basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE/ NATIONAL SENIOR CERTIFICATE

KEREITI 12

DIPALO P2

LOETSE 2021(2)

MATSHWAO: 150

NAKO: Dihora tse 3

Pampiri ena ena le maqephe a 15 le leqephe le 1 la tlhahisoleseding.

* M A T S E S 2 *

DITAELO LE TLHAHISOLESEDING

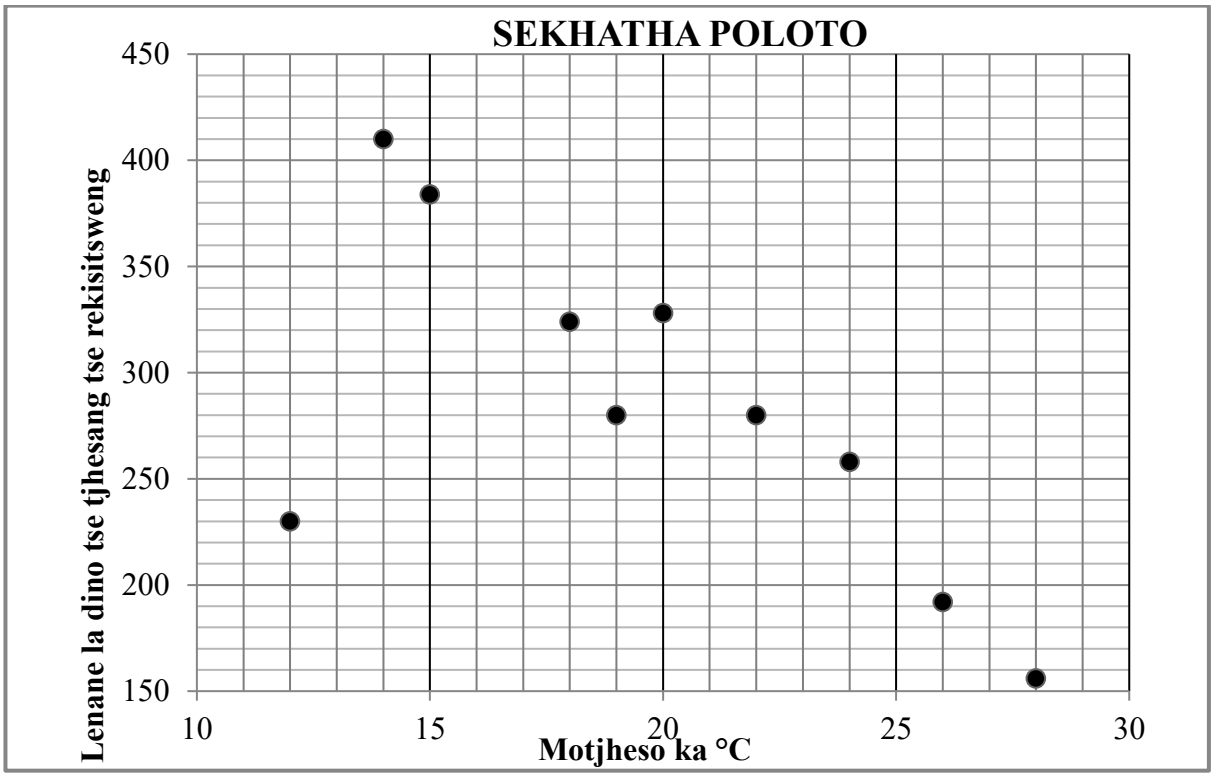
Bala ditaelo tse latelang ka hloko.

1. Ena pampiri ena le dipotso tse 10.
2. Araba dipotso TSOHLE ho BUKANA E IKGETHILENG YA HO ARABELA.
3. Ka makgethe BONTSHA tsohle dipalo, ditshwantsho, dikerafo, jwalojwalo. tseo o di sebedisitseng ho fumana dikarabo tsa hao.
4. Dikarabo feela di KEKE tsa fumana matshwao kaofela ka nako tsohle.
5. Oka sebedisa khalukhetara e dumelletsweng ya saense (esa porogeremuang ebile ena le dikerafo), kantle le haeba ho boletswe ka tsela e nngwe.
6. Moo ho hlokahalang teng, atametsa dikarabo tsa hao ho desimale tse PEDI, kantle le haeba ho boletswe ka tsela e nngwe.
7. HAHO bolele hore ditswantsho tsohle di takuwe ho latela ditekanyo tse nepahetseng.
8. Leqephe la tlhahisoleding le nang le di-fomula le teng moo pampiri e fellang teng.
9. Ngola ka makgethe leka tsela e bonahalang.

POTSO 1

Mokete wa selemo wa dipapadi o tshwerwe nako ya matsatsi a 11. Lebenkele le rekisa dino tse tjhesang moketeng ona. Ho letsatsi le leng lele leng ho matsatsi a pele a 10, monga lebenkele o ile a ngola mofuthu ka 13:00 le palo ya dino tse tjhesang tse rekisitsweng. Tlhahisoleseding ena e bontshitswe tafoleng leho sekhatha poloto ka tlase.

