

**THE NATIONAL BENCHMARK TESTS:
UKULUNGISELELA ABAFUNDI BAKHO
UKUHLOLELWA IZIBALO (MAT)**

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ISINGENISO

Le ncwajana izokusiza ukuthi uqonde ukuthi kuyini ukuhlololwa i-NBT MAT nokuthi ikutshele ukuthi ibalungiselela kanjani abafundi bakho ukuthi bayisebenzise.

I-National Benchmark Tests (NBTs) yiqoqo lokuhlola elikala ukulungela ngokwezifundo kwalowo ofake isicelo ukuthi aye enyuvesi. Agcwalisa asekele, okunokuthi angene esikhundleni noma okufana Nesitifiketi Sebanga Leshumi.

Maningana amanyuveni aseNingizimu Afrika asebenzisa i-NBTs ukusiza ukuhumusha imiphumela yesitifiketi sebanga leshumi i-National Senior Certificate (i-NSC). Amanyuvesi asebenzisa imiphumela ye-NBT ngezindlela ezehlukene:

- Amanye ayisebenzisela ukuthatha izinqumo mayelana nokungena enyuvesi kofake isicelo. Lokhu kusho ukuthi imiphumela ye-NBT, uma ihlanganiswe nemiphumela ye-NSC, isetshenziselwa ukubona ukuthi ngabe ofake isicelo ukulungele yini ukufunda enyuvesi.
- Amanye ayisebenzisela ukunikeza isikhala ngaphakathi enyuvesi. Lokhu kusho ukuthi le miphumela isetshenziselwa ukubheka ukuthi ngabe lo ofake isicelo uyoludinga yini usizo olwengeziwe ezifundweni emva kokuba esethathiwe enyuvesi.
- Amanye ayisebenzisela ukuwasiza ukwenza uhlelo lwezifundo ngaphakathi emanyuvesi awo.

Kubili ukuhlolwa: yi-AQL, okuyi-Academic Literacy and Quantitative Literacy ne-MAT, okungukuhlolwa ezibalweni.

1. ISENDLALELO NENJONGO YOKUHLOLELWA I-MAT

1a. AMAZINGA OKUPHUMELELA OKUHLOLWA EZIBALWENI

Ukubona ukuthi ngabe abafundi bayakwazi ukwenza izinguquko phakathi kwezibalo ezingeni lasesikoleni nelamabanga aphakeme, amakhono adingekayo, kodwa angabekiwe acaca ngaWezemfundo Ephakeme, kudingeka ahlolwe.

Ababhali be-NBT babekwe kwesisodwa salezi zigaba ezintathu: Esiyisisekelo, Esiphakathi, Esiphumelele. Ekuhlolweni kwezibalo i-(MAT), lokhu kusho ukuthini? Bheka Amazinga Okuphumelela angezansi. Uzobona ukuthi kudingeka kakhulu kangakanani ukuthi ababhali basuke esigabeni Esiyisisekelo baye esigabeni Esiphakathi; ngokufanayo ukusuka esigabeni Esiphakathi kuya Kwesiphumelele. Leli thebula lincike ezihlokweni ezibalulwe ngaphansi kwesihloko “IZIHLOKO ZOKUHLOLELWA I-MAT”.

