Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

KEREITI YA 12

LOETSE 2023

MMETSE P1

MATSHWAO: **150**

NAKO: **Dihora tse 3**

Pampiri ena e na le maqephe a 12, ho kenyelletsa le leqephe la tlhahisoleseding.

DITAELO LE TLHAHISOLESEDING

Bala ditaelo tse latelang ka hloko pele o ka araba dipotso.

1. Pampiri ena e na le dipotso tse LESHOME LE MOTSO O MONG. Araba dipotso KAOFELA.

2. Bontsha ka ho hlakileng KAOFELA dikhalekhuleishene, didayakeramo, dikerafo jwalo jwalo, tseo o di sebedisitseng ho fumana dikarabo.

3. O ka sebedisa khalekhuleitha ya saentifikhi e dumelletsweng(e sa porokeramuwang le e se nang dikerafo) ntle le ha ho boletswe.

4. Dikarabo feela di ke ke tsa abelwa matshwao a felletseng.

5. Haeba ho hlokeha, atametsa dikarabo ho didesimale tse PEDI, ntle le ha ho boletswe.

6. Didayakeramo HA DI latelle ditekanyetso tse nepahetseng.

7. Nomora dikarabo tsa hao jwalo ka ha ho nomorilwe ho pampiri ya dipotso.

8. Pampiri ya tlhahisoleseding e nang le difomula e kenyelleditswe qetellong ya pampriri ena.

9. Ngola ka mongolo o makgethe, o balehang.

POTSO YA 1

1.1 Solva x:

1.1.1 $x^2 + x - 30 = 0$ (3)

1.1.2 $x(2x-6) = -3$ (atametsa ho didesimale tse PEDI) (4)

1.1.3 $x^2 - 2x + 1 > 0$ (3)

1.1.4 $2x - 1 = \sqrt{4-5x}$ (4)

1.2 Solva x le y ka nako e le nngwe:

$y - 2x = -1$ le $2y^2 + 4xy = 6x^2$ (6)

1.3 O fuwe khwadrathikhi ikhweishene ena: $2x^2 - px + 1 = 0, x \in \mathbb{R}$.

Fumana velyu(di) ya/tsa p, tse tla etsa hore ikhweishene e be le diruthi tse pedi tse **sa lekaneng** tse real. (5)

[25]

POTSO YA 2

2.1 Themo ya leshome le ya leshome le metso e supileng ya arithimetikhi sekhwense ke 21 le 49 ka ho latellana.

2.1.1 Fumana khomon difarense ya sekhwense. (3)

2.1.2 Khalekhuleitha: $T_1 + T_{18}$ (3)

2.2 O fuwe: $\sum_{n=1}^{m}(4n-19)=1189$

2.2.1 Ngola dithemo tse tharo tsa pele tsa sirisi. (1)

2.2.2 Khalekhuleitha velyu ya m. (4)

2.3 $-78;-76;-72;-66;$ … ke khwadrathikhi namba phethene.

2.3.1 Ngola dithemo tse pedi tse latelang tsa namba phethene. (1)

2.3.2 Fumana n^{th} themo ya namba phethene ka mokgwa ona, $T_n = an^2 + bn + c$. (4)

2.3.3 Khonstante k o ekeditswe ho T_n hore kaofela dithemo tsa khwadrathikhi namba phethene di be phosithivi. Fumana velyu(di) ya/tsa k. (2)

[18]

POTSO YA 3

3.1 Themo ya pele ya jiometrikhi sekhwense ke 81 le khomon reshio ke r. Ha ho kopanngwa themo ya pele le ya boraro tsa jiometrikhi sekhwense e le nngwe ke 117. Khalekhuleitha velyu ya r. (4)

3.2 O fuwe conveent/conversant jiometrikhi serisi: $3^x + 9^x + 27^x + 81^x + ...$

3.2.1 Ngola khomon reshio ka mokgwa wa x. (1)

3.2.2 Khalekhuleitha velyu ya x, if $S_\infty = \frac{1}{2}$ (3)

[8]

