NATIONAL
SENIOR CERTIFICATE

IBANGA 12

SEPTEMBA 2020

IMATHEMATIKA P1

AMANQAKU: **150**

IXESHA: **3 iiyure**

Eli phepha lemibuzo linamaphepha ali 10, lidibene nephepha lolwazi.

IMIYALELO NOLWAZI

Funda imiyalelo elandelayo ngocoselelo phambi kokuphendula imibuzo.

1.   Eli phepha lemibuzo linemibuzo eyi ELEVEN.

2.   Phendula YONKE imibuzo.

3.   Bonisa ngokucacileyo ZONKE iikhaltyhuleyshini, iidayagram, iigrafu, njl. ozisebenzisileyo ukubonisa iimpendulo zakho.

4.   Ungayisebenzisa ikhalityhuleytha esayentifikhi evunyiweyo (engaprogranyangwa nengenagrafikhi nengafakwanga mizobo), ngaphandle kokuba uxelelwe ngeny'indlela.

5.   Iiphendulo kuphela azinyanzelekanga ukunikwa amanqaku apheleleyo.

6.   Ukuba kunyanzelekile, sondeza iimpendulo kwiindawo EZIMBINI zedesimal, ngaphandle kokuba uxelelwe ngeny'indlela.

7.   Iidayagram AZI zotywanga ngokwesikeyile (scale).

8.   Nambarisha iimpendulo ngokuchanekileyo ngendlela esetyenzisiweyo ukunambarisha eli phepha lemibuzo.

9.   Iphepha lolwazi elineefomyula lifakwe ekugqibeleni kwiphepha lemibuzo.

10.   Bhala ngokucocekileyo nangokucacileyo.

Nceda tyhila

UMBUZO 1

1.1   Solva u x:

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

1.1.2 $x(7x + 2) = 1$ (lungisa iye kwiindawo eziMBINI zedesimal)   (4)

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

1.1.4 $2^x + 2^{2-x} = \dfrac{17}{2}$ (5)

1.2   Unikwe:
- $(x - 2)^2 + y^2 = 25$ yi-ikhweyzhini yesekile
- $x + 3 - 3y = 0$ yi-ikhweyzhini yomgca ostreyti nee
- Iigrafu zesekile nomgca zi-intasektha kupoynti A no B

Fumana (Determine) ubonise zonke iikhalthuleyshini eziyimfuneko,
iikhoodineythi zepoynti A no B.   (6)

1.3   Bonisa ukuba iingcambu zeikhweyzhini $(x + m)(x + n) = 3p^2$ ziyinyani (are
real) kwiivelyu zika m, n and p.   (4)

[26]

UMBUZO 2

2.1   Unikwe ikhwadrathik phatheni: 86 ; 119 ; 150 ; 179 ; …

2.1.1   Bhala iithem ezilandelayo eziMBINI zephatheni.   (2)

2.1.2   Fumana u T_n, ithem ejeneral yephatheni ngale fom $T_n = an^2 + bn + c$.   (4)

2.1.3   Yeyi (zezi) phi iithem zephatheni ezinevelyu engu 326?   (3)

2.1.4   UTaine udibanisa ukhostent k kwithem nganye kwiphatheni enika
iphatheni entsha u P_n. Fumana ithem ejeneral yephatheni entsha.   (2)

2.2   Iithem zokuqala ezintathu zearhithmetik sikhwensi zii:

$2y - 1$; $4y - 1$; $6y - 1$.

2.2.1   Fumana u T_{30} ngokwe them ka y.   (3)

2.2.2   Fumana ivelyu ka y, xa unikwe isam yeethem zokuqala eziyi 30
zesikhwensi ngu -2820.   (4)

[18]

Nceda tyhila

UMBUZO 3

3.1 Unikwe iisiris: $1 + 2 + 3 + 4 + 5 + 6 + ... + 5000$

Bhala iisiris ngokwe sigma noteyshini ukuba zonke iiphawa zika4 zisusiwe kwiisiris. (4)

3.2 Unikwe ukuba iijonetrik siris ezimbini ezilandelayo ziikhonvejent (convergent):

$$1 + x + x^2 + x^3 + ... \quad \text{no} \quad 1 - x + x^2 - x^3 + ...$$

Fumana i(i)velyu zika x apho isam yeesiris ezimbini ilingana no 8. (6)

[10]

UMBUZO 4

Unikwe: $f(x) = \dfrac{a}{x-1} + 3$, apho u $a \in \mathbb{Z}$.