OKUYISISEKELO	OKUPHAKATHI	OKUPHUMELELE
Ababhali bokuhlolwa abasebenza ezingeni Eliyisisekelo bayokwazi ukusebenzisa imiqondo elula futhi basebenzise inqubo eyaziwayo ezimweni ezijwayelekile. Ngokuvamile bayokwazi ukubhekana nemisebenzi ebandakanya ukukhumbula nokuphindaphinda amaqiniso alula ezibalo noma ukwenza izibalo ezilula. Ababhali bezinga eliyisisekelo bayokwazi ukusebenzisa isimo noma indlela eyodwa olwazini olulodwa.	Ababhali bokuhlolwa abasebenza ezingeni Eliphakathi kumele bakwazi ukusebenza ezingeni Eliyisisekelo futhi <u>ukwengeza</u> lapho, bakwazi ukukhetha amasu okuxazulula izinkinga nokuhlanganisa amakhono, imiqondo nenqubo. Ngokuvamile, ababhali abakuleli zinga bayokwazi ukwenza imisebenzi yezibalo ebandakanya izinyathelo ezingeni ezidinga ukusetshenziswa kolwazi namakhono okukwazi ukuthatha izinqumo. Ababhali bayokwazi ukwenza ukuhlobana phakathi futhi bahlanganise ulwazi olungaphezu kolulodwa, basebenzise inqubo yezibalo eningana nokusetshenziswayo	Ababhali be-NBT abasebenza ezingeni Eliphumelele kumele bakwazi ukusebenza ezingeni Eliphakathi, futhi <u>ukwengeza</u> lapho bakhombise ulwazi olujulile lwemiqondo yezibalo kanye namakhono kwinqubo enezinyathelo ezingeni ekulolu hlaka. Ababhali bokuhlolwa bezinga <i>Eliphumelele</i> kumele bakwazi ukukhombisa ubunzulu kanye nokuhlanganisa ulwazi ukuxazulula izibalo ezinzima. Kumele bakwazi ukusebenzisa ngobuciko amakhono avamile njengokwenza umngathekiso nokuhlola ubuqiniso balokho okutholakele.

	<p>okuningana ezinyathelweni ezilandelanayo. Ababhali bokuhlolwa abasebenza ezingeni eliphakathi kumele bakwazi ukuhumusha ukuxoxisana bafinyelele esiphethweni esenza umqondo kumqondosizinda wemisebenzi eminingi eyehlukene yezibalo.</p>	
<p>Inqubo Ye-algebra: Ababhali bokuhlolwa kumele bakwazi-</p> <ul style="list-style-type: none"> • ukwenza izibalo ngokuvamile ngezinombolo zangempela • ukwenza izibalo ezilula ze-algebra • ukuthola amaphethini (ukulandelana) e(kwe)zinombolo a(oku)lula • ukusebenzisa okuguququkayo okumele izinto ezingaziwa • ukusebenzisa okushiwoyo nezibalo eziveza ubudlelwane obulula phakathi kwezinto ezingaziwa • ukubona nokusebenzisa amafomula ajwayelekile • ukwenza izibalo ezivamile ngokuguququkayo okukodwa • ukwenza izibalo ezivamile zezimali 	<p>Inqubo Ye-algebra: Ababhali bokuhlolwa kumele bakwazi-</p> <ul style="list-style-type: none"> • ukulinganisa nokubala • ukubona nokusebenza ngamaphethini (kubandakanya ukulandelana kwejiyomethri nezibalo) • ukuqhathanisa izilinganiso • ukukhombisa ukwazi kabanzi ngezimpawu zokungalingani • ukwenza izinyathelo ezingama zokulawula i-algebra • ukulawula okuvezwa yi-algebra okuhlukahlukene, kubandakanya lokho okufaka phakathi amasurds, abaphindaphindi namalarithimu • ukwenza izibalo ezingavamile ngokuguququkayo okukodwa, • ukuxazulula izindlela zezibalo eziyimidwa • ukufanekisa izimo (okungukuhlaziya ulwazi olunikeziwe, uveze ulwazi ngendlela efanele) nokwenza izibalo ngokusebenzisa inqubo yezibalo 	<p>Inqubo Ye-algebra: Ababhali bokuhlolwa kumele bakwazi-</p> <ul style="list-style-type: none"> • ukukhetha nokukwazi ukusebenzisa amafomula afanele ukwenza izibalo ezingavamile • ukuxazulula nokuhumusha izibalo nokungalingani
<p>Imisebenzi namagrafu:</p>	<p>Imisebenzi namagrafu:</p>	<p>Imisebenzi namagrafu:</p>