Mofuthu (in °C)	14	24	26	18	20	28	22	15	12	19
Palo ya dino tse tjhesang tse rekisitsweng	410	258	192	324	328	156	280	384	230	280



1.1 Hlalosa mokgwa oo data eo bontshang. (1)

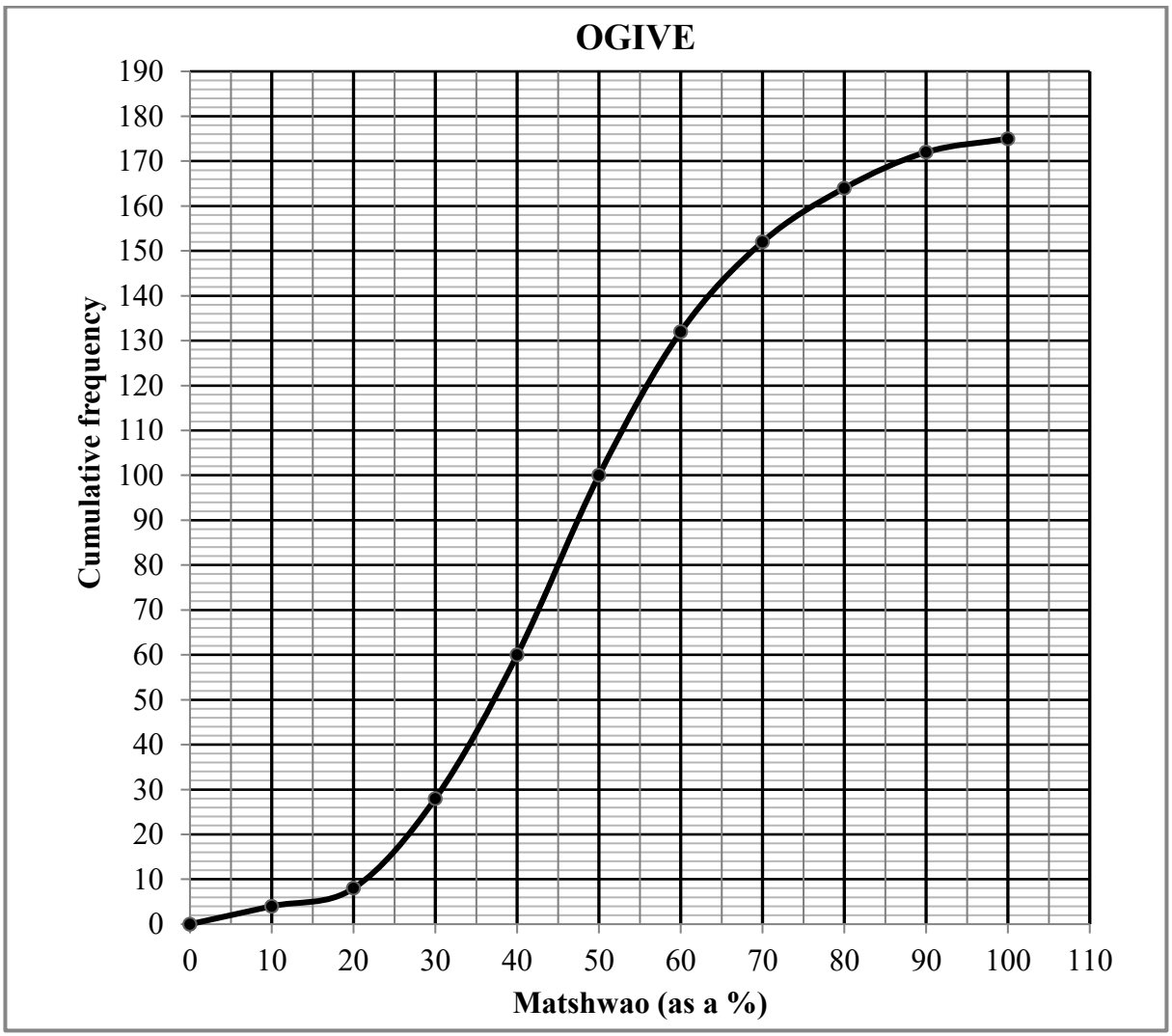
1.2 Fumana ekweshini ya mola wa disekwere tse nyane tsa rekereshene tsa datha. (3)

1.3 Monga lebenkele o hlokometse hore o sebedisitse litara ele nngwe ya lebese ho dikopi tse 8 tsa dino tse tjhesang tse rekisitsweng. Haeba mofuthu ka 13:00 ka letsatsi labo 11 ene lebelletswe hoba 17 °C, akanya lenane la lebokoso la litara ele nngwe ya lebese monga lebenkele a tlamehang ho e reka ka letsatsi la bo 11. (3)

1.4 Kgetha outlier ho datha. (1)
[8]

POTSO2

2.1 Baithuti hotswa dikolong tse fapaneng ba ngotse teko tsa mahlale hore ba kgone hore ba khwalifaye ho fumana basari. Matshwao a bona (ka peresente) a bontshitswe ho ogive (cumulative frequency kerafo) ka fatshe.