4.1 Bhala ii-ikhweyzhini zeasymptotes ka f. (2)

4.2 Fumana i x ne y intasepthi zika f ngokwe them ka a. (3)

4.3 Unikwe ukuba u $a = -1$, zoba isikhetshi esicocekileyo sika f, bonisa ngokucacileyo zonke iiasymptotes nee intasepthi nge-ekhziz. (4)

4.4 Igrafu ka f ibhekiswe ngeeyunithi ezi 3 ukuya ngasekhohlo nangeeyunithi ezi2 ukuya ezantsi. Bhala i-ikhweyzhini entsha ka f ngokwee them zika a. (2)

[11]

UMBUZO 5

Idayagram engezantsi ibonisa iigrafu zika $f(x) = ax^2 + bx + c$ and $g(x) = b^x + q$.
U A no B zii x-intasepthi, u E yi y-intasepthi no $C\left(-\frac{3}{4}\ ;\ y\right)$ yipoynti ejikayo (turning point) ka f. U J yi x-intasepthi aze u D abeyi y-intasepthi ka g. $y = -8$ yi-ikhweyzhini ye asymptote ka g. $H(1; -5)$ yenye yeepoynti zeintasekshini ka f no g.
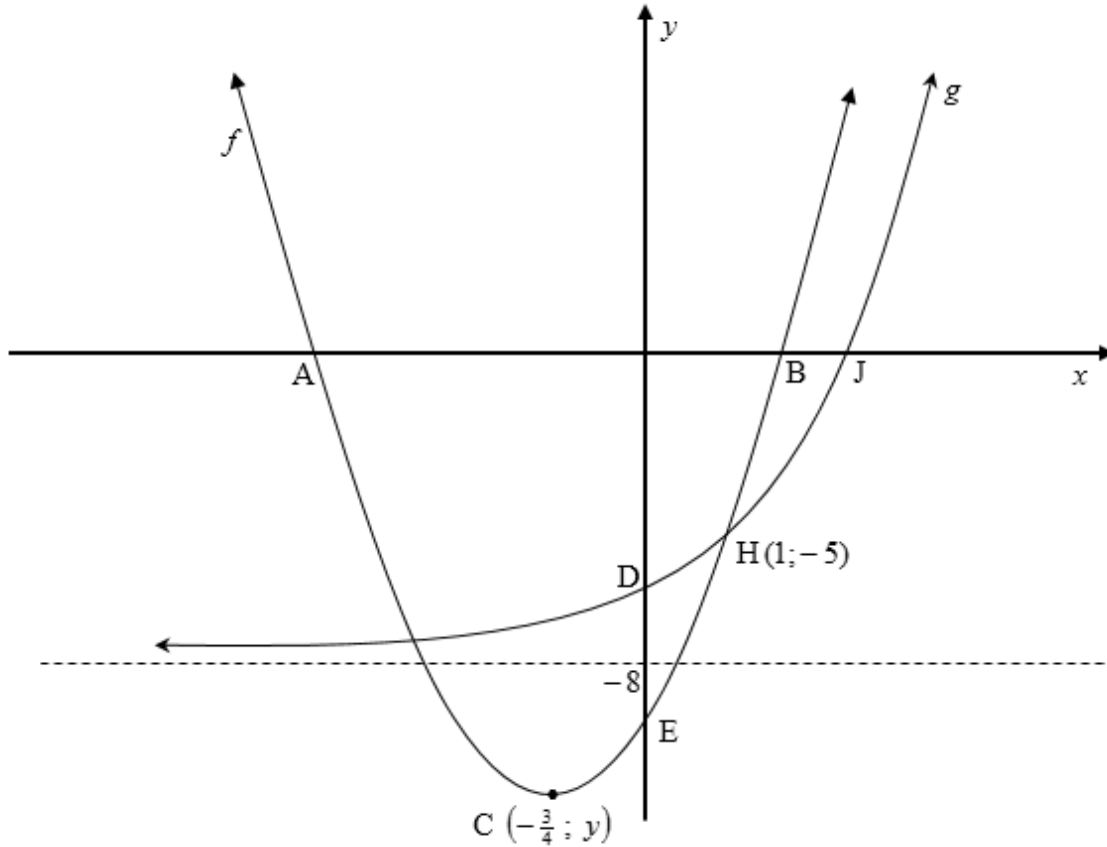
5.1   Bhala iikhoodineythi zika D.   (1)