<p>Ababhala ukuhlolwa kumele bakwazi-</p> <ul style="list-style-type: none"> • ukubona amagrafu emisebenzi ebalulwe ngenhla • ukuxazulula izibalo ezivamile ezibandakanya imisebenzi evezwe ngendlela eyodwa, okungaba ngomlomo, ngokwe-algebra noma ngokwamagrafu 	<p>Ababhala ukuhlolwa kumele bakwazi-</p> <ul style="list-style-type: none"> • ukusebenzisa nokuhumusha amagrafu abalulwe ku-3a • ukuxazulula izibalo ezingavamile ezibandakanya imisebenzi evezwa ngezindlela eziningi • ukulawula ukuvezwa okuningana kwemisebenzi nokuhumusha imininigwane • ukukhombisa ulwazi olunzulu lwezimpawu ezahlukene zemisebenzi ngaminye (kubandakanya imisebenzi yethrignonometri) efana nendawo nezinga, • ukuhumusha izinguquko nemicabango ngale misebenzi 	<p>Ababhala ukuhlolwa kumele bakwazi-</p> <ul style="list-style-type: none"> • ukuhumusha ubudlelwane phakathi kwemisebenzi nokuphambene kwayo • ukubonisa ulwazi olunzulu lwendawo nezinga lemisebenzi eyehlukene, kubandakanya nemisebenzi yethrignonometri • ukuveza nokuhumusha incazelo yemidwa ehlanganisa amachopho emisebenzi ethile bese besebenzisa ubudlelwane phakathi kwendawo eyehlelayo nethangenti • ukusebenzisa imigomo yemisebenzi yohlu lwezibalo, evezwe ngamagrafu noma nge-algebhra
<p>Ithrignonometri: Ababhali bokuhlolwa kumele bakwazi-</p> <ul style="list-style-type: none"> • ukuchaza izilinganiso zethrignonometri ezikhethekile konxantathu bangakwesokudla bethrignonometri • ukubona amagrafu ethrignonometri • ukwenza izibalo ezilula ngezilinganiso zethrignonometri • ukuxazulula izibalo ezilula zethrignonometri • ukubona nokusebenzisa okufanayo, amafomula ayi-engela embaxa namaformula okunciphisa 	<p>Ithrignonometri: Ababhali bokuhlolwa kumele bakwazi-</p> <ul style="list-style-type: none"> • ukusebenzisa izilinganiso zethrignonometri ukwenza izibalo ezinhlangothimbili • ukwazi kabanzi ngezimpawu zamagrafu ethrignonometri, kubandakanya nokuhumushwa kwala magrafu • ukusebenzisa imithetho ye-sine, cosine nendawo kumqondosizinda olula • Ukwenza izibalo zethrignonometri ezingavamile 	<p>Ithrignonometri: Ababhali bokuhlolwa kumele bakwazi-</p> <ul style="list-style-type: none"> • ukuhumusha imisebenzi yamagrafu ethrignonometri, ngawodwa futhi noma ehlobene namanye • ukusebenzisa imiqondo yethrignonometri ukwenza izibalo ezingavamile kumqondosizinda wemikhakha emibili nemithathu