2.1.1 Ho ngotse baithuti ba bakae teko? (1)

2.1.2 Ngola modal class ya data. (1)

2.1.3 Matshwao a tlase a ho khwalifayela basari ke 75%. Ke ba bake baithuti batla khwalifayela basari? (2)

2.2 Tafole e latelang e bontsha matshwao a baithuti ba 15 hotswa sekolong se itseng a fumanweng ho teko ya mahlale.

Matshwao (ka%)	62	58	78	85	74	48	74	84	100	46	80	92	60	90	92

Fumana:

2.2.1 Letshwao la mini le fumanweng ke baithuti. (2)

2.2.2 Setandade devieshene ya matshwao a baithuti. (1)

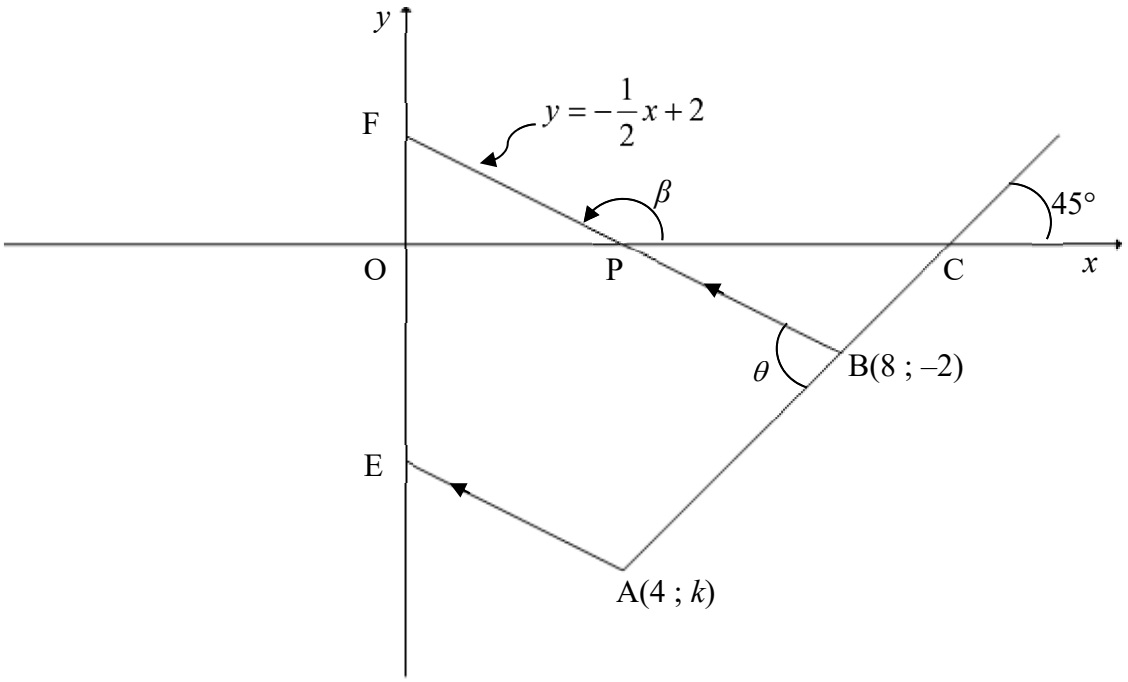
2.2.3 Lenane la baithuti bao matshwao a bona a fumanehang ho feta setandathe devieshene sele seng ka hodimo ho mini. (2)

2.3 Matshwao a Kereiti 11 (ka persente) aho qetela a fumanweng ke baithuti a lekotswe. Setandathe devieshene sele seng ho inthavale ya mini e fumanwe ele (82,7; 94,1).

Fumana setandathe devieshene ya matshwao aho qetela a Kereiti 11. (3)
[12]

POTSO 3

Ho setshwantsho se latelang, mola wa BF o takilwe hotswa ho B(8 ; –2) ho kgaola *x*-axis ho P le *y*-axis ho F. Engele ya inclination BF ke β le ekweshene ya BF $y = -\frac{1}{2}x + 2$. Hotswa ho A(4 ; *k*), mola o mong o takilwe o pharalele ho BF le ho kgaola *y*-axis ho E. Mola o fetang ho A le ho B ena le inclination ya 45° le ho kgaola *x*-axis ho C. $A\hat{B}F = \theta$.



