education

Department of Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATION - 2007

MATHEMATICS P2

STANDARD GRADE

FEBRUARY/MARCH 2007

301-2/2

MATHEMATICS SG: Paper 2

301 2 2E SG

MARKS: 150

TIME: 3 HOURS

This question paper consists of 12 pages, 1 formula sheet and a diagram sheet of 4 pages.

X05

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions:

1. This question paper consist of 9 questions, a formula sheet and diagram sheets.
2. Use the formula sheet to answer this question paper.
3. Detach the diagram sheets from the question paper and place them inside your ANSWER BOOK.
4. The diagrams are not drawn to scale.
5. Answer ALL the questions.
6. Number ALL the answers correctly and clearly.
7. ALL the necessary calculations must be shown.
8. Non–programmable calculators may be used, unless otherwise stated.
9. The number of decimal digits to which answers must be rounded off will be stated in the question where necessary.

ANALYTICAL GEOMETRY

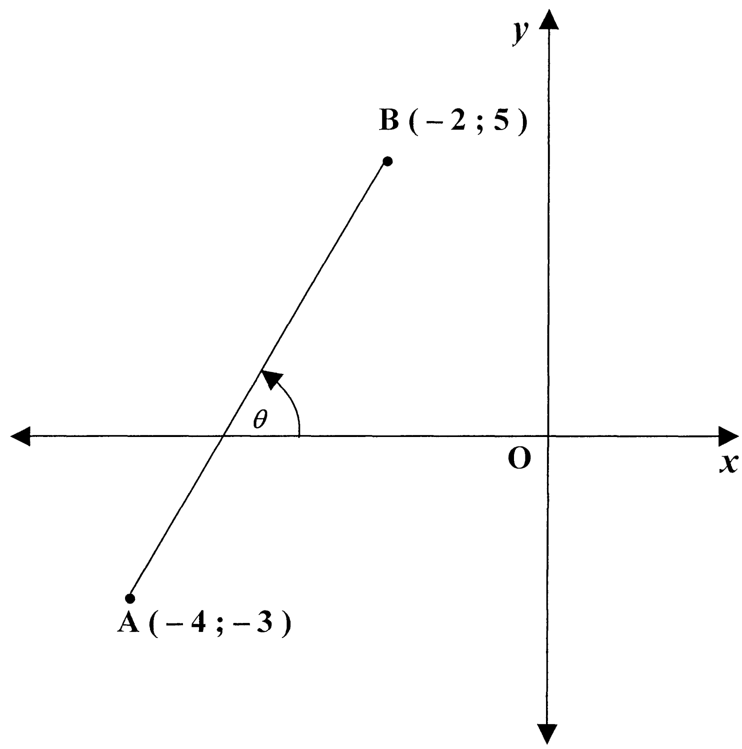
NOTE: – USE ANALYTICAL METHODS IN THIS SECTION.
– CONSTRUCTION AND MEASUREMENT METHODS MAY NOT BE USED

QUESTION 1

In the diagram alongside,

A(– 4 ; – 3) and B (–2 ; 5)

are two points in a Cartesian plane.



Determine:

1.1 the length of AB (leave the answer in surd form) (3)

1.2 the gradient of AB (3)

1.3 the size of θ, the angle of inclination of AB, rounded off to ONE decimal digit (2)

1.4 the co-ordinates of M, the midpoint of AB (3)

1.5 the equation of the straight line which is perpendicular to AB and which passes through M. Write the equation in the form $y = mx + c$ (4)

1.6 the co-ordinates of D, the x-intercept of the straight line obtained in QUESTION 1.5 (2)

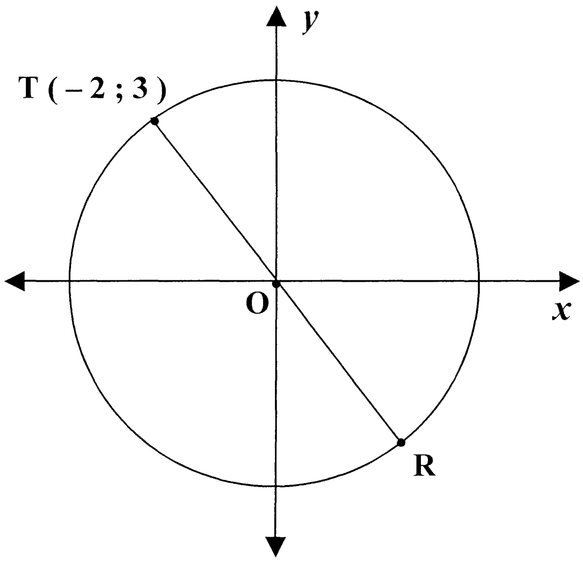
1.7 the value of p if points B, D and C (p ; 10) are collinear. (6)

[23]

QUESTION 2

2.1 In the diagram alongside, T (– 2 ; 3) is a point on the circle with centre O(0 ; 0).

TR is a diameter of the circle.