	<ul style="list-style-type: none"> • ukusebenzisa okufanayo kwethrignonometri, ukunciphisa amafomula nolwazi lwama-engela akhethekile ukwenza izibalo 	
<p>Umbono wokwenzeka emkhathini: Ababhala ukuhlolwa kumele bakwazi-</p> <ul style="list-style-type: none"> • ukubona izimpawu zezinombolo ezimkhakhamibili nemikhakhamithathu, ezifana nezimpawu zama-engela noma okufana nxazombili • ukwenza izibalo ezivamile ezibandakanya amapherimitha, indawo nomthamo • ukusebenzisa amafomula afanele ejiyometri okuhlaziya • ukubona ama-axioms nama-theorems Omjikelezo Wejiyometri 	<p>Umbono wokwenzeka emkhathini: Ababhala ukuhlolwa kumele bakwazi-</p> <ul style="list-style-type: none"> • ukubona izimpawu zezinombolo zejiyometri ezinezinhlangothi ezimbili nezintathu nokuthola ubudlelwane phakathi kwezinto ezehlukene • ukwenza izibalo ezingavamile ezibandakanya indawo nomthamo • ukusebenzisa ama-axioms nama-theorems Omjikelezo Wejiyometri ukuxazulula izibalo zejiyometri 	<p>Umbono wokwenzeka emkhathini: Ababhala ukuhlolwa kumele bakwazi-</p> <ul style="list-style-type: none"> • ukusebenzisa izimpawu ezahlukene zezinombolo zejiyometri nezinto, kanye nobudlelwane obuphakathi kwazo, ukuxazulula izibalo ezimayelana nendawo nomthamo wenhlanganisela yezinombolo nezinto ukuxazulula izibalo zejiyometri ezinzima kakhulu ezidinga ukusetshenziswa kwama-axioms nama-theorems Omjikelezo Wejiyometri
<p>Ukuphathwa kolwazingqo Nokungenzeka Ababhala ukuhlolwa kumele bakwazi-</p> <ul style="list-style-type: none"> • ukubona nokusebenzisa izindlela zomkhuba wangaphakathi • ukubona ukuvezwa kolwazi ngokwezibalo • ukuxazulula izibalo ezilula ezivamile ezinokwenzeka 	<p>Ukuphathwa kolwazingqo Nokungenzeka Ababhala ukuhlolwa kumele bakwazi-</p> <ul style="list-style-type: none"> • ukusebenzisa izindlela zomkhuba omaphakathi nokuhlukahluka kokusabalalisa ukwenza izinqumo nokuqagela ukuhumusha ulwazingqo oluvezwe ngamagrafu noma olukumathebula • Ukusebenzisa umfanekiso wesihlahla nowe-Venn • ukusebenzisa imithetho yokunokwenzeka ukwenza izibalo 	<p>Ukuphathwa kolwazingqo Nokungenzeka Ababhala ukuhlolwa kumele bakwazi-</p> <ul style="list-style-type: none"> • ukuhumusha ulwazingqo oluvezwe ngezindlela ezahlukene • ukubona umthelela walokhu okungaphandle kwezindlela zomkhuba wangaphakathi nokuguququka • ukuhumusha nokusebenzisa izindlela zomkhuba wangaphakathi nokuphambuka ezingeni elifanele • ukuhlaziya ukuqagela okuncike emaqoqweni olwazingqo oluningi nokusebenzisa ulwazi

		lokubala ezibalweni ezinzima kakhulu <ul style="list-style-type: none"> • ukuxazulula izibalo ezinzima ezinokwenzeka ezidinga ukusetshenziswa kwemifanekiso ye-Venn noyisihlahla, nemithetho eyehlukene enokwenzeka
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2. I-NSC ne-NBT

2a. IZIHLOKO ZE-NBT KUMQONDOSIZINDA WE-NSC

Kwi-NSC, Izibalo Esigabeni se-FET ziqukethe izindawo eziningana ezehlukene. Okuqukethwe ngakunye kunomthelela ekutholakaleni kwamakhono athile. Izihloko ezisemqoka Esigabeni se-FET yilezi: Imisebenzi; amaphethini ezinombolo, ukulandelana nochungechunge; Ezezimali, ukukhula nokubohla; I-Algebhra; i-Calculus yokuhlukanisa; Okunokwenzeka; Ijyomethri ye-Euclide nesilinganiso; Ijyomethri Yokuhlaziya; Ithrigonometri; Izibalo (Umnyango Wezemfundo Eyisisekelo ISITATIMENDE SENQUBOMGOMO YOHLELO LWEZIFUNDO NOKUHLOLWA, I-CURRICULUM AND ASSESSMENT POLICY STATEMENT (I-CAPS) I-FET BAND MATHEMATICS AMABANGA 10 – 12, ikh.12: www.thutong.doe.gov.za, *kufundwe 24/04/2015*).

Izikole zihlinzekwe ngomhlahlandlela wokuzinika isikhathi (bheka ikhasi lama-22 ledokhumenti i-CAPS FET Band Mathematics Ibanga le-10 – 12; ebalulwe ngenhla), eqinisekisa ukuthi abafundi Bebanga le-12 banesikhathi esanele sokubukeza ngaphambi kokuhlolwa Kwebanga le-12 kokuphela konyaka. Kunezihloko ezimbalwa umhlahlandlela wokuzinika isikhathi obona ukuthi ziyekwe kuze kube yikota yesithathu yonyaka Webanga le-12. Ngokwazi ukuthi abanengi abafake izicelo emanyuvesi kudingeka babhale i-NBT ngokushesha ngasekupheleni kukaMeyi, ukuhlololwa i-MAT akufaki izihloko okungase kwenzekwe ukuthi azikafundiswa ngaleso sikhathi.