POTSO YA 4

O fuwe: $f(x)=\frac{2}{x-5}+3$

4.1 Ngola ikhweishene ya diasimpthote tsa f. (2)

4.2 Ngola reinje ya f. (1)

4.3 Fumana dikhoodineithi tsa x-inthasepthe y-inthasepthe tsa f. (3)

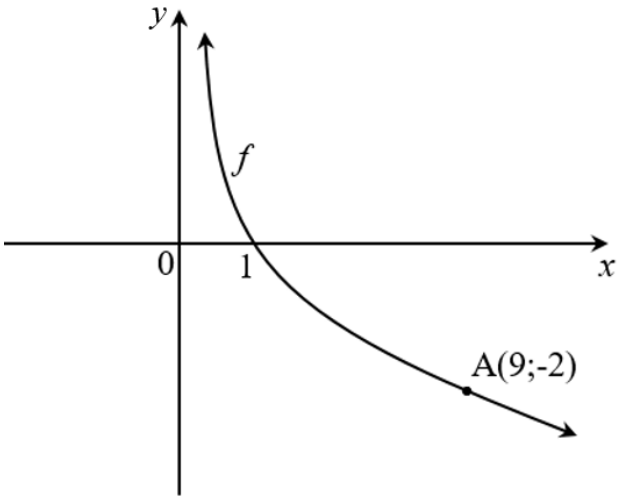
4.4 Sketjha kerafo ya f, bontsha ka ho hlakileng kaofela diasimpthote le diinthasepthe ho dieksis. (4)

4.5 Hlalosa transfomeishene eo kerafo ya f e ka e tsamayang ho etsa kerafo ya h, moo $h(x)=-\frac{2}{x-5}-5$. (3)

[13]

POTSO YA 5

Dayakeramo e latelang e bontsha kerafo ya $f(x) = \log_b x$, moo b e leng khonstente. f e feta ho poente $A(9 ; -2)$.



5.1 Bontsha hore $b = \frac{1}{3}$. (2)

5.2 Fumana ikhweishene ya f^{-1}, invese ya f, ka mokgwa ona $y = ...$ (2)

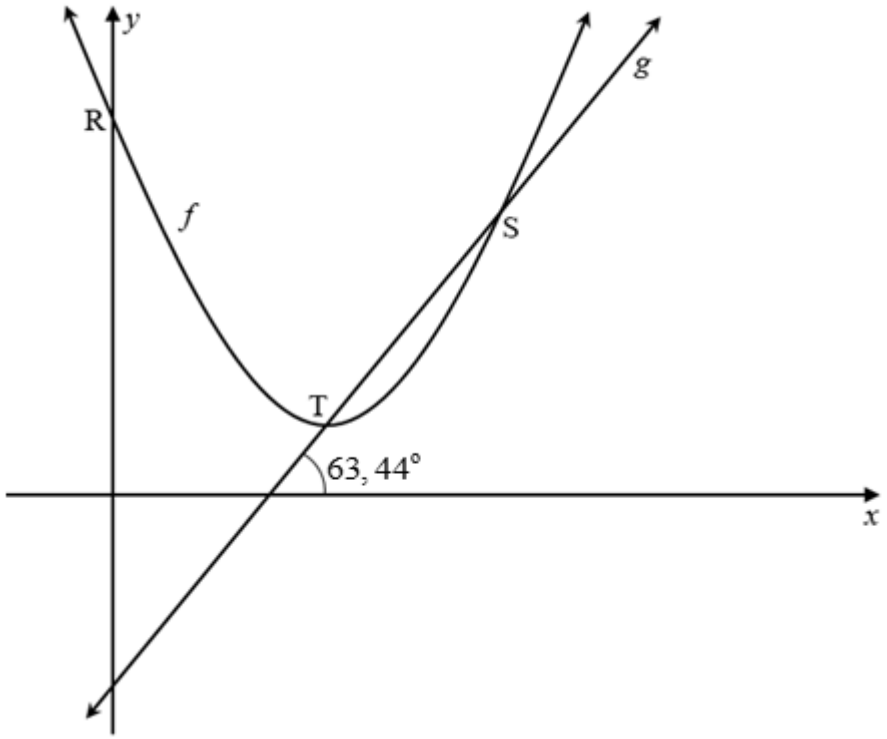
5.3 Ke divelyu dife tsa x moo $f(x) \geq 0$? (2)

5.4 Ngola ikhweishene ya asimpthote ya g, haeba $g(x) = f^{-1}(x+1)$. (2)

[8]

POTSO YA 6

Dayakeramo e latelang e bontsha dikerafo tsa $f(x)=x^2-6x+11$ le $g(x)=ax+b.$ Dikerafo tsa f le g diinthasektha ho S le T, moo T e leng thening poente f. Engele ya inclineishene ya g ke $63,44^{o}$.