Determine:

2.1.1 the equation of the circle (3)

2.1.2 by calculation whether point C (– 3 ; – 4) lies inside or outside the circle (3)

2.1.3 the length of TR (leave the answer in surd form) (2)

2.1.4 the equation of diameter TR (4)

2.1.5 the gradient of the tangent at point T (1)

2.1.6 the equation of the tangent to the circle at point T. (3)

2.2 A (– 2 ; 6) and B (– 4 ; 3) are two points in a Cartesian plane. Determine the equation of the locus of point P (x ; y) if the gradient of PA is equal to two times the gradient of PB. (5)

[21]

TRIGONOMETRY

QUESTION 3

3.1 If $x = 155°$ and $y = 130°$, calculate the values of the following, rounded off to TWO decimal digits:

3.1.1 $\sin 2x + \sec y$ (2)

3.1.2 $\tan^2 (x - y)$ (2)

3.2 **Answer this question without the use of a calculator.**

3.2.1 If $13 \sin \theta + 5 = 0$ and $\theta \in [0°; 270°]$, calculate by using a sketch the value of:

$$\cot \theta + \operatorname{cosec} \theta$$ (7)

3.2.2 Simplify to a single trigonometric ratio of x:

$$\frac{\sin(180° - x) . \sec(90° - x) . \cos 240°}{\tan(360° - x)}$$ (6)

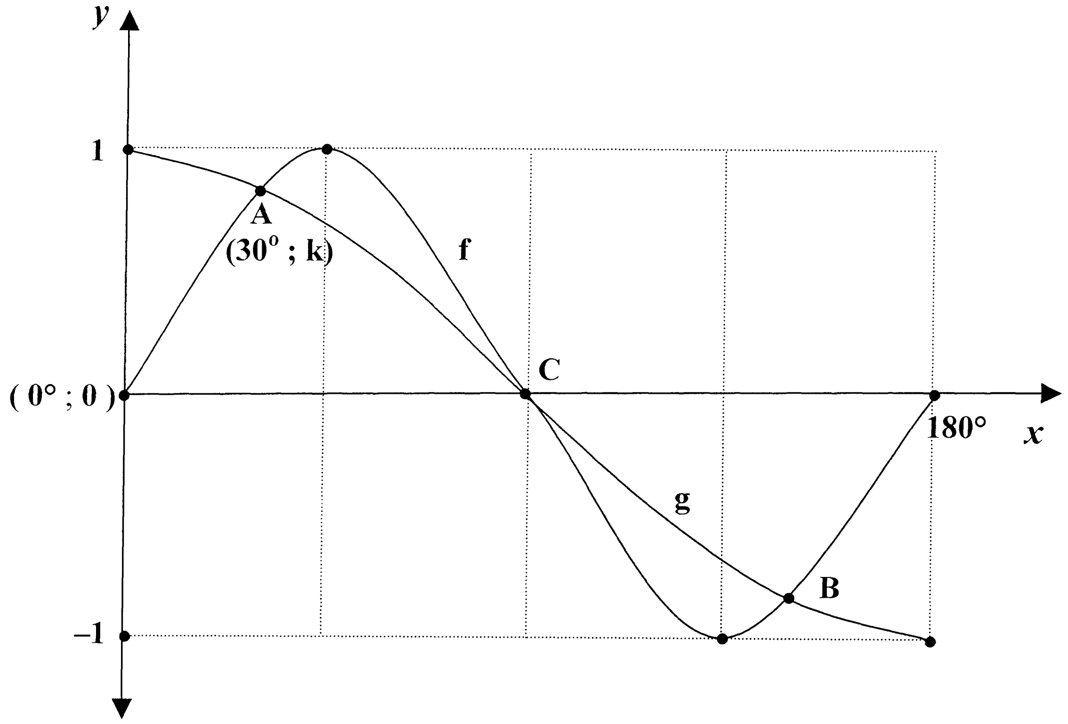
[17]

QUESTION 4

Sketch graphs of the curves of f and g are shown in the diagram below for

$x \in [0°; 180°]$ with $f(x) = \sin mx$ and $g(x) = p \cos x$

Curves f and g intersect at A (30° ; k), C and B .