Kwezinye izikole, ikakhulu lezo ezilandela uhlelo lwezifundo okungeyona i-NSC, abafundi bebanga le-12 basuke sebevele sebehlangabezanile nezihloko

zezibalo ezithe thuthu, isibonelo amazinga A, Uhlelo Oluthe thuthu, njll. Kodwa-ke, **kuyacatshangelwa ukuthi ukufunda izihloko ezithe thuthu angeke kwenzeka ngaphandle uma abafundi sebevele sebenalo ulwazi ezihlokweni eziyingxenye ye-CAPS.** Labo bafundi bayobe sebezilungiselele kahle ezihlokweni ze-CAPS.

Imibuzo ekuhlolweni i-MAT ihlanganiswe nemiqondo ebalulwe kwi-CAPS, kodwa ukuhlolwa akuphoqeelwe ekuhloleni konke okungaphakathi kwi-CAPS. Ngesikhathi ukuhlolwa i-Academic Literacy and Quantitative Literacy kuhloswe ngakho ukuhlola amakhono wonke atholakala kule mikhakha, ukuhlolwa i-MAT kugxile kakhulu elwazini olukhethekile kanye namakhono afundiswa ezingeni lasesikoleni, kodwa njengakweminye imikhakha futhi, **akhelwe ngokusobala ukukala ukulungela kwalabo abafake isicelo ukuthi bayongena esikhungweni Semfundo Ephakeme.** Lokhu kuhlolwa kudinga ukuthi ababhali bakhombise ulwazi lwabo olunzulu lwemiqondo ukubavumela ukuthi basebenzise leyo miqondo kwimiqondosizinda ehlukene. La makhono asezingeni eliphezulu aveza impumelelo Ezibalweni Emfundweni Ephakeme. La makhono enziwe ngamabomu ezifundweni zezibalo ezifana ne-Mathematics ne-Physical Science, avame ukuthi ngendlela engaqondakali alindeleke ezikhungweni Zemfundo Ephakeme futhi afakiwe ohlelweni lwazo lwezifundo. **Kusemqoka kothisha ukugxila ohlelweni lokufunda oluhlosiwe futhi bangaziboni bephoqeelwe yinjwayelo ohlelweni lokufundisa oluhlolwayo.**

IMIBUZO EKHLOLELWENI I-MAT ISETHWE NGENDLELA YOKUTHI IMISHINI YOKUBALA AYIDINGEKI. IMISHINI YOKUBALA AYIVUMELEKILE EKUBHALWENI KOKUHLOLWA. Isibonelo salokhu esikuchazayo ngalokhu sinikeziwe esigabeni esidingida imibuzo eyisampula.

2b. UKUSEBENZISANA KWEZIBALO ZE-NSC NOKUHLOLELWA I-NBT MAT

Ngezizathu eziningi ezizwakalayo ukuhlolwa i-MAT akuzami ukulingisa amaphepha okuhlolwa i-NSC Ezibalweni. Ukuhlolwa i-NSC kubhalwa yibo

bonke abafundi bebanga le-12, futhi kumele kuveze lonke uhlelo lwesikole lwesifundo sezibalo. Ukuhlololwa i-MAT kubhalwa kuphela yilabo bafundi abazimisele ukuqhubeka bafunde izifundo ezidinga isifundo sezibalo. Ukuhlololwa i-MAT angeke kwahlola lutho olungaphandle kohlelo lwesifundo sasesikoleni, akuphoqelekile ukuthi kufake zonke izihloko zezibalo zasesikoleni, bese kukhetha ukugxila kuleyo mikhakha yohlelo lwezifundo zasesikoleni ezinomthelela omkhulu ezifundweni zezibalo zonyaka wokuqala. Ngokucacile ukuhlololwa izibalo kwe-NSC nokuhlololwa i-MAT kumele kubonakale njengendlela yokulekelela ukuhlolwa.

Idokhumenti ye-CAPS FET Band Mathematics Amabanga 10 – 12 (bheka okubalulwe ngenhla) iveza ukuhlukaniswa kwezigaba zokudingwa umqondo, okusho ukuthi abafundi kudingeka basebenze kuwo wonke amazanga okwazi (ukukhumbula, noma ukuhlolwa kwamaqiniso olwazi oluyisisekelo), ukwenza inqubo evamile, ukwenza inqubo enzima, nokwenza izibalo (bheka idokhumenti ebalulwe ngenhla ye-CAPS FET Band Mathematics Amabanga 10 – 12, ikh. 55). Lezi zigaba ziqukethe umthamo oye ufinyelele cishe ema-20%, 35%, 30% nama-15%.