6.1 Khalekhuleitha dikhoodineithe tsa T. (4)

6.2 Fumana ikhweijene ya g ka mokgwa ona $y=mx+c.$ (3)

6.3 O nto, kapa ka mokgwa o mong o fumane dikhoodineithe tsa S. (4)

6.4 Fumana divelyu tsa:

6.4.1 x, moo $f(x)\leq 6$ (2)

6.4.2 k, moo $f(x)+k$ a tla ba le diruthi tse real. (2)

[15]

POTSO YA 7

7.1 Lufezo o kentse polokelong R97 000 akhaontong e lefang 9,1% ka selemo kompaundede kotare le kotara. Khalekhuleitha hore ho nkile polokelo ya hae dilemo tse kae ho fihla ho R166 433. (4)

7.2 Ka la 1 January 2018 sekolo se rekile base e ntjha ya boleng ba R482 000. Ka lona letsatsi leo ba qala sinking fund ho lokisetsa ho reka base e ntjha dilemong tse 5 tse tlang.

7.2.1 Dilemong tse 5 tse tlang boleng ba base ba theoha ka 14,7% ka selemo ka mokgwa wa reducing-balance. Khalekhuleitha velyu ya ho threida-in base kamora dilemo tse 5. (2)

7.2.2 Theko ya dibase tsena e nyoloha ka 8,1% ka selemo. Khalekhuleitha theko ya base e ntjha ka la 1 January 2023, e leng ka mora dilemo tse 5. (2)

7.2.3 Banka e fana ka inthereste reiti ya 7,3% ka selemo, khompaundede kgwedi le kgwedi, bakeng sa sinking fund. Tefo ya pele ya diranta tse x, e kentswe ho fund ka la 1 January 2018, ka mora moo ha kenngwa tjhelete eo e lekanang ka letsatsi la pele la kgwedi e nngwe le e nngwe. Tefo ya ho qetela e bile ka la 1 December 2022.

Ka la 31 December 2022 sekolo sa reka base e ntjha mme ba sebedisa tjhelete ya ho threida-in base ya kgale bakeng sa diphosithi.

Khalekhuleitha tjhelete e kenngwang ka kgwedi ho sinking fund. (6)

[14]

POTSO YA 8

8.1 Fumana $f'(x)$ o sebedisa first principles ha $f(x)=1-x^2$. (5)

8.2 Fumana:

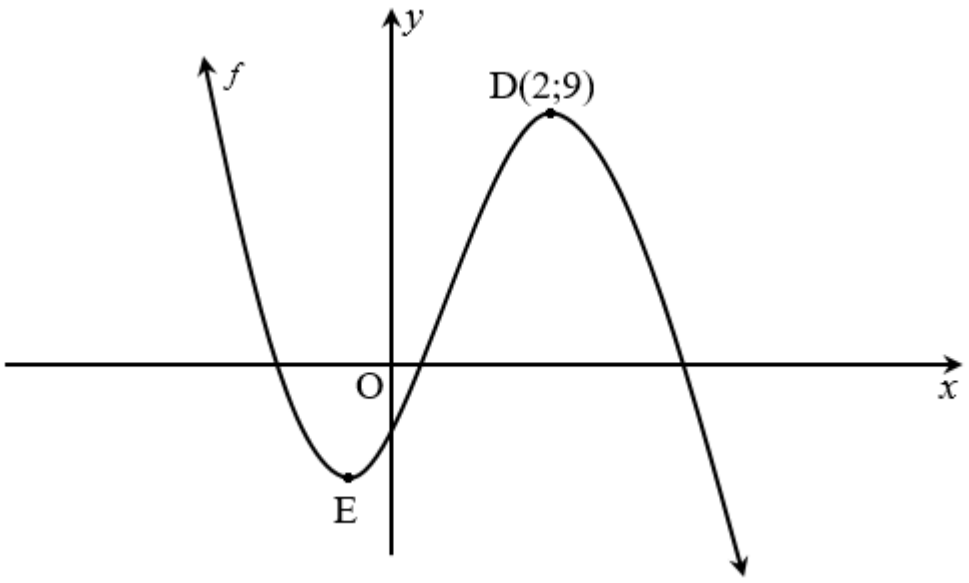
8.2.1 $D_x\left(x-\frac{1}{x}\right)^2$ (3)

8.2.2 $\frac{dy}{dx}$ if $y=\frac{x^5}{10}-\frac{2}{\sqrt{x}}$ (3)

[11]

POTSO YA 9

Dayakeramo e latelang e bontsha kerafo ya $f(x)=-2x^3+ax^2+bx-3$. D(2 ; 9) le E ke dithening poente tsa f.