4.1 Determine the numerical values of m, p and k.
(Rounded off to TWO decimal digits where necessary.) (4)

4.2 Write down the period of g . (1)

4.3 Write down the co-ordinates of C. (1)

4.4 Determine the co-ordinates of B. (2)

4.5 Determine for which value(s) of $x \in [0°; 180°]$ is:

4.5.1 $g(x) < 0$ (3)

4.5.2 $f(x) - g(x) = 1$ (1)
[12]

QUESTION 5

5.1 Use fundamental trigonometric identities and **not a sketch**, to prove the identity:

$$\tan x \,.\, \cot x - \frac{\sin x}{\operatorname{cosec} x} = \cos^2 x$$ (4)

5.2 Solve for θ, rounded off to the nearest degree:

$$2 \tan \theta = -3{,}2 \quad \text{where} \quad \theta \in [\,0° \;;\; 360°]$$ (5)

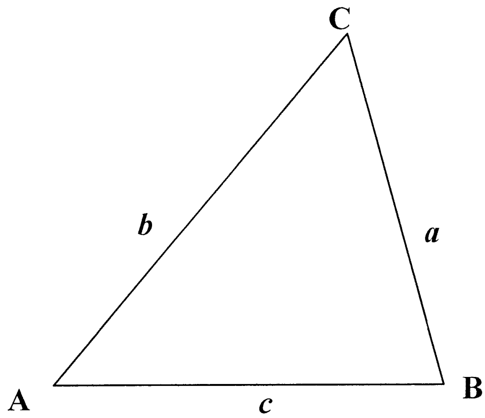
[9]

QUESTION 6

6.1 In the diagram alongside, Δ ABC is an acute–angled triangle.

Use the diagram on the diagram sheet, or redraw the diagram in your answer book to prove that:

Area of Δ ABC = $\frac{1}{2}(b)(c)\sin A$



(4)

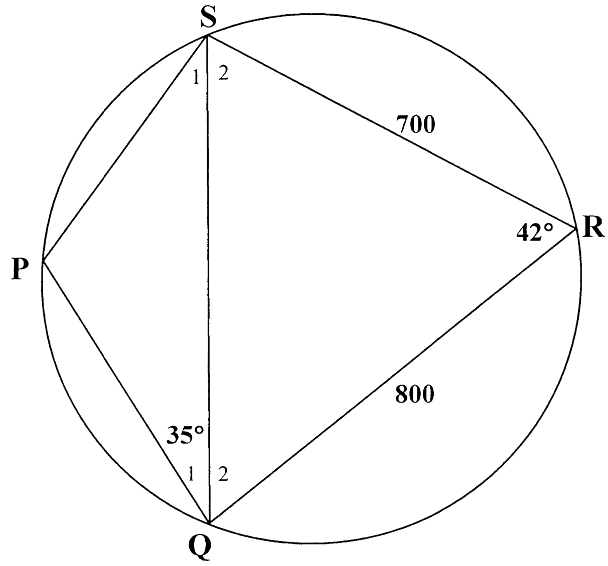
6.2 In the diagram alongside, PQRS is a cyclic quadrilateral.

QR = 800 m

RS = 700 m

$\hat{R} = 42°$

$\hat{Q}_1 = 35°$



Calculate the following, rounded off to ONE decimal digit:

6.2.1 the area of Δ QRS (3)

6.2.2 the length of QS (4)

6.2.3 the size of $\hat{P}$, with a reason (2)

6.2.4 the length of PS. (4)
[17]

EUCLIDEAN GEOMETRY

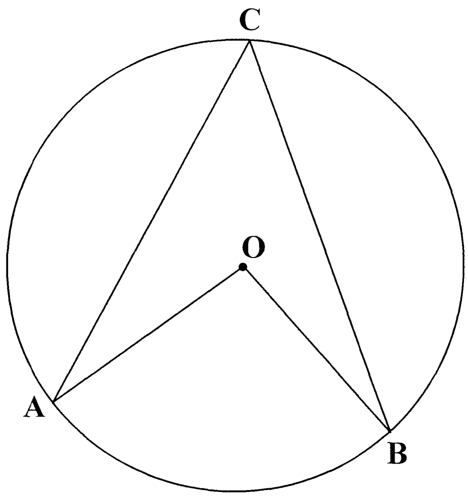
N0TE: – DIAGRAMS FOR PROVING THEORY MAY BE USED ON THE DIAGRAM SHEETS OR REDRAWN IN YOUR ANSWER BOOK.
– DETACH THE DIAGRAM SHEETS FROM THE QUESTION PAPER AND PLACE THEM IN YOUR ANSWER BOOK.
– GIVE A REASON FOR EACH STATEMENT, UNLESS OTHERWISE STATED.