5.2   Bhala ivelyu ka q.   (1)

5.3   Bonisa ukuba u $a = 2$, $b = 3$ no $c = -10$.   (6)

5.4   Bhala irheynji ka g.   (2)

5.5   Umgca ne ikhweyzhini, $y + 9x = -28$, yithanjent ka f kupoynti T.
        Fumana iikhoodineythi zika T.   (5)

5.6   Unikwe ukuba u $h(x) = g(x) + 8$, bhala u $h^{-1}(x)$ ngokwe fom $y = ...$ (2)

5.7   Unikwe ukuba u $p(x) = f(x) + 1$, fumana iivelyu zika x apho u $x.p(x) < 0$.   (4)

                                                                                [21]

UMBUZO 6

6.1 UColby wathenga ilaptop exabisa i Rx yezifundo zakhe zaseyunivesithi. Ivelyu yelaptopyehla nge r % ngonyaka kusetyenziswa imethodi yebhalansi enciphayo. Emva kweminyaka emi 4, ivelyu yelaptop yayixabisa i$\frac{1}{3}$ yexabiso layo lakuqala. Khaltyhuleytha u $r,$ irheythi yediprishiyeyshini. (3)

6.2 Nge 1 February 2014, uNcominkosi wathatha ilowuni ebhankini ukuthenga imoto.Intlawulo yakhe yokuqala yelowuni yayingomhla we 31 July 2014. Ukuqala nje kwakhe ukuhlawula ilowuni, kwamthatha iminyaka eyi 6 ukuyihlawula yonke ilowuni ngerheythi yenzala eyi 9,5% ngonyaka idityaniswe kwinkunzi ngenyanga. Wabhatala ibhanki iR596 458,10 iyonke.

     6.2.1 Yayiyimalini i-instolmenyi yakhe ngenyanga? (5)

     6.2.2 Yimalini awayeyibolekile ebhankini?
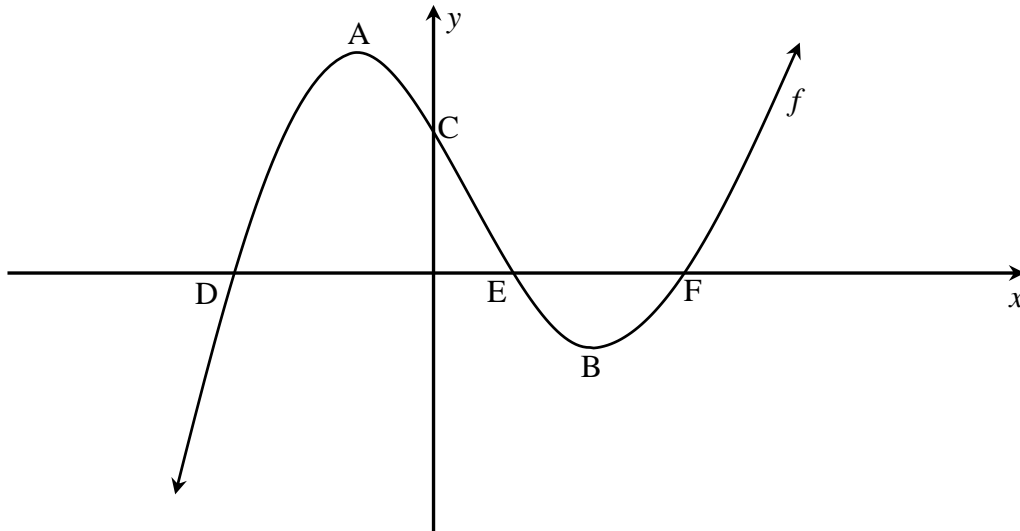Bhala impendulo yakho kwirandi ekufutshane. (6)

[14]

UMBUZO 7

Fumana:

7.1 $f'(x)$ ukusuka kwiprinsiple yokuqala ukuba u $f(x) = -2x^2$ (5)

7.2 $\frac{dy}{dx}$ ukuba $y = 7x^4 - \frac{2}{\sqrt{x^3}}$ (3)

7.3 $D_t \left[\frac{1}{2} gt^2 - \frac{5}{t} + 3g \right]$ (4)

[12]