3.1 Batla keradiente ya AB. (1)

3.2 Bontsha hore velu ya *k ke* -6. (2)

3.3 Fumana ekweshini ya EA ka tsela ya $y = mx + c$. (3)

3.4 Fumana:

3.4.1 Boholo ba θ (3)

3.4.2 Bolelele ba BF (3)

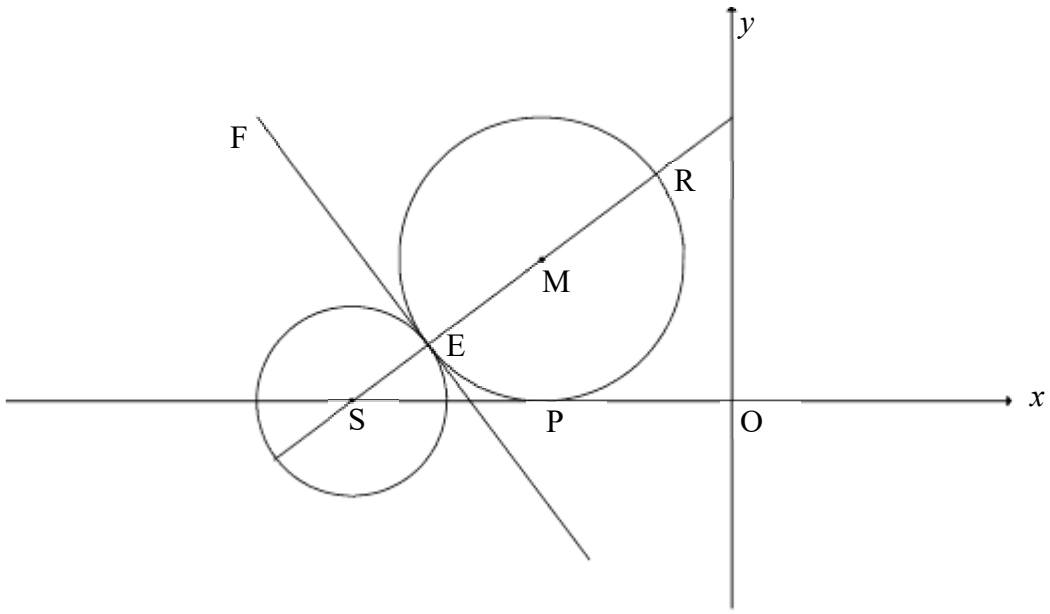
3.4.3 Eria ya ΔABF (4)

3.5 Haeba G ke ntlha e khwaderanteng ya bone hore APBG ebe pharalelokereme. Fumana boholo ba $P\hat{A}G$. (4)

[20]

POTSO 4

Ho setshwantsho se latelang, S ke ntlha ho *x*-axis. Sedikadikwe se nang le bohare S le sedikadikwe se nang le bohare M di takilwe. Didikadikwe tse pedi di kopana kantle ho E. FE ke thanjente ya didikadikwe tse pedi ho E. Sedikadikwe sa bohare ba M, ena le ER ele diametha, e kopana le *x*-axis ho P.



4.1 Ekweshini ya sedikadikwe se nang le bohare S k e $(x+8)^2 + y^2 = 4$.

4.1.1 Fumana dikhoodinetse tsa S. (2)

4.1.2 Bontsha hore diametha ya sedikadikwe sa bohare ba S ke diyuniti tse 4. (1)

4.2 Haeba re boela re nehwa hore SR = 8 diyuniti le $R\left(-\frac{8}{5}; \frac{24}{5}\right)$, bala::

4.2.1 Bolelele ba EM (2)

4.2.2 Keradiente ya thanjente FE (3)

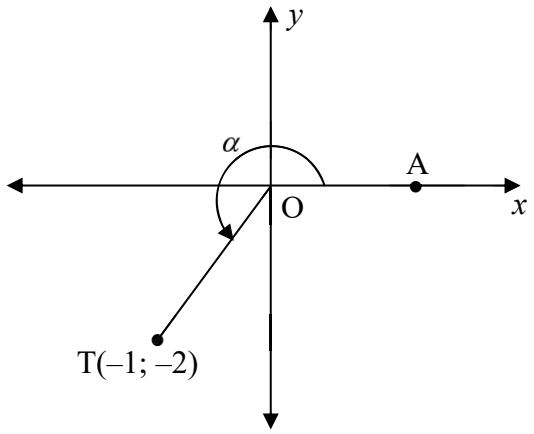
4.2.3 Khoodinetse tsa M (4)

4.2.4 Khoodinetse tsa E (2)

4.3 Sedikadikwe sa bohare ba M(–4 ; 3) e s h i f o t i l e u n i t i e 1 hoya ka letsohong le leqele le ho refolekotiwa ho *x*-axis ho fumana sedikadikwe se setjha ho K. Fumana hore ntlha (–8 ; 0) eka hare kapa kantle ho sedikadikwe ho K. Bontsha mesebetsi YOHLE. (5)
[19]

POTSO 5

5.1 Ntlha T(–1; –2) re e nehilwe setshwantshong se ka fatshe. A ke ntlha ho *x*-axis hore reflex $A\hat{O}T = \alpha$.



Fumana, **ntle le tshebediso ya khalukhetara,** velu ya tse latelang:

5.1.1 $\tan\alpha$ (1)

5.1.2 $\cos\alpha$ (2)

5.1.3 $\cos(\alpha + 45°)$ ho foromo e bobebe. (4)

5.2 Fumana, **ntle le tshebediso ya khalukhetara,** velu ya expression tse latelang:

$2\sin(-20°).\sin 160° - \cos 40°$ (4)

5.3 Ela hloko: $3\cos x.\sin x + \tan x.\cos^2(180° - x)$

5.3.1 Etsa expression ena ebe bobebe hoya ho trigonometric reshio ele nngwe. (4)

5.3.2 Ebe, o ngola renje ya:

$$f(x) = 3\cos x.\sin x + \tan x.\cos^2(180° - x)$$ (2)