Ukuhlololwa i-MAT futhi kuhlukene ngokwamazanga ezengqondo, kuqala ngemibuzo yamazanga aphansi ukugqugquzela isingeniso esilula ekuhlolweni, bese kuqhutshekela emibuzweni edinga ukusebenzisa kakhulu umqondo. Okuqukethwe ekuhlololweni i-MAT kuhlukaniswe amazanga amane okusebenza komqondo. Izinga eliphezulu kakhulu (ukubala okucishe kube ama-8%) linemibuzo ebandakanya ukusebenzisa kakhulu ingqondo, nezinga eliphansi kakhulu (cishe) ama-45% emibuzo isiphelele), linemibuzo ebandakanya ukwazi, ukukhumbula nokusetshenziswa kwinqubo elula.

Isikhathi esiningi sinikezwe ekulinganisweni kwemibuzo esekuhlololweni i-MAT, ukuqinisekisa ukuthi imiqondo yezibalo efanele yenziwe, emazingeni okwengqondo afanele. **Ukuhlololwa konke kuhambisana nakho konke okudingekayo okufanayo, futhi kuyafana kakhulu ngaphambi kokuthi kubhalwe; ukufana kwangempela kuqinisekisiwe ngenqubo yokubala**

okulinganayo emva kokubhala ukuze kubalekelwe lokho okungenzeka kokuthi abafundi babesenkingeni ngenxa yohlobo oluthile lokuhlolwa.

2c. UMEHLUKO PHAKATHI KOKUHLOLELWA I-NSC EZIBALWENI NOKUHLOLELWA I-MAT

Umehluko owodwa phakathi kokuhlolwelwa i-MAT kanye namaphepha Ezibalo e-NSC ukuthi imibuzo ekuhlolwelweni i-MAT ayibakhumbuzi ababhali noma ngayiphi indlela. Inqubo yemibuzo yokusiza ayenzeki. Isibonelo, ephepheni le-NSC lokhu okulandelayo kungavela:

Ngokunikezwa umfanekiso, abafundi babuzwa:

*Bala umehlelo we-AC. **Ngakho-ke**, thola isibalo se-BN (lapho i-BN ikhonjiswa emfanekisweni iqondene ngqo ne-AC).*

Ekuhlolwelweni i-MAT umfanekiso ungabakhona futhi, kodwa uyobe usulandelwa yilokhu

Isibalo se-BN yi ... nezimpendulo ezine okungakhethwa kuzo.

Ukwengeza kulokhu, ekuhlolwelweni kwe-MAT, ayikho inkomba enikezwayo (isibonelo ngokweqiniso lokuthi umbuzo owenzeka Ephepheni Loku-1 noma Ephepheni Lesi-2) ukuthi ngabe umbuzo kumele kubhekanwe nawo ngokusebenzisa umqondo wejiyomethri noma we-Algebra, ngokusebenzisa imigomo yethrignonmethri, noma ngengxube yalokhu. Iqiniso lokuthi izibalo zivama ukudinga ukuthi abafundi bahlanganise amakhono nemiqondo eminingi eyehlukene kunoma yisiphi isibalo abasinikeziwe kusho ukuthi umbuzo owodwa ungahlola amakhono amaningi ehlukene ezibalo. Isibonelo, umbuzo obhekene nokuvezwa kwegrafu yomsebenzi ungaphinde uhlole indawo nekhono kwi-algebhra. Lokhu kusho ukuthi abafundi kumele babe nokuqonda izibalo okunzulu, nokwazi ukuthi yikuphi ukucabanga okufanele kulo mqondosizinda abawunikeziwe, bayowadinga la makhono Ezikhungweni Zemfundo Ephakeme.