QUESTION 7

7.1 In the diagram alongside, O is the centre of circle ABC .

Use the diagram on the diagram sheet, or redraw the diagram in your answer book to prove the theorem which states that:

If O is the centre of the circle, then $A\hat{O}B = 2A\hat{C}B$



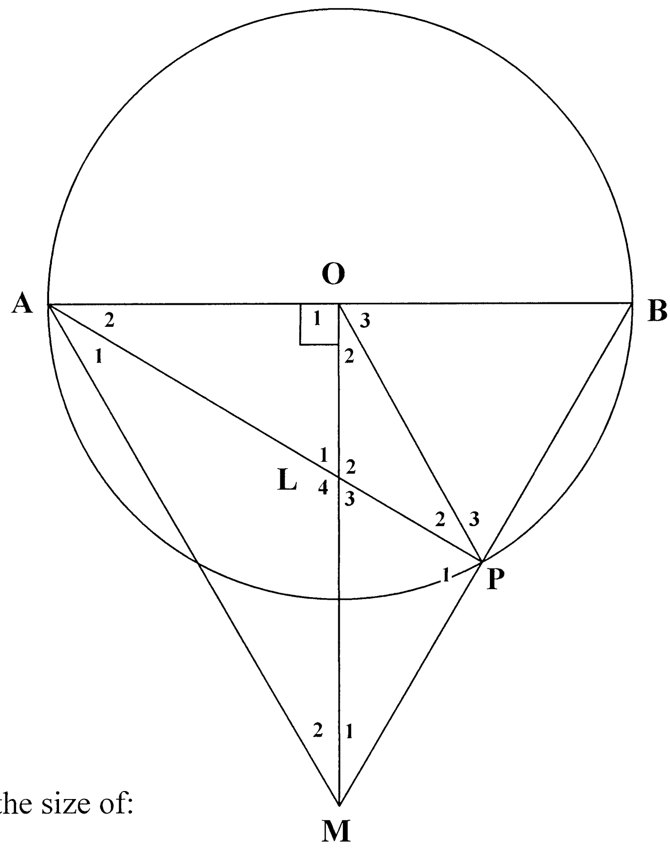
(6)

7.2 In the diagram alongside, O is the centre of circle ABP.

BP is produced to M such that $MO \perp AOB$.

AP intersects OM at L.

$\hat{O}_2 = 20°$



7.2.1 Calculate, with reasons, the size of:

(a) $\hat{A}_2$ (3)

(b) $\hat{P}_1$ (3)

7.2.2 Prove, with reasons, that AOPM is a cyclic quadrilateral. (2)

7.2.3 Calculate, with a reason, the size of $\hat{M}_1$. (2)

7.2.4 Name, with a reason, ONE other cyclic quadrilateral in the diagram. (2)

[18]

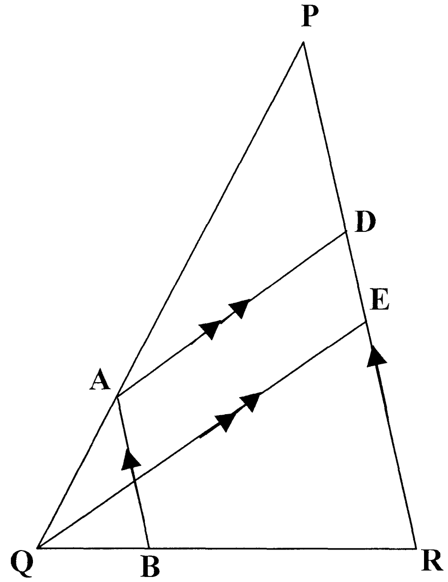
QUESTION 8

In the diagram alongside, A is a point on PQ and B is a point on QR of Δ PQR, such that AB || PR.

E is the midpoint of PR.

D is a another point on PR such that AD || QE.

PA : AQ = 5 : 2



Calculate, with reasons, the numerical value of the following:

8.1 $\dfrac{QB}{QR}$ (2)

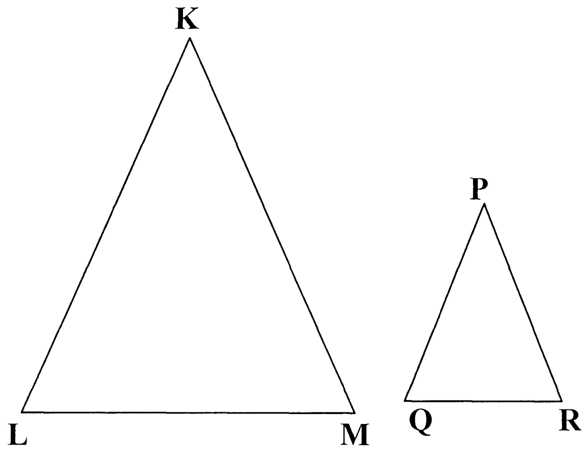
8.2 $\dfrac{DE}{PR}$ (5)

[7]