5.4 Pruva identity: $\dfrac{\cos 3x}{\cos x} = 4\cos^2 x - 3$ (5)

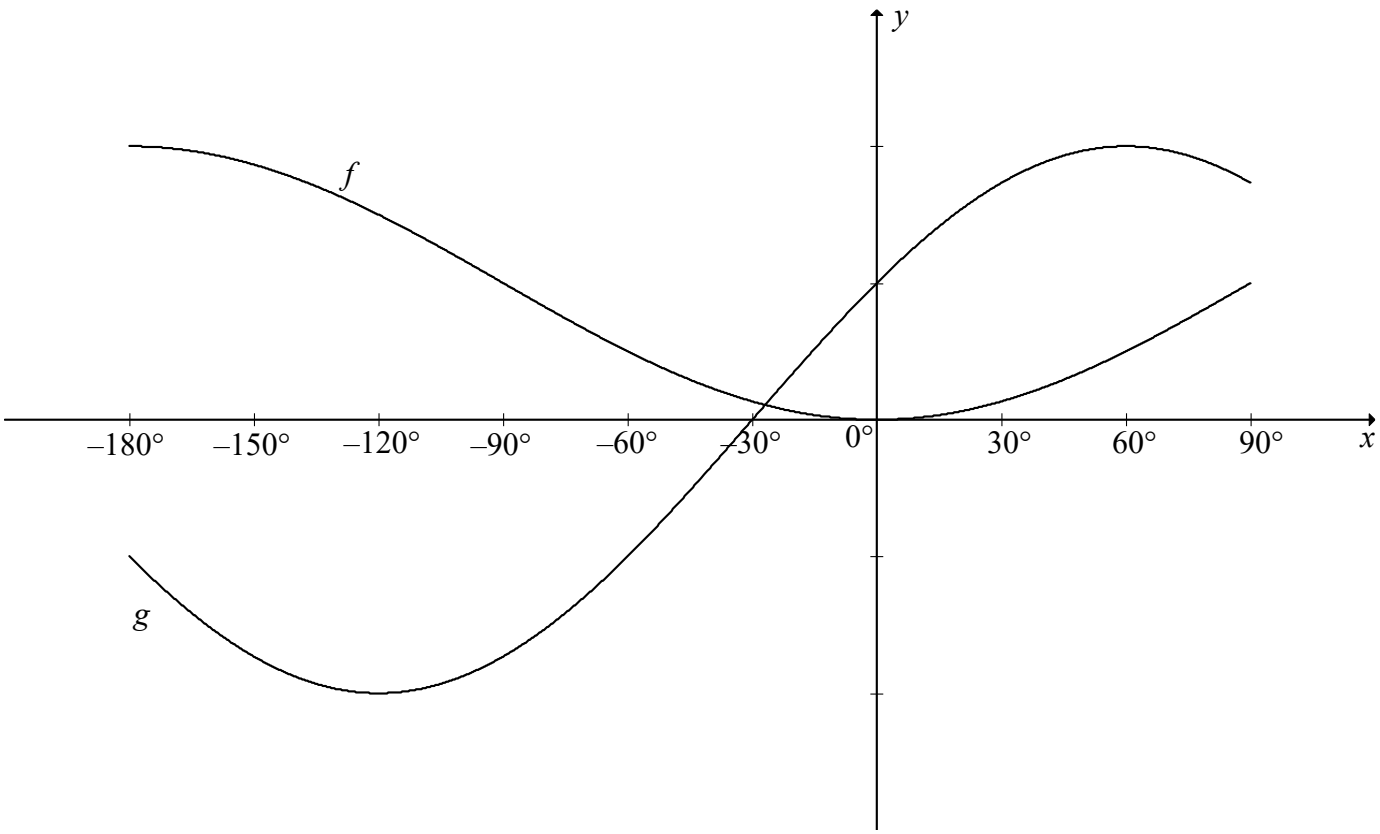
5.5 Fumana jeneral solushene ya x ho ekweshini e latelang:

$3^{2\tan x} - 3^{\tan x + 1} = 54$ (5)

[27]

POTSO 6

Setshwantshong se latelang, kerafo ya $f(x) = -\cos x + 1$ le $g(x) = 2\sin(x + 30°)$ di takilwe ho inthavale $x \in [-180°; 90°]$.



6.1 Ke velu efe ya x, $x \in [-180° ; 90°]$, moo:

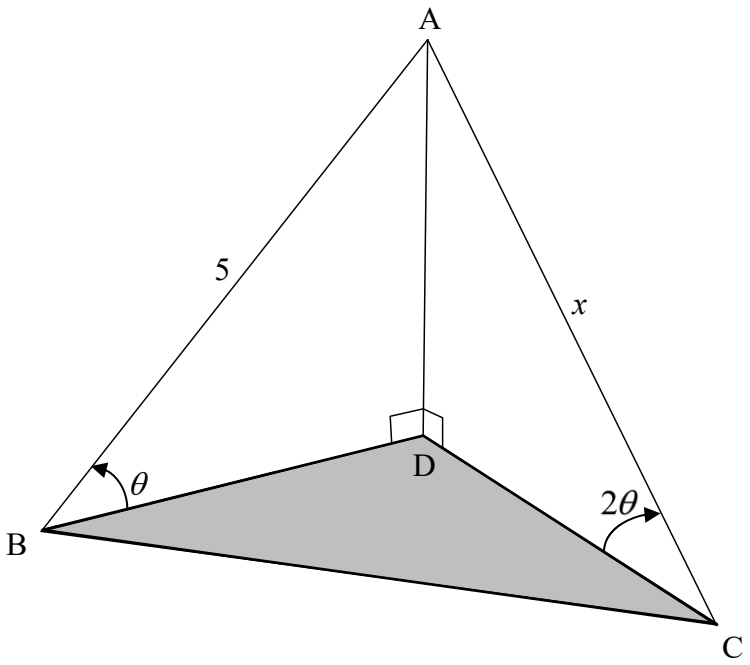
6.1.1 $f(x).g(x) \geq 0$ (2)