Kungacatshangelwa ukuthi ukuhlolwa okunemibuzo enezimpendulo eziningi okungakhethwa kuzo akuvumeli ababhali bathole ingxenye yamaphuzu

ngokusebenzisa ukucabanga kwabo ezimweni lapho becabange kahle kwaze kwafika esinyathelweni sokugcina bese benza iphutha ngenxa yokunganaki. Lokhu kugxeka kuyazwakala, kodwa inqubo yokubuyekeza i-NBTP, esikhathini esiyiminyaka eminingi, isiyenze kwenzeka ukuthi kulungiswe inqubo yokwenza izimpendulo zokuthi lokhu kungavami ukwenzeka. Okokuqala, uma indlela yokusebenza kwezinombolo ibandakanyeka, izinombolo zilula (ngokwenele ukwenza imishini yokubala ingadingeki); okwesibili izimpendulo ezinikeziwe zihlinzeka ngempendulo eyodwa eyiyo bese lezi ezintathu okungeke wenzeke ukuthi kufinyelelwe kuzo ngokuthi kwenzeke amaphutha okunganaki. Kukho konke ababhala ukuhlolwa kumele bakwazi okumele bakwenze, kunoma yisiphi isimo kulezi bathole impendulo okuyiyona; noma baqagele, okungase kwenzeke ukuthi bakhethe izimpendulo okungezona. Kwesinye isikhathi okuphuma eceleni kufakwa ngamabomu, ukuze eyodwa yezimpendulo okungezona kungaba edumile kodwa okungeyona. Lokhu kungenza ukuthi abafundi bakhethe impendulo okungeyona uma besendaweni eyethusayo yokuhlolwa, ngakho-ke akuvamile ukusetshenziswa, ngoba ukuhlolwa kumele kudale amathuba okuthi ababhali bakhombise lokho abakwaziyo.

3. YINI ESINGAYILINDELA EKHLOLELWENI I-MAT?

IZIHLOKO ZOKUHLOLWA KWE-MAT

Izihloko okungakhishwa kuzo imibuzo yokuhlolwa yilezi ezilandelayo.

3a UKUXAZULULWA KWEZIBALO NOKUKHOMBISA

Inqubo ye-Algebhra

- Ukukwazi ukubona amaphethini, ukulandelanisa nochungechunge, ukusetshenziswa kwezimpawu ze-sigma
- Imisebenzi ebandakanya ubudlelwane obufana nezilinganiso namaphesenti
- Ukukhombisa izimo ngokusebenzisa amakhono enqubo yezibalo (ukuhumusha ususa olimini usa kwi-algebhra, ukuxazululwa kwezibalo)
- Imisebenzi ebandakanya ama-surds, amalarithimu nokuchaza, kubandakanya izimpindulo zezibalo zokuchaza
- Ukubalwa kwezezimali (inzalompinda, ukubonga, ubungako besikhathi esizayo, njll.)
- Umqondo wezinombolo – ukulawulwa/izibalo ezilula ezibandakanya izinombolo eziphelele, izinombolo ezizwakalayo nezingazwakali
- Ukulawulwa kwe-Algebhra (kubandakanya ukushiwo, izibalo, ukungalingani, ukwenziwa kube lula, ukwenza kube amaphuzu, ukugcwalisa isikwele)

Imisebenzi emelelwe amagrafu nezibalo; 'imisebenzi' ibandakanya umugqa oqondile, isibalo esinegama elilodwa noma amabili, i-hyperbola, okuphindwe kathathu, okunokuchaza nokunenombolo eyisibambiso. Amanye amagrafu afana neziyingi nawo afakiwe.

- Ukuqondiswa kwezimpawu zemisebenzi, ukubambela, indawo nezinga
- Imifanekiso yomsebenzi (oyi-algebhra nongamagrafu); izimpawu zemisebenzi namagrafu (afana nokokuvimbela, lapho okuguquka khona izinto, imigqa eqondile); ubudlelwane phakathi kwamagrafu nezibalo zawo; ukuhunyushwa kwemininingwane yamagrafu
- Ukuguqulwa kwamagrafu emisebenzi ebalulwe ngenhla; isixazululo sezibalo ezithintekayo; imisebenzi yokuphambaniswa

- Ukusetshenziswa kwemigomo yokuhlukanisa yezibalo kanye nezinye izibalo ezibandakanya umudwa olula, imisebenzi engenayo imidwa (okungamaphuzu asemqoka, imisebenