



Province of the  
**EASTERN CAPE**  
EDUCATION



**NATIONAL  
SENIOR CERTIFICATE**

**IBANGA 12**

**SEPTEMBER 2023**

**IMATHEMATIKA P1**

**AMANQAKU: 150**

**IXESHA: 3 iiyure**

---

Eliphepha mibuzo linamaphepha ali 12 , kunye nephepha leenkukacha.

---

**IMIYALELO NEENKCUKACHA**

Funda lemiyalelo ilandelayo ngonyamekelo phambi kokuba uphendule imibuzo.

1. Eliphepha liqulathe imibuzo ELISHUMI ELINANYE. Phendula YONKE imibuzo.
2. Ngokucacileyo bonisa ZONKE iikhaltyhuleyishini, iidayagram, iigrafu, njalonjalo othe wazisebenzisa ukufumana iimpendulo zakho.
3. Ungayisebenzisa isayentifikhi khaltyhuleyitha evumelekileyo (engaprogranywanga nengenagrafikhi), ngaphandle kokuba kuchazwe ngenye indlela.
4. Iimpendulo zodwa zinganganikwa manqaku apheleleyo.
5. Xa kukho imfuneko, sondeza iimpendulo kwiindawo eziMBINI zedesimali, ngaphandle kokuba uxelelwe ngenye indlela.
6. Iidayagram AKUNYANZELEKANGA zizotywe ngokweskeyile.
7. Nombola iimpendulo ngokuchanekileyo ngokohlobo ekunonjolwe ngalo kweliphepha mibuzo.
8. Iphepha elineenkukacha neefomyula lifakwe ekupheleni kwephepha mibuzo.
9. Bhala ngokucocekileyo nangokulandelekayo.

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

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

1.1.2  $x(2x - 6) = -3$  (lungisa iye kwiindawo EZIMBINI zedesimali) (4)

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

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

1.2 Solva u  $x$  no  $y$  ngaxesha linye:

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

1.3 Unikwe ikhwadrathikhi ikhweyizhini engu:  $2x^2 - px + 1 = 0, x \in \mathbb{R}$ .Fumana i/iivelyu zika  $p$ , ukuze i-ikhweyizhini ibenee ruthi ezimbini **ezingalinganiyo** eziriyeli.(5)  
[25]

**UMBUZO 2**

- 2.1 Ithem yeshumi kunye neshumi elinesixhenxe zearithmetikhi sikhwensi ngu 21 no 49 ngokulandelelanayo.
- 2.1.1 Fumana ikhomoni difarensi yesikhwensi. (3)
- 2.1.2 Khaltyhuleyitha u:  $T_1 + T_{18}$  (3)
- 2.2 Unikwe u:  $\sum_{n=1}^m (4n - 19) = 1189$
- 2.2.1 Bhala ithem zokuqala ezintathu zesirisi. (1)
- 2.2.2 Khaltyhuleyitha ivelyu ka  $m$ . (4)
- 2.3  $-78; -76; -72; -66; \dots$  yikhwadrathikhi namba patheni,
- 2.3.1 Bhala ithem ezimbini ezilandelayo kulenamba patheni. (1)
- 2.3.2 Fumana i  $n^{\text{th}}$  them yenamba patheni ngokwefom ka,  $T_n = an^2 + bn + c$ . (4)
- 2.3.3 U  $k$  okhonstenti udityaniswe ku  $T_n$  ukuze zonke ithem zekhwadrathikhi namba patheni zibe phozithivu. Fumana  $i$ /ivelyu zika  $k$ . (2)
- [18]**

**UMBUZO 3**

- 3.1 Ithem yokuqala kwijiyometrikhi sikhwensi ngu 81 ize ikhomoni reshiyo ibengu  $r$ . Xa udibanise eyokuqala neyesithathu ithem yejiyometrikhi sikhwensi ufumana u117. Khaltyhuleyitha ivelyu ka  $r$ . (4)
- 3.2 Unikwe ikhonvejenti sirisi engu:  $3^x + 9^x + 27^x + 81^x + \dots$
- 3.2.1 Bhala ikhomoni reshiyo ngendlela ka  $x$ . (1)
- 3.2.2 Khaltyhuleyitha uvelu ka  $x$ , if  $S_\infty = \frac{1}{2}$ . (3)
- [8]**