6.1.2 $g(x) = -1$ (2)

6.2 y-axis e tsamaisitswe $90°$ hoya ka letsohong le letona. Fumana ekweshini e ntjha ya kerafo eo qalong e ile ya bitswa f, ho foromo e bobebe. (2)
[6]

POTSO 7

Setshwantshong se latelang, B, C and D di sebakeng se tshwanang se tshekaletseng. AD ke palo e tsepameng e tsheheditsweng ke dithapo tse pedi, AB and AC. Engele tsa eleveishene ho qala ho B le C hoya ho A, tsullung ya palo, ke θ le 2θ ka ho latellana. $AB = 5$ diyuniti le $AC = x$ diyuniti.

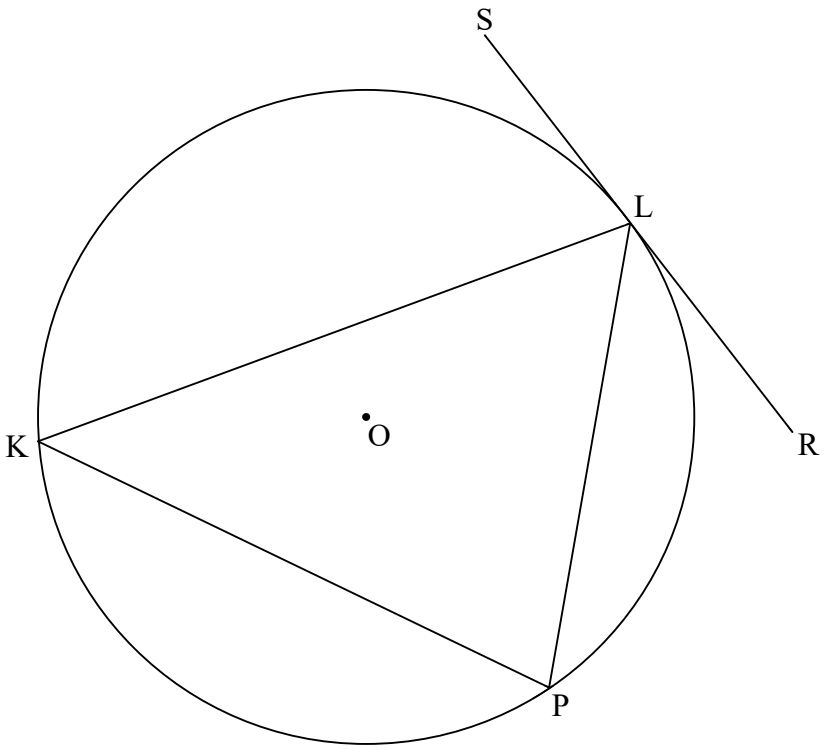


7.1 Bontsha hore $x = \dfrac{5}{2\cos\theta}$ (5)

7.2 Bala bolelele ba BC haeba re nehilwe hore $B\hat{A}C = 112°$ le $\theta = 30°$. (3)
[8]

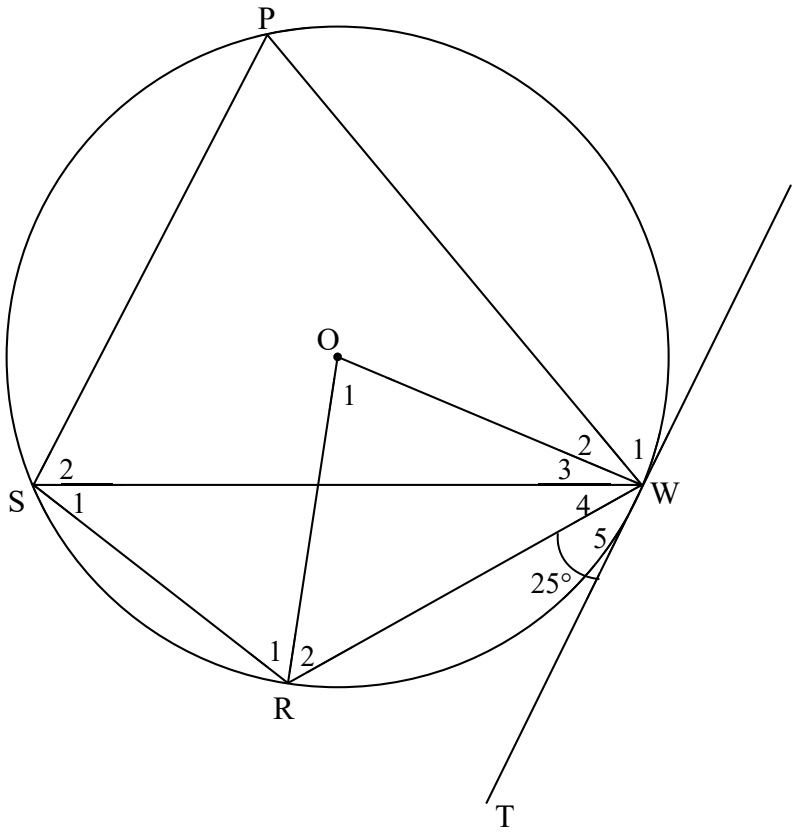
POTSO 8

8.1 Setshwantshong se latelang, dikhodo KL, LP and KP di takilwe ka hare ho sedikadikwe, se nang le bohare ba O. SLR ke thanjente ya sedikadikwe ho L.