QUESTION 9

9.1 In the diagram alongside, Δ KLM and Δ PQR are given.

Use the diagram on the diagram sheet, or redraw the diagram in your answer book to prove the theorem which states that:



If $\hat{K} = \hat{P}$, $\hat{L} = \hat{Q}$, and $\hat{M} = \hat{R}$, then $\dfrac{KL}{PQ} = \dfrac{KM}{PR}$ (7)

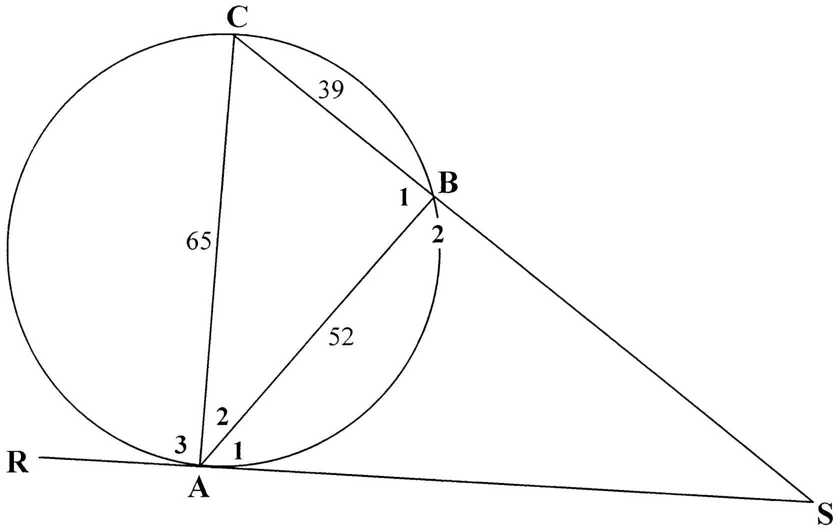
9.2 In the diagram below, SAR is a tangent to circle ABC at A.

SBC is a straight line.

AB = 52 units

BC = 39 units

CA = 65 units



9.2.1 Prove, stating reasons, that:

(a) $\hat{B}_1 = 90°$ (3)

(b) CS is a diameter of the circle passing through A, C and S. (5)

(c) Δ BAS ||| Δ BCA (4)

9.2.2 Hence, calculate the length of BS, rounded off to ONE decimal digit. (4)

9.2.3 Prove that $\cos^2 C = \dfrac{BC}{SC}$ (3)

[26]

TOTAL: 150

Mathematics Formula Sheet (HG and SG)
Wiskunde Formuleblad (HG en SG)

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$T_n = a + (n-1)d$ $\quad S_n = \frac{n}{2}(a + T_n)$ $\quad S_n = \frac{n}{2}(a + \ell)$ $\quad S_n = \frac{n}{2}[2a + (n-1)d]$

$T_n = a.r^{n-1}$ $\quad S_n = \frac{a(1 - r^n)}{1 - r} \quad (r \neq 1)$ $\quad S_n = \frac{a(r^n - 1)}{r - 1} \quad (r \neq 1)$

$$S_\infty = \frac{a}{1 - r} \quad (|r| < 1)$$

$A = P\left(1 + \frac{r}{100}\right)^n$ $\quad A = P\left(1 - \frac{r}{100}\right)^n$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan\theta$$

$$(x_3 \,;\, y_3) = \left(\frac{x_1 + x_2}{2} \,;\, \frac{y_1 + y_2}{2}\right)$$

$$x^2 + y^2 = r^2$$

$$(x - p)^2 + (y - q)^2 = r^2$$

In Δ ABC: $\quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

$$a^2 = b^2 + c^2 - 2bc.\cos A$$

$$\text{area } \Delta ABC = \tfrac{1}{2}ab.\sin C$$

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SENIOR CERTIFICATE EXAMINATION/**SENIORSERTIFIKAAT-EKSAMEN**
MATHEMATICS SG/**WISKUNDE SG**
PAPER II/VRAESTEL II
FEBRUARY/MARCH/**FEBRUARIE/MAART**

DIAGRAM SHEET/DIAGRAMVEL

INSTRUCTION

This diagram sheet must be handed in with your answer book. Ensure that your details are complete.

INSTRUKSIE

Hierdie diagramvel moet saam met jou antwoordeboek ingelewer word. Maak seker dat jou besonderhede volledig ingevul is.