**UMBUZO 4**

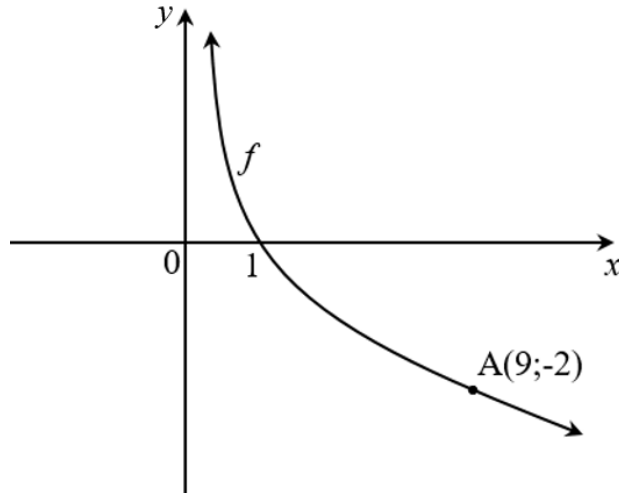
Unikwe u:  $f(x) = \frac{2}{x-5} + 3$

- 4.1 Bhala ii-ikhweyizhini zeeasimpthowuthi zika  $f$ . (2)
- 4.2 Bhala ireyinji ka  $f$ . (1)
- 4.3 Fumana iikho-odineyithi zika  $x$ - no  $y$ - intasephthi zika  $f$ . (3)
- 4.4 Zoba igrafu ka  $f$ , ubonise ngokucacileyo zonke iiasimpthowuthi neeintasephthi kwii ekhzisi. (4)
- 4.5 Chaza itransfomeyishini yokuba igrafu ka  $f$  izohamba njani ukwenza igrafu ka  $h$ , apho u  $h(x) = -\frac{2}{x-5} - 5$ . (3)

**[13]**

### UMBUZO 5

Idayagram engezantsi ibonisa igrafu ka  $f(x) = \log_b x$ , apho  $ub$  ayikhonstenti. U  $f$  udlula kwipoyinti engu  $A(9; -2)$ .

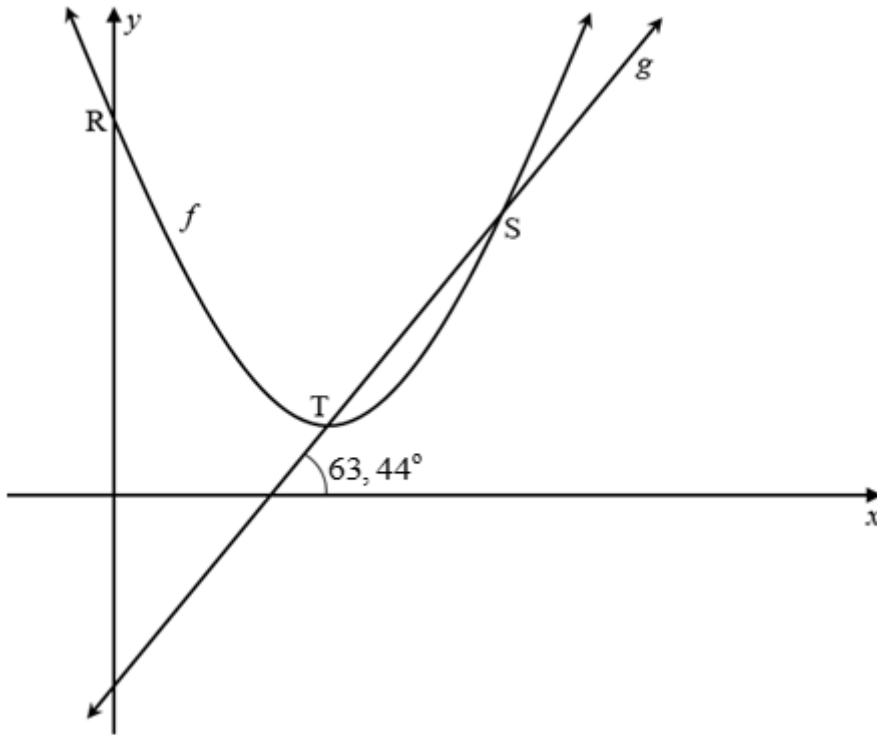


- 5.1 Bonisa ukuba u  $b = \frac{1}{3}$ . (2)
- 5.2 Fumana i-ikhweyizhini ka  $f^{-1}$ , i-invesi ka  $f$ , ngokwefom ka  $y = \dots$  (2)
- 5.3 Zeziphi iivelyu zika  $x$  apho u  $f(x) \geq 0$ ? (2)
- 5.4 Bhala i-ikhweyizhini yeasimpthowuthi ka  $g$ , ukuba  $g(x) = f^{-1}(x+1)$ . (2)

**[8]**

### UMBUZO 6

Idayagram engezantsi ibonisa igrafu ka  $f(x) = x^2 - 6x + 11$  no  $g(x) = ax + b$ . Igrafu ka  $f$  no  $g$  idibana ku S no T, apho u T ayitheningi poyinti ka  $f$ . Iengile yeinklineyishini ka  $g$  ngu  $63,44^\circ$ .



- 6.1 Khaltyhuleyitha iikho-odineyithi zika T. (4)
- 6.2 Fumana i-ikhweyizhini kag ngokwefom ka  $y = mx + c$ . (3)
- 6.3 Ngoko ke, okanye fumana iikho-odineyithi zikaS. (4)
- 6.4 Fumana iivelyu zika:
- 6.4.1  $x$ , apho u  $f(x) \leq 6$  (2)
- 6.4.2  $k$ , apho u  $f(x) + k$  uzoba neeriyeli ruthi (2)
- [15]**

**UMBUZO 7**

- 7.1 ULufezo udiphozithe iR97 000 kwiakhawunti enika i9,1% p.a. ekhompawundwe kotali. Khaltyhuleyitha ukuba kuthathe iminyaka emingaphi ukuze i-investimenti yakhe ifike kwiR166 433. (4)
- 7.2 Nge1 Januwari 2018 isikolo sithenge ibhasi entsha ngeR482 000. Kwangaloo mini baqala isinkingi fandi ukungiselela ibhasi entsha kwiminyaka emi5 ezayo.
- 7.2.1 Kwiminyaka emi5 ezayo ibhasi yehle ngo14,7% p.a. kwiridyusingi-bhalansi methodi. Khaltyhuleyitha ithreyidi-ini velyu yebhasi emva kweminyaka emi5. (2)
- 7.2.2 Ixabiso lezibhasi lenyuka ngo8,1% ngonyaka. Khaltyhuleyitha ixabiso lebhasi entsha nge1 Januwari 2023, i.e. emva kweminyaka emi5. (2)
- 7.2.3 Ibhanki inike i-intrest i-reyithi engu7,3% p.a. yesinkingi fandi, ekhompawundwe ngenyanga. Imali yokuqala ayibhatelelo, eyi*x* yeerandi, yenziwe nge1 Januwari 2018 kwaze emva koko iamawunti efanayo yadiphozithwa ngosuku lokuqala lwenyanga nganye. Imali yokugqibela ayibhatelelo yenziwe nge1 Disemba 2022.
- Nge31 Disemba 2022 isikolo sithenge ibhasi entsha saze sasebenzisa ithreyidi-ini velyu yebhasi endala njenge diphozithi.
- Khaltyhuleyitha imali ebhatelwe ngenyanga kwisinkingi-fandi. (6)

**[14]**



**UMBUZO 8**

8.1 Fumana u  $f'(x)$  kwiifirst principle ukuba u  $f(x) = 1 - x^2$ . (5)

8.2 Fumana u:

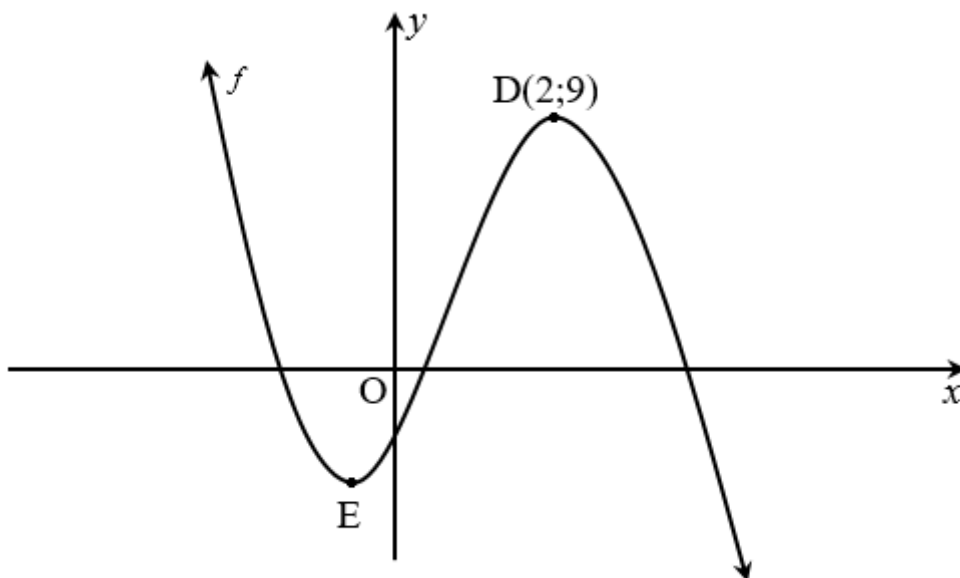
8.2.1  $D_x \left( x - \frac{1}{x} \right)^2$  (3)

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

[11]

**UMBUZO 9**

Idayagram engezantsi ibonisa igrafu ka  $f(x) = -2x^3 + ax^2 + bx - 3$ . uD(2; 9) noE ziitheningi poyinti zika  $f$ .



