  
 CA is a tangent to the circle at B.  
 AO intersects BE at F.  
 $BD // AO$  and  $\hat{E} = x$ .

*ED is 'n middellyn van die sirkel, met middelpunt O. ED is verleng na C.  
 CA is 'n raaklyn aan die sirkel by B.  
 AO sny BE by F.  
 $BD // AO$  en  $\hat{E} = x$ .*



- 8.3.1 Write down, with reasons, THREE other angles equal to  $x$ .  
*Skryf neer, met redes, DRIE ander hoeke wat gelyk is aan  $x$ .*

(3)

- 8.3.2 Determine, with reasons,  $\hat{CBE}$  in terms of  $x$ .  
*Bereken, met redes,  $\hat{CBE}$  in terme van  $x$ .*

(3)

- 8.3.3 Prove that F is the midpoint of BE.  
*Bewys dat F die middelpunt van BE is.*

(3)

8.3.4 Prove / Bewys  $\Delta CBD \sim \Delta CEB$ .

8.3.5 Prove / Bewys  $2EF \cdot CB = CE \cdot BD$ .

(2)

(3)