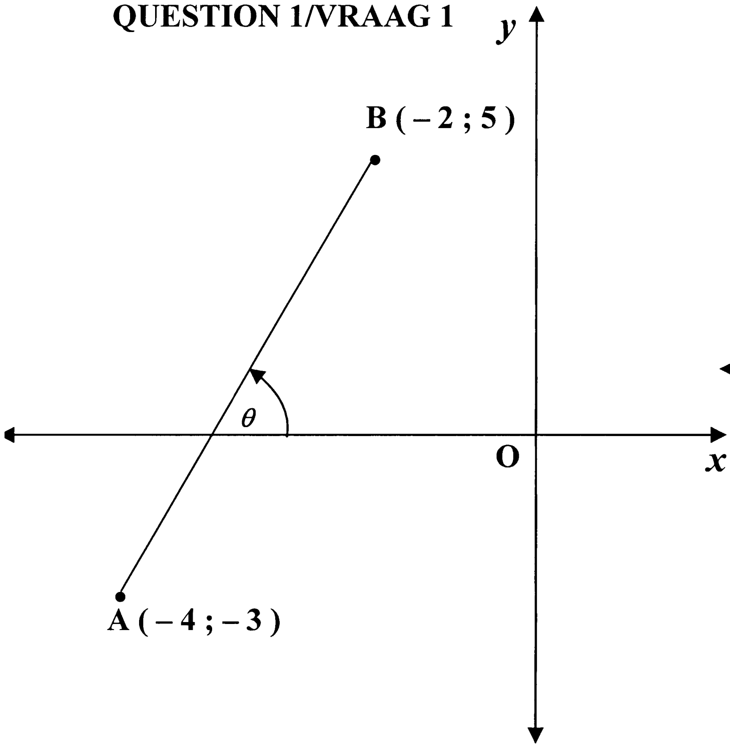
EXAMINATION NUMBER **EKSAMENNOMMER**														

CENTRE NUMBER **SENTRUMNOMMER**								

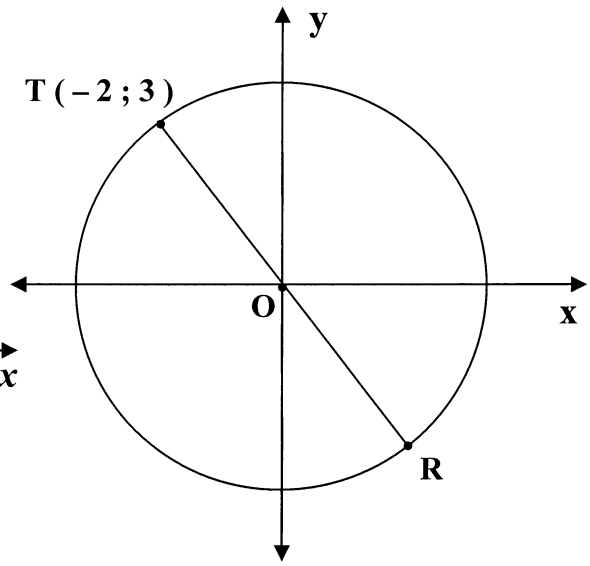
GAUTENG

EXAMINATION NUMBER
EKSAMENNOMMER

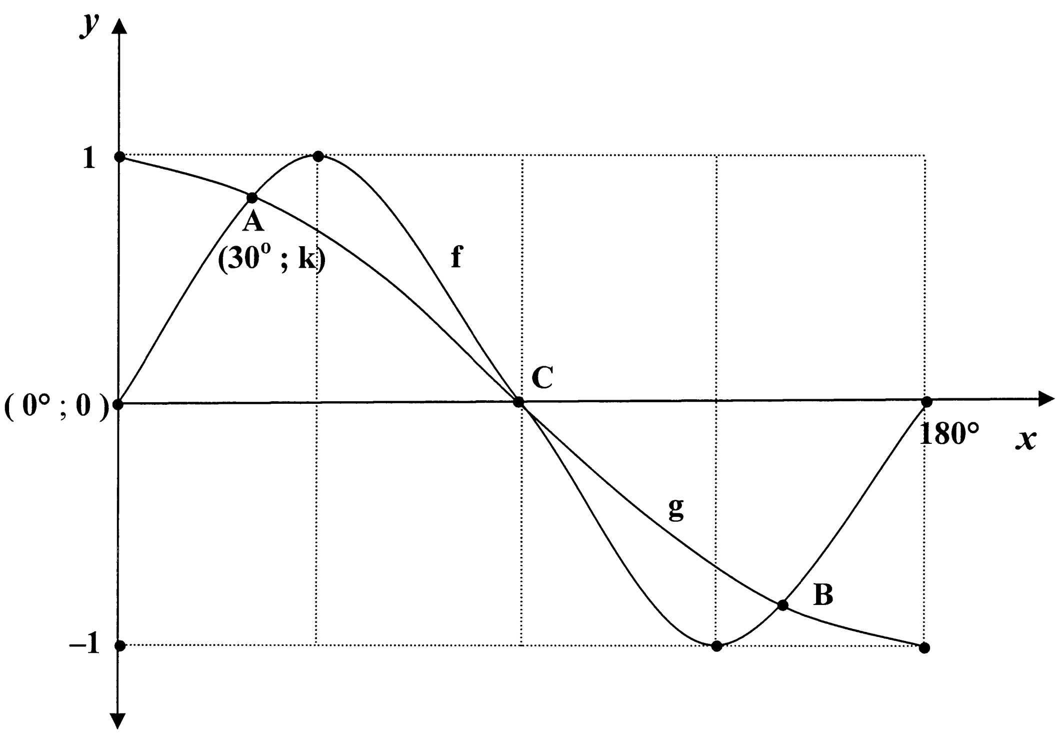
QUESTION 1/VRAAG 1



QUESTION 2.1/VRAAG 2.1

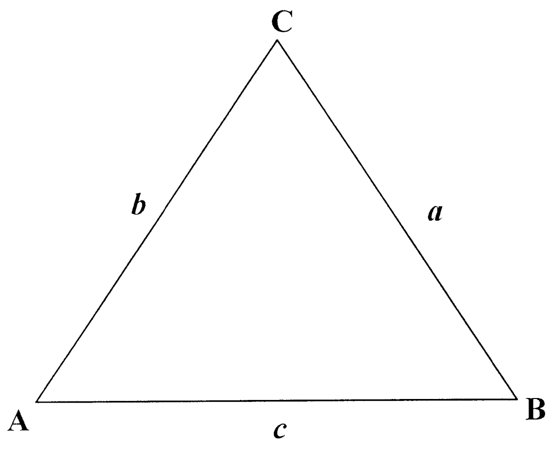


QUESTION 4/VRAAG 4

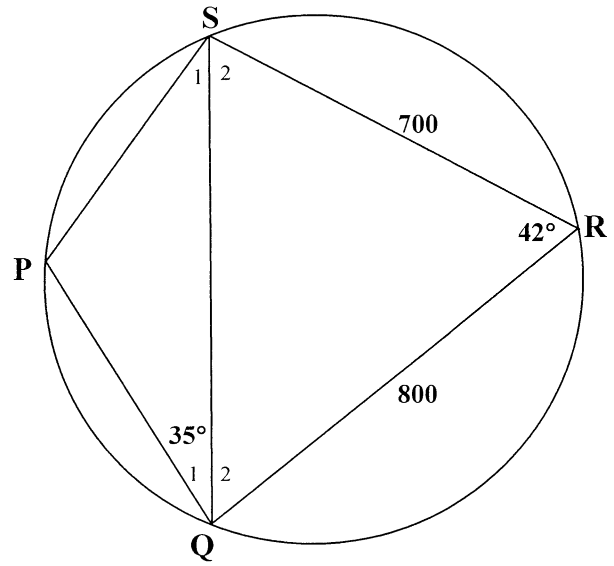


EXAMINATION NUMBER
EKSAMENNOMMER

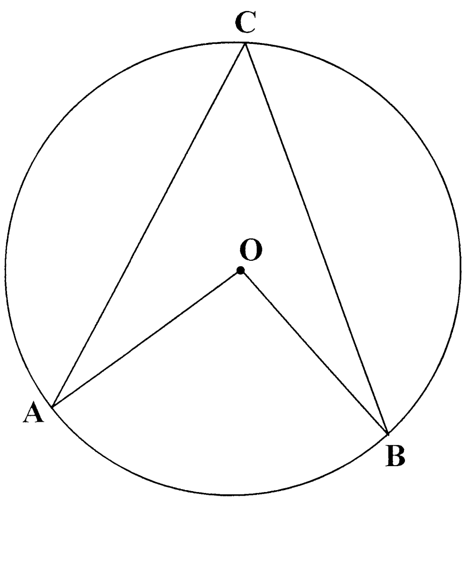
QUESTION 6.1/VRAAG 6.1



QUESTION 6.2/VRAAG 6.2



QUESTION 7.1/VRAAG 7.1



QUESTION 7.2/VRAAG 7.2

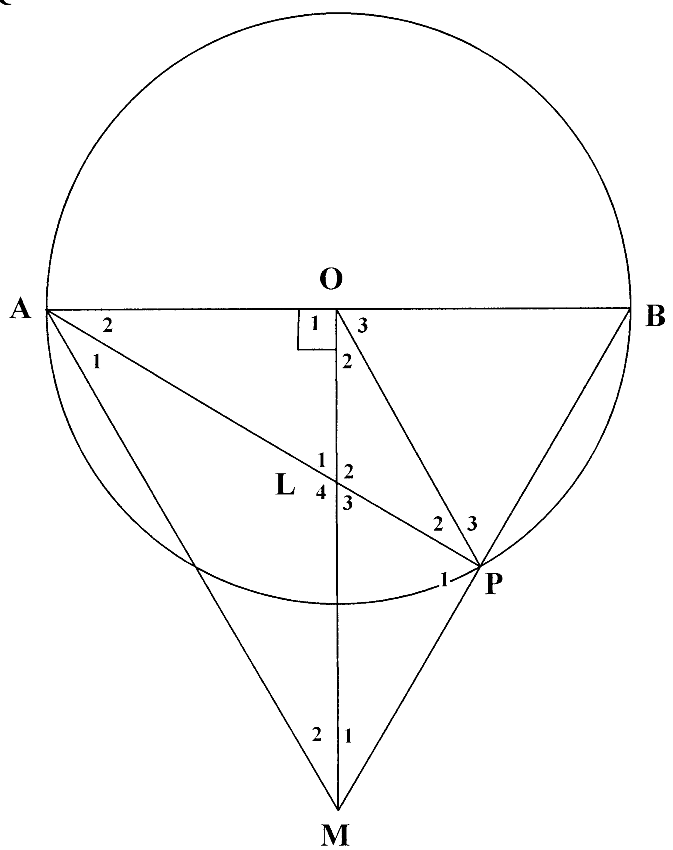


DIAGRAM SHEET/DIAGRAMVEL

EXAMINATION NUMBER
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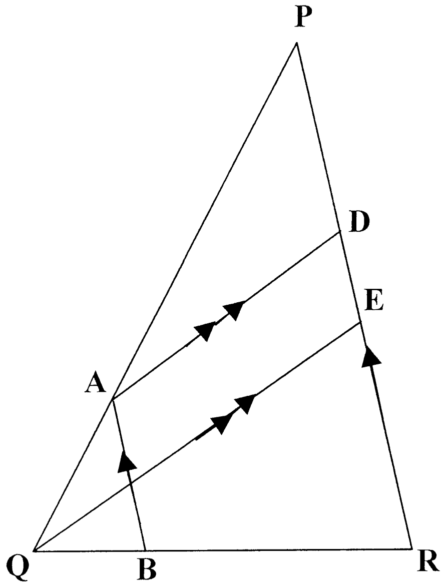
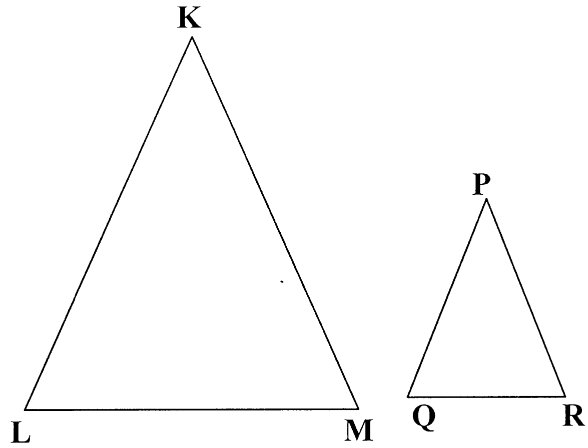
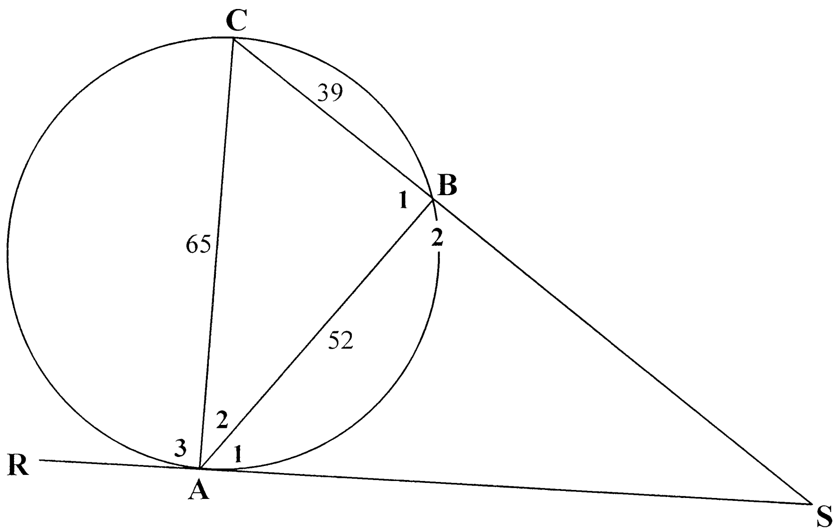
QUESTION 8/VRAAG 8



QUESTION 9.1/VRAAG 9.1



QUESTION 9.2/VRAAG 9.2



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