



Province of the  
**EASTERN CAPE**  
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo  
Provinsie van die Oos Kaap: Departement van Onderwys  
Porafensie Ya Kapa Botjhabela: Lefapha la Thuto

# **NATIONAL SENIOR CERTIFICATE**

## **IBANGA 12**

### **SEPTEMBER 2024**

## **IMATHEMATIKA P1**

**AMANQAKU: 150**

**IXESHA: 3 Iiyure**

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Eli phepha lemibuzo linamaphepha ayi-13 kunye nephepha eli-1 leenkukacha.

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**IMIYALELO NEENKCUKACHA**

Funda imiyalelo elandelayo ngonyamekelo phambi kokuba uphendule imibuzo.

1. Eli phepha lemibuzo liqulathe imibuzo eyi12.
2. Phendula YONKE imibuzo KWINCWADI YOKUPHENDULELA oyinikiweyo.
3. Bonisa ngokucacileyo ZONKE iikhalithyuleyishini, iidayagram, iigrafu, njalonjalo ozisebenzisileyo ukufumana iimpendulo zakho.
4. Ungayisebenzisa isayentifikhi khalithyuleyitha evunyiweyo (engaprogranywanga nengenagrafikhi), ngaphande kokuba uxelelwe ngenye indlela.
5. Iimpendulo zodwa ZINGANGANIKWA manqaku apheleleyo.
6. Xa kukho imfuneko, iimpendulo mazisondezwe kwiidesimali EZIMBINI, ngaphandle kokuba uxelelwe ngenye indlela.
7. Iidayagram AKUNYANZELEKANGA zizotywe ngokwesikeyile.
8. Nombola iimpendulo ngokuchanekileyo ngokohlobo ekunonjolwe ngalo kweli phepha mibuzo.
9. Iphepha leenkukacha elineefomyula lifakiwe ekugqibeleni kwephepha lemibuzo.
10. Bhala ngokucocekileyo nangokucacileyo.

**UMBUZO 1**1.1 Solva u  $x$ :

1.1.1  $(2x - 4)(x - 1) = 0$  (2)

1.1.2  $2x^2 - 3(x + 2) = 4$  (lungisa iye kwiidesimali EZIMBINI) (4)

1.1.3  $x^2 + 4x - 21 \leq 0$  (3)

1.1.4  $-\sqrt{x-1} = 3 - 2x$  (4)

1.2 Solva simultaneously u  $x$  no  $y$ :

$2x = 1 - y$  no  $xy - x^2 + y^2 = 5$  (6)

1.3 Unikwe ukuba u:

- $f(x) = x^2 + 3x$
- $2x - [t(x)]^{\frac{1}{2}} = 0$

Zeziphi iivelyu zika  $k$  apho i-ikhweyizhini ka  $f(-x) + \frac{t(2k)}{4} = 0$  eyakuba neeruthi ezilinganayo?

(5)  
[24]

**UMBUZO 2**

2.1 Unikwe ikhwadrathikhi namba pateni engu:  $-5; -4; -1; 4; \dots$

2.1.1 Fumana i  $n^{\text{th}}$  them yekhwadrathikhi namba pateni kwifom ka  $T_n = an^2 + bn + c$ . (4)

2.1.2 Khalityhuleyitha i35<sup>th</sup> them yekhwadrathikhi namba pateni. (1)

2.1.3 Ngeziphi iikhonzekethivu them EZIMBINI zefirst differences sequence eziyakuba neprodakhthi engu 1 155? (4)

2.2 Unikwe iarithmethikhi sikhweni engu:  $60; 65; 70; \dots$

Khalityhuleyitha ivelyu ka  $p$  apho u  $T_p = 430$ . (3)

2.3 Isum yeethem ezintathu zokuqala zeincreasing arithmethikhi sirisi ngu30, ze iprodakhthi yazo iithem ezintathu ngu510. Fumana ivelyu zika  $a$  no  $d$ , ithem yokuqala nekhomoni difarensi yesirisi ngokulandelelanayo. (5)

[17]

**UMBUZO 3**

3.1 I-infinite jiyometrikhi sirisi inethem yokuqala engu 2 nekhonstenti reyisho engu  $\frac{1}{3}$ .

3.1.1 Khalityhuleyitha iithem ezimbini ezilandelayo. (1)

3.1.2 Khalityhuleyitha ivelyu ka  $S_{\infty}$ . (2)

3.2 Fumana ivelyu ka  $m$  ukuba u:

$$\sum_{k=3}^m 8(2)^{k-1} = 131\,040 \quad (5)$$

[8]

**UMBUZO 4**

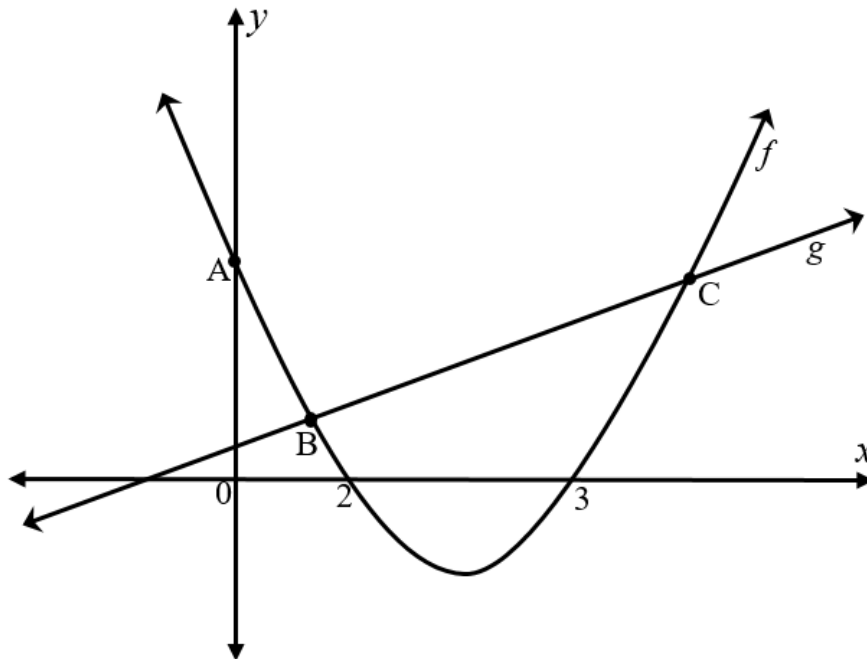
Qwalasela ifankshini:  $f(x) = \frac{-1}{x+5} - 2$

- 4.1 Bhala ii-ikhweyizhini zeeasymptote zika  $f$ . (2)
- 4.2 Fumana iikho-odineyithi ze  $x$ -intasephthi zika  $f$ . (2)
- 4.3 Fumana iikho-odineyithi ze  $y$ -intasephthi zika  $f$ . (2)
- 4.4 Yenza isiketshi segrafu ka  $f$ , bonisa ngokucacileyo zonke iiasymptote neeintasephthi kwiiekhzisi. (3)
- 4.5 Fumana i-ikhweyizhini ye-eksisi yesimetri ene-gradiyenti engu-1. (2)

**[11]**

**UMBUZO 5**

Iigrafu zika  $f(x) = x^2 - 5x + 6$  no  $g(x) = x + 1$  zizotywe ngezantsi. U B no C ziipoyinti zeintasekshini phakathi ko  $f$  no  $g$ . Iigrafu ka  $f$  inee  $x$ -intasephthi ku  $(2;0)$  no  $(3;0)$  ne  $y$ -intasephthi ku A.



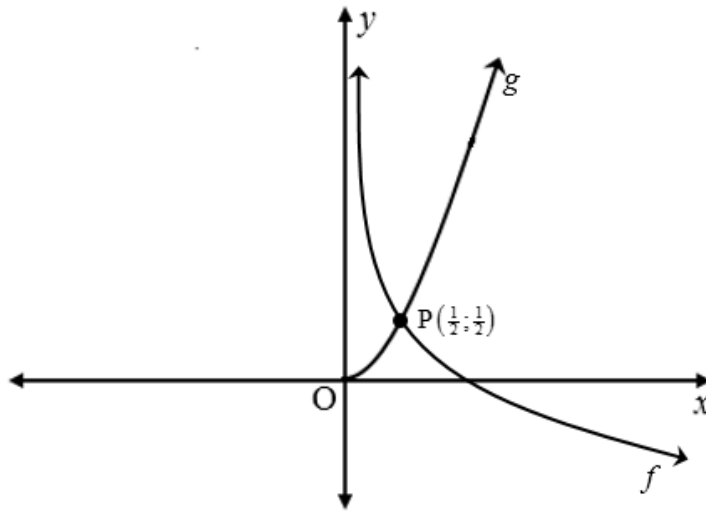
- 5.1 Fumana i-ikhweyizhini ye-eksisi yesimetri ka  $f$ . (2)
- 5.2 Khalityhuleyitha iikho-odineyithi zika B no C. (4)
- 5.3 PQ yivertical distance phakathi kweigrafu u  $g$  no  $f$  phakathi kuka B no C. Fumana imaximum length kaPQ. (4)
- 5.4 Fumana ireyinji ka  $t(x)$  ukuba u  $f(x) - 2 = t(x)$ . (2)
- 5.5 Kukweziphi iivelyu zika  $x$  u  $f(x) \cdot g'(x) < 0$ ? (2)

**[14]**

## UMBUZO 6

Idayagram engezantsi ibonisa iigrafu zika  $f(x) = -\log_c x$  no  $g(x) = dx^2$  ;  $x \geq 0$ .

Upoyinti  $P\left(\frac{1}{2}; \frac{1}{2}\right)$  yipoyinti yeintasekshini yeegrafu u  $f$  no  $g$ .



6.1 Khalityhuleyitha iivelyu zika  $c$  no  $d$ . (3)

6.2 Fumana:

6.2.1 I-ikhweyizhini ka  $g^{-1}(x)$  kwifom ka  $y = \dots$  (2)

6.2.2 I-ikhweyizhini ka  $h^{-1}(x)$  kwifom ka  $y = \dots$ , ukuba u  $h$  uyiriflekshini ka  $f$  kwi  $x$ -eksisi. (2)

6.2.3 Ii  $x$ -velyu apho u  $h^{-1}(x) > 0$  (1)  
[8]

**UMBUZO 7**

7.1 Imoto exabisa iR180 000, idiprishiye yitha ngo 13% p.a. compounded annually kwiridyusingi bhalansi methodi. Khalityhuleyitha ivelyu yemoto kwiminyaka eyi6. (3)

7.2 ULumi uvule iseyivingi pleni akhawunti yeminyaka eyi15 ebhatala i-intrest eyi8% ngonyaka compounded monthly. Ugcina iR900 qho ngenyanga kwiminyaka yokuqala eyi10. Intlawulo yakhe yokuqala yaba ngempelanyanga yokuqala. Kwiminyaka eyi5 yokugqibela yeseyivingi pleni yakhe wakwazi ukunyusa imali ayihlawula ngenyanga yaba yiR1 300.

Khalityhuleyitha ivelyu yeseyivingi yakhe ekupheleni kwexesha leseeyivingi. (5)

7.3 UMr Leanya uthenge indlu yeR850 000. Ufumene ilowuni kwibhanki ngeintrest eyi13% ngonyaka compounded monthly ukubhatala indlu. Uvume ukuhlawula i-instolimenti eyiR9 958,39 ngenyanga nganye kwiminyaka eyi20.

7.3.1 Khalityhuleyitha ibhalansi yelowuni yakhe emvakwanje kwe75<sup>th</sup> instolimenti. (3)

7.3.2 UMr Leanya ufumene ubunzima kwezezimali emva kokuhlawula i75<sup>th</sup> instolimenti waze akakwazi ukuhlawula i76<sup>th</sup> ukuya kwi79<sup>th</sup> Ekupheleni kwenyanga ye80<sup>th</sup> wenyuse i-instolimenti yakhe ukuze akwazi ukuhlawula ilowuni yakhe yonke ngokwexesha ebelibekiwe ngaphambili.

Khalityhuleyitha ivelyu yeinstolimenti ehlengahlengisiweyo yakhe. (5)  
[16]

**UMBUZO 8**

8.1 Fumana u  $f'(x)$  kwi first principles ukuba u  $f(x) = x^2 - 3$ . (4)

8.2 Fumana u:

8.2.1  $\frac{dy}{dx}$  ukuba u  $y = -3x^2 + 7x$  (2)