Pruva theoreme e bolelang hore engele pakeng tsa thanjente SLR le khodo KL e lekana le englele e fumanehang ho althanete segmente, ka hoo pruva hore $S\hat{L}K = \hat{P}$. (6)

8.2 Ho setshwantsho se latelang, PWRS ke saetliliki khwaderilatherale ka hare ho sedikadikwe, bohareng ho O. ΔPSW ke ekhwilaterale teraengele. TW ke thanjente ya sedikadikwe ho W. Radii OR le OW di takilwe. $\hat{W}_5 = 25°$.



8.2.1 Fumana, o fana ka mabaka, boholo ba:

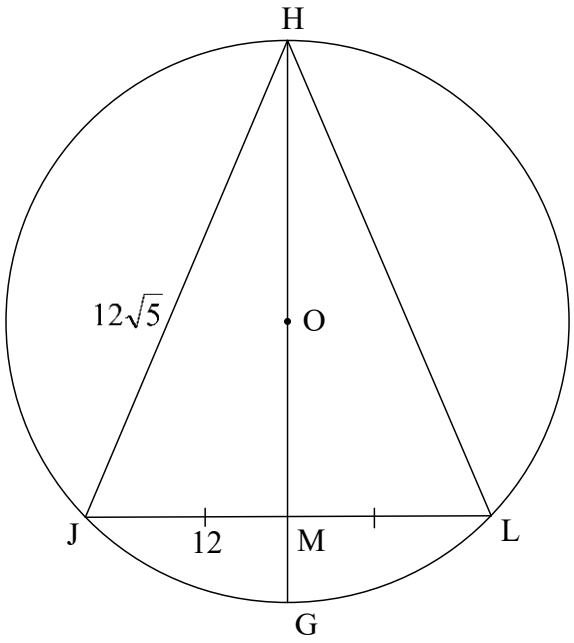
(a) $\hat{S}_1$ (2)

(b) $\hat{O}_1$ (2)

(c) $\hat{R}_1$ (5)

8.2.2 Pruva hore SP || TW. (3)

8.3 Setshwantshong se latelang, sedikadikwe se nang le bohare O se takilwe. H, J, G and L ke dintlha tse hodima sedikadikwe. ΔHJL e takilwe. HOG e kgaola JL mahareng ho M.
$HJ = 12\sqrt{5}$ diyuniti and JM = 12 diyuniti.