9.1 Fumana divelyu tsa a le b. (5)

9.2 Haeba $f(x)=-2x^3+5x^2+4x-3$, khalekhuleitha velyu ya E. (3)

9.3 Fumana divelyu tsa x moo:

9.3.1 $f'(x)<0$ (2)

9.3.2 Kerafo ya f e leng concave down (3)

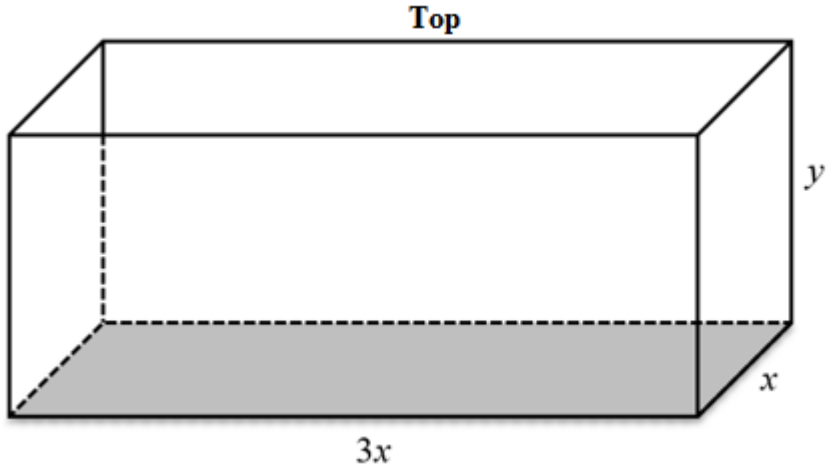
9.4 Fumana ikhweijene ya tangent ho kerafo ya f ho $P(-1\ ;\ 0)$, ka mokgwa $y=mx+c$. (4)

[17]

POTSO YA 10

Lebokoso la patsi le dayakeramong ke phrizimo e rekhthengula mme e bulwa ka hodimo. Didaemenshene tsa bheise ke $3x$ dimithara e phetaphetuwe ka x dimithara mme bophahamo ke y dimithara.

Safeise eriya ke $147\,\text{m}^2$.



10.1 Bontsha hore $y = \dfrac{147 - 3x^2}{8x}$. (2)

10.2 Khalekhuleitha velyu ya x moo volume ya lebokoso e leng maksimamo. (5)
[7]

POTSO YA 11

11.1 Dipatlisiso tse entsweng ho batho ba 210 tse batlang ho tseba hore ba thabela ho shebella rugby kapa bolo ya maoto ho TV. Diphetho di hlahella ho theibole ya khontinjensi e ka tlase.

	BA SHEBELLANG BOLO YA MAOTO	**BA SHEBELLANG RUGBY**	**TOTALE**
Ba batshehadi	72	*a*	120
Ba batona	54	36	90
Totale	*b*	84	210

11.1.1 Fumana divelyu tsa *a* le *b*. (2)

11.1.2 Fana ka probability ya hore motho ya kgethilweng feela ke motho e motshehadi ya thabelang ho shebella bolo ya maoto. (2)

11.1.3 Na dievente 'ho ba motho e motona'le 'ho shebella rugby' di ikemetse? Tshehetsa karabo ya hao ka dikhalekhuleishene. (4)

11.2 Password ya khomputhara e nang le ditlhaku tse 3 le didijithi tse 3, ka tatellano eo. Ho ka sebediswa kaofela didijithi tseo tse 10 le ditlhaku tseo tse 26 di ka sebediswa ho sa phetaphetwe.

Mohlala:

A	B	C	1	2	3

11.2.1 Ke dipassword tse kae tse arohaneng tse ka etswang ha ho sebediswa didijithi tse 10 le ditlhaku tse 26? (2)

11.2.2 Khalekhuleitha propabilithi ya hore tlhaku ya pele ke vawele mme dijithi ya ho qetela ya password ke fekthara ya 9. (4)

[14]

MATSHWAO KAOFELA: 150

PAMPIRI YA TLHAHISOLESEDING: MMETSE

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$P(A) = \frac{n(A)}{n(S)}$ $P(A \text{ of } B) = P(A) + P(B) - P(A \text{ en } B)$

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