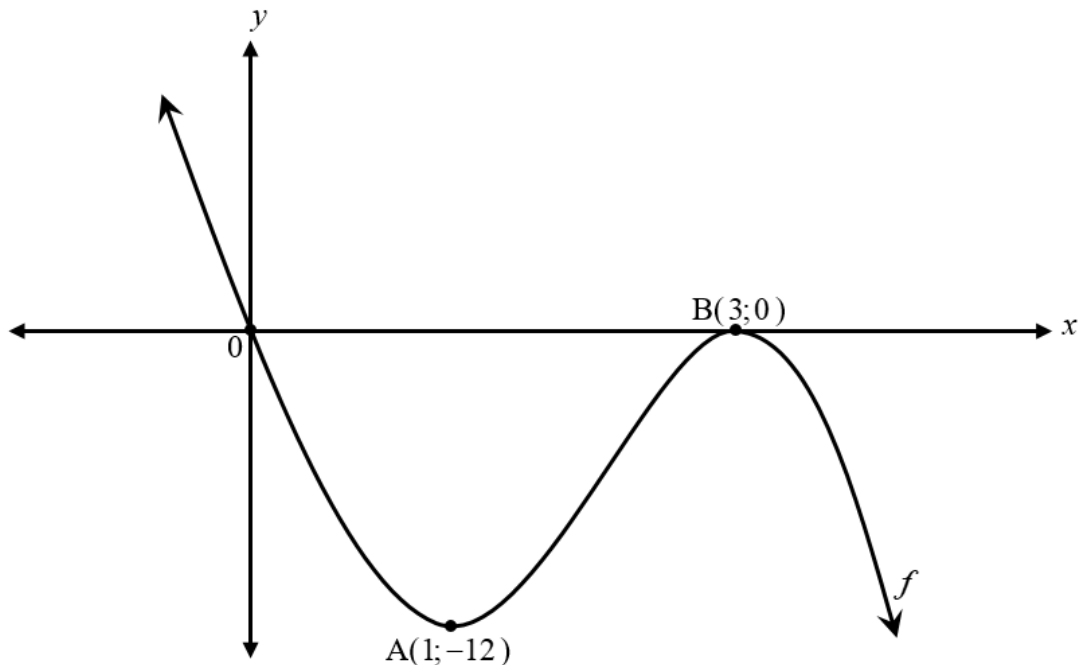
8.2.2  $D_x \left[ \frac{x^3 - 5x^2}{x^3} - \sqrt{x} \right]$  (4)

8.3 Masithi u  $g(x)$  umele irate of change ka  $h(x) = -x^3 - 3x^2 + 1$ . Khalityhuleyitha ivelyu enkulu ka  $g(x)$ . (3)  
[13]



## UMBUZO 9

- 9.1 Isiketshi esigezantsi sibonisa igrafu ka  $f(x) = -3x^3 + mx^2 + nx$ . Igrafu ka  $f$  idlula kwiorijini ze ibe nelocal minimum nelocal maximum kuA(1; -12) no B(3; 0) ngokulandelelanayo.



- 9.1.1 Bonisa ukuba u  $m = 18$  no  $n = -27$  (5)
- 9.1.2 Chaza umahluko phakathi kuka  $f(a)$  no  $f'(a)$ . (2)
- 9.1.3 U  $g(x)$  yithanjenti kwikhevu  $f(x)$  kwipoyinti yeriflekshini. Fumana i-ikhweyizhini ka  $h(x)$ , istreyithi layini esiphephendityhula ku  $g(x)$  ze sidlule kwiorijini. (5)
- 9.1.4 Zeziphi iivelyu zika  $x$  eziza kuba ngu  $f''(x) > 0$ ? (2)
- 9.2 Ifankshini engu  $t$  inikwe ingu  $t(x) = 2x^3 + bx + c$  kwaye ineepropati ezilandelayo.
- $t(-3) = t(3) = t(0) = 0$
  - $t'(-1,5) = t'(1,5) = 0$
- Sebenzisa olu lwazi ukuzoba nokuleyibhelisha ngokucecekileyo isiketshi grafu sikat, ungamsolvanga u  $b$  no  $c$ . (3)

[17]

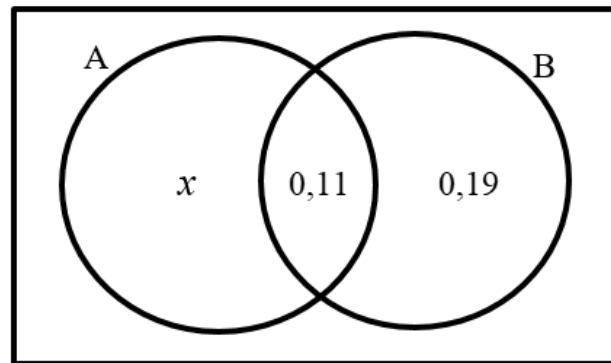
**UMBUZO 10**

Inani lamaphepha amakishwe ngumakishi othile alandelelwe emakhingi senta emva kweentsuku eziyi  $t$  kuqaliwe ukumakishwa, yaze yaboniswa ngefankshini,  $S(t) = -3t^2 + 30t$ ,  $1 \leq t \leq 10$ ,  $t \in \mathbb{Z}$ , apho u  $S(t)$  emetwe ngokwamaphepha ngosuku.

- 10.1 Fumana inani lamaphepha amakhishwe ngumakishi ngosuku lwesithathu. (2)
- 10.2 Kungoluphi usuku apho ummakishi ayakufika kwimaximum namba yamaphepha amakishwe ngosuku? (3)
- 10.3 Inani lamaphepha ewonke ekufuneke ummakishi ewamakishile ngeentsuku eziyi10 ibingu500. Ingaba ummakishi ufikile kumlinganiselo onikiweyo? Xhasa impendulo yakho ngeekhalithyuleyishini. (2)
- [7]

**UMBUZO 11**

- 11.1 Ii-iventi ezimbini uA no B ziboniswe kwiVenn dayagram engezantsi. Unikwe ukuba  $uP[\text{not } (A \text{ or } B)] = 0,41$ .



Fumana :

- 11.1.1 Ivelyu ka  $x$  ube sowufumana no  $P(A)$  (2)
- 11.1.2  $P(A \text{ or not } uB)$  (2)
- 11.2 Iziphumo zemidlalo eyi30 zeqela lesoka, iCity Brothers FC ngo2022–2023 ziboniswe ngezantsi.

	HOME GAME	AWAY GAME	TOTAL
<b>WINS</b>	3	4	7
<b>LOSSES</b>	7	7	14
<b>DRAWS</b>	5	$a$	9
<b>TOTAL</b>	15	15	30

- 11.2.1 Bhala ivelyu ka  $a$ . (1)
- 11.2.2 Ngubani iprobhabhiliti yokuba kumdlalo orandomly selected weCity Brothers FC wabaliqela elingaphumelelanga? (1)
- 11.2.3 Ingaba ii-iventi ‘winning a game’ kunye ‘playing at the home ground’ zi-indiphendenti? Xhasa impendulo yakho ngeekhalithyuleyishini. (3)

[9]

**UMBUZO 12**

Iphondo iKwazulu-Natal livelise inumber plate system entsha ukusuka ngoDecember 2023. Inumber plate code entsha inoonobumba ababini, iidijithi ezimbini kunye noonobumba ababini. Isystem isebenzisa iidijithi, 0–9 kunye noonobumba bealfabhethi ngaphandle kwezikhamiso. Ngezantsi ngumzekelo wale number plate intsha. Qaphela ukuba zonke iinumber plate ziphela ngoZN ozimeleyo kwikhowudi.



[Umthombo: KZN Provincial Gazette 2614-iipleyiti zeenombolo ezintsha ze KZN]

- 12.1 Zingaphi iinumber plate code ezino bapossible kwisystem entsha, ukuba iidijithi noonobumba banokungaphindwa? (2)
- 12.2 Khalityhuleyitha iprobhabhiliti yokuba inumber plate code iya kuqala ngonobumba wealfabhethi ophambi konobumba G, ibenedijithi yokuqala eyicomposite number ze idijithi yokugqibela ibeyifektha ka4. Iidijithi noonobumba zingangaphindwa. (4)
- [6]

**EWONKE: 150**

## IPHEPHA LEENKCUKACHA: IMATHEMATIKA

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

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

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

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

$$T_n = a + (n - 1)d$$

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

$$T_n = ar^{n-1}$$

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

$$S_\infty = \frac{a}{1 - r} ; \quad -1 < r < 1$$

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

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

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

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

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

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

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

$$m = \tan \theta$$

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

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

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A \quad \text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

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

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

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

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

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

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

$$\bar{x} = \frac{\sum x}{n}$$

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

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ okanye } B) = P(A) + P(B) - P(A \text{ no } B)$$

$$\hat{y} = a + bx$$

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