9.1 Fumana iivelyu zika  $a$  no  $b$ . (5)

9.2 Ukuba u  $f(x) = -2x^3 + 5x^2 + 4x - 3$ , khaltyhuleyitha iikho-odineyithi zikaE. (3)

9.3 Fumana iivelyu zika  $x$  apho u:

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

9.3.2 Igrafu ka  $f$  ikhonkheyivu dawuni (3)

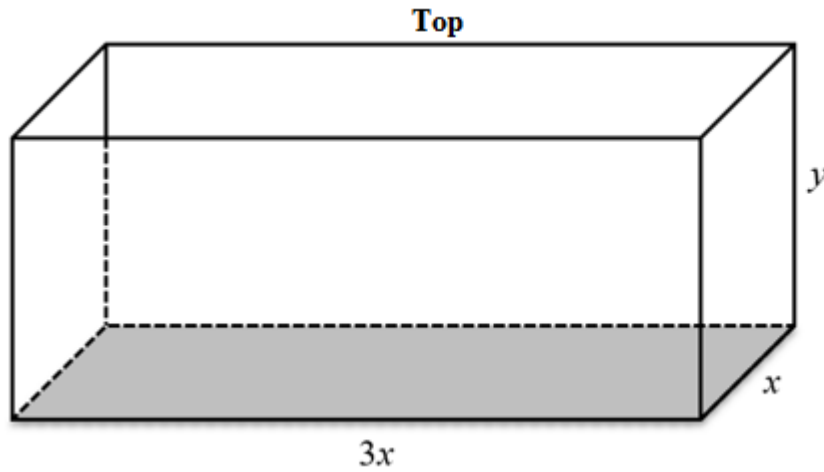
9.4 Fumana i-ikhweyizhini yethanjenti kwigrafu ka  $f$  ku  $P(-1; 0)$ , ngokwefom ka  $y = mx + c$ . (4)

[17]

**UMBUZO 10**

Ibhokisi yomthi ekwidayagram yirekhthendyula prizim kwaye ivulekile ngasentla. Iidayimenshini zebheyisi ngu  $3x$  mithazi ngo  $x$  mithazi ize ihayithi ibengu  $y$  mithazi.

Itotali safeyisi eriya ngu  $147 \text{ m}^2$ .



10.1 Bonisa ukuba u  $y = \frac{147 - 3x^2}{8x}$ . (2)

10.2 Khaltyhuleyitha ivelyu ka  $x$  apho ivolyum yebhokisi ikwimakhzimam. (5)  
[7]

**UMBUZO 11**

- 11.1 Uphando lwenziwe kubantu kubantu abangama 210 ukufumana ukuba bakhetha ukubukela umbhoxo okanye isoka kwi TV. Iziphumo ziboniswe kwikhontijensi theyibhile engezantsi.

	<b>ABABUKELA ISOKA</b>	<b>ABABUKELA UMBHOXO</b>	<b>BEBONKE</b>
Abasetyhini	72	$a$	120
Amadoda	54	36	90
Bebonke	$b$	84	210

- 11.1.1 Fumana iivelyu zika  $a$  no  $b$ . (2)
- 11.1.2 Nika iprobhabhiliti yokuba umntu ongakhethwa ngokungacwangciswanga okhetha ukubukela isoka ingangowasetyhini. (2)
- 11.1.3 Ingaba ii-iventi 'ukuba yindoda' 'nokubukela umbhoxo' zi-indiphendenti? Sekela impendulo yakho ngeekhaltyhuleyishini. (4)
- 11.2 Iphasiwedi yekompyutha inonobumba abangama 3 kunye needijithi ezi 3, ngokwaloo-oda . Zonke iidijithi ezili 10 kunye nonobumba abangama 26 zingasetyenziswa, zingaphindwanga.

Umzekelo:

A	B	C	1	2	3
---	---	---	---	---	---

- 11.2.1 Zingaphi iiphasiwedi ezohlukileyo ezinokwenziwa kweedijithi zili 10 nonobumba abangama 26? (2)
- 11.2.2 Khaltyhuleyitha iprobhabhiliti yokuba unobumba wokuqala wephasiwedi uzoba yivaweli ze idijithi yokugqibela yephasiwedi ibe yifekhtha ka 9. (4)

[14]

**EWONKE: 150**

## IPHEPHA ELINEENKCUKACHA: IMATHEMATIKA

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$y = mx + c$$

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

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

$$m = \tan \theta$$

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

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

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

$$\text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

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

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

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

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

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

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

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

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

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

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

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

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