Nceda tyhila

UMBUZO 8

Kwidayagram engezantsi, igrafu ka $f(x) = 2x^3 + x^2 - 12x + 9$ izotyiwe.U A no B bazipoynti ezijikayo (turning points) zika f u C yi y-intasepthi. U D, E no F zii x-intasepthi.
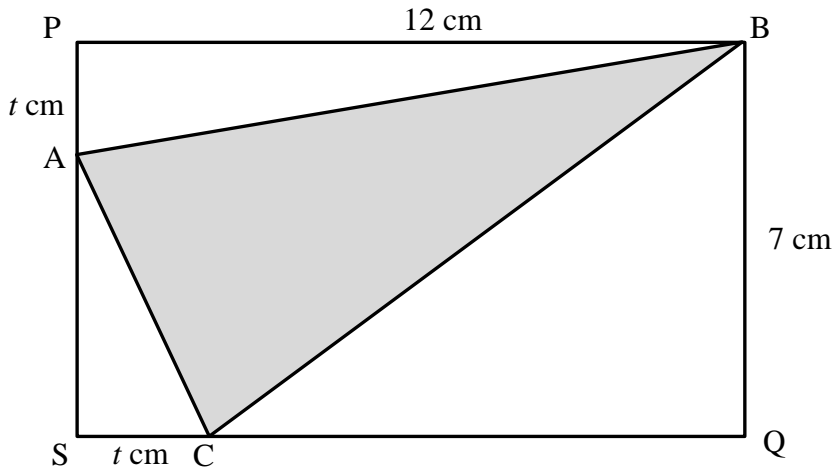

8.1   Bhala iikhoodineythi zika C. (1)

8.2   Khaltyhuleytha iikhoodineythi zika D, E no F. (6)

8.3   Fumana iivelyu zika x apho u f eyikhonkheyvu ezantsi. (4)

8.4   Fumana iivelyu zika x apho u $f'(x) \le 0$. (4)

[15]

UMBUZO 9

Idayagrm engezantsi ibonisa itrayengle ABC ezotywe kangangokuba iivetisis zayo zilale kwirekthengle PBQS, njengoko ibonisiwe. PA = SC = t cm. PB = 12 cm ze u BQ = 7 cm.

Khaltyhuleytha eyona ndawo enobancinci ye ΔABC. **[6]**

UMBUZO 10

E St Johns High School, uphando lwenziwa ukufumana inani labafundi bebanga le12 abafunda iMathematics (M), Physical Sciences (P) ne Accounting (A). Ulwazi olulandelayo lwaqokelelwa:

- 135 yabafundi bathatha inxaxheba kuphando
- 5 yabafundi bafunda iMathematics ne Accounting kodwa hayi iPhysical Sciences
- 12 yabafundi bafunda iMathematics ne Physical Sciences kodwa hayi iAccounting
- 24 yabafundi bafunda iPhysical Sciences ne Accounting kodwa hayi iMathematics
- y yabafundi ifunda iPhysical Sciences kuphela
- x yabafundi ifunda zonke izifundo zontathu
- y yabafundi ifunda iAccounting kuphela
- $2y + 3$ yabafundi bafunda iMathematics kuphela
- 60 yabafundi abafunda iAccounting
- Inani labafundi abafunda iMathematics lilingana nenani labafundi abafunda iPhysical Sciences

10.1 Riprezanta ulwazi olungentla kwiVenn-diagram. (4)

10.2 Fumana iivelyu zika x no y. (4)

10.3 Khaltyhuleytha iprobhabhilithi ethi umfundi okhethe nje wenza iMathematics okanye zombini iPhysical Sciences ne Accounting. (3)

[11]

Nceda tyhila

UMBUZO 11

ULwazi no Cwenga zinkokheli zamakhwenkwe namantombazana esikolweni sabo ngokulandelelanayo. Ukongeza, kukho amakhwenkwe ama 3 namantombazana ama 2 aziprifekhthi. Kumele balindele ukufotwa kabini kwirowu.

11.1 Kwifoto yabo yakuqala indlela abahleli ngayo ayibalulekanga. Bangahlala ngeendlela ezingaphi? (2)

11.2 Kwifoto yabo yesibini, uLwazi no Cwenga bangahlala kuphela kwizihlalo zesithathu nakwesesihlanu nangayiphi indlela.
Ithini iprobhabhilithi yokokuba isitulo sokugqibela sihlelwe yinkwenkwe yaye yintombi kuphela enokuhlala kwisitulo sesine? (4)

[6]

EWONKE: 150

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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