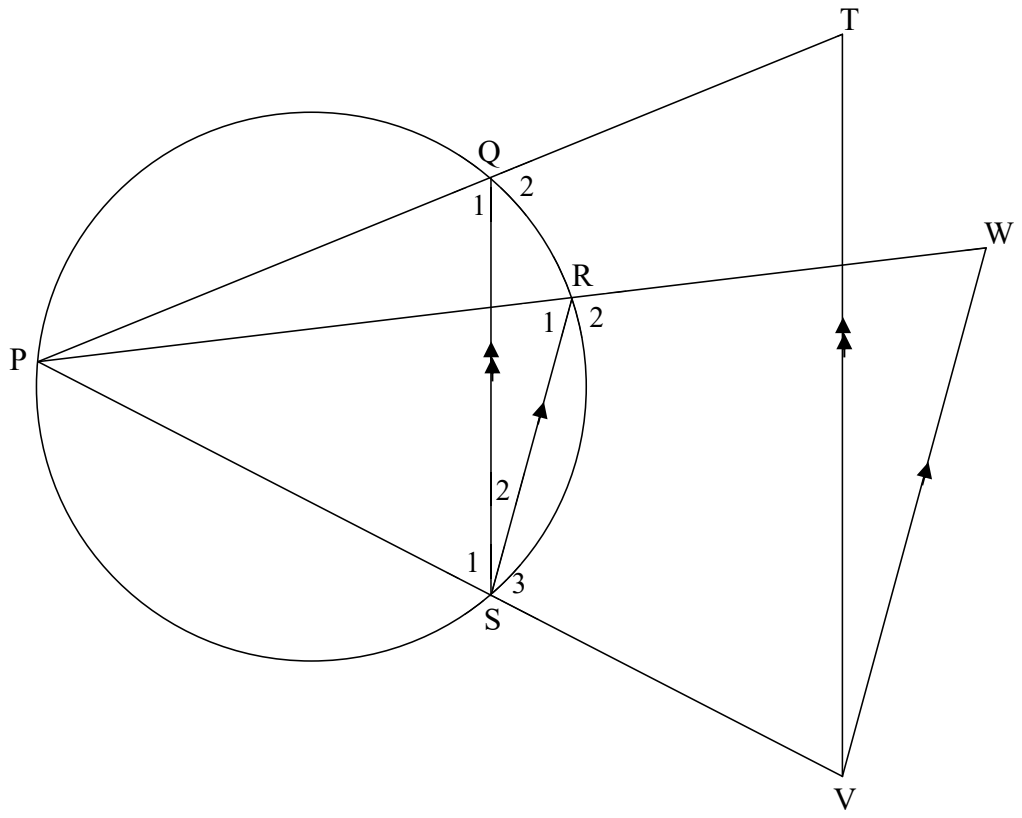


8.3.1 Haeba MG = 6 diyuniti le OM = x, ngola HM ka mokgwa wa x. (2)

8.3.2 Bala, o fana ka mabaka, bolelele ba rediase ya sedikadikwe. (5)
[25]

POTSO 9

Setshwantshong se latelang, P, Q, R and S ke dintlha tse hodima sedikadikwe. PS, PQ le PR di lelefaditswe hoya ho V, T le W ka ho latelanang. VT || SQ le SR || VW.



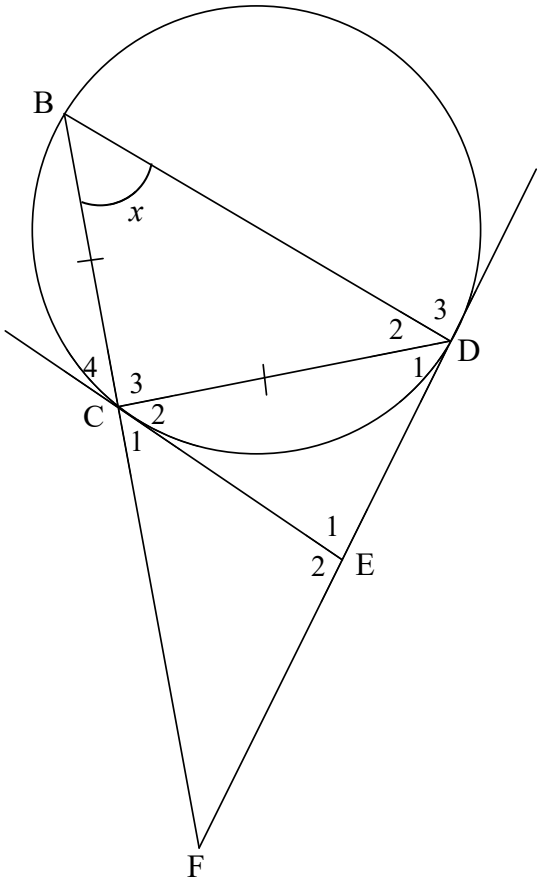
Pruva, o fana ka mabaka, hore*:*

9.1 $\frac{TQ}{QP} = \frac{WR}{RP}$ (3)

9.2 TPVW ke setliliki khwadilatherale (5)
[8]

POTSO 10

Setshwantshong se latelang, B, C le D ke dintlha tse hodima sedikadikwe hore BC = CD. EC le ED ke di thanjente hodima sedikadikwe ho C le D ka ho latellana. BC e lelefaditswe ho kopana le thanjente ho DE e lelefaditsweng hoya ho F. $\hat{B} = x$.



10.1 Pruva, o neha mabaka, hore:

10.1.1 $\hat{E}_1 = 180° - 2x$ (5)

10.1.2 $\Delta ECD \,|||\, \Delta CBD$ (3)

10.2 Pruva, o fan aka mabaka, hore:

10.2.1 $CD^2 = CE.BD$ (3)

10.2.2 $\dfrac{CF^2}{EF^2} = \dfrac{BD}{DE}$ (6)

[17]

KAOFELA: 150

a

LEQEPHE LA TLHAHISOLESEDING

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

$A = P(1+ni)$ $A = P(1-ni)$ $A = P(1-i)^n$ $A = P(1+i)^n$

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

$T_n = ar^{n-1}$ $S_n = \frac{a\left(r^n - 1\right)}{r-1}\ ;\ r \neq 1$ $S_\infty = \frac{a}{1-r}\ ;\ -1 < r < 1$

$F = \frac{x\left[(1+i)^n - 1\right]}{i}$ $P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$

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

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $\mathrm{M}\left(\frac{x_1 + x_2}{2}\ ;\frac{y_1 + y_2}{2}\right)$

$y = mx + c$ $y - y_1 = m(x - x_1)$ $m = \frac{y_2 - y_1}{x_2 - x_1}$ $m = \tan\theta$

$(x-a)^2 + (y-b)^2 = r^2$

In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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

$\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$ $\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$

$\cos(\alpha + \beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$ $\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases}$$

$\sin 2\alpha = 2\sin\alpha\cos\alpha$

$\bar{x} = \frac{\sum x}{n}$ $\sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$

$\mathrm{P(A)} = \frac{n(\mathrm{A})}{n(\mathrm{S})}$ $\mathrm{P(A\ or\ B)} = \mathrm{P(A)} + \mathrm{P(B)} - \mathrm{P(A\ and\ B)}$

$\hat{y} = a + bx$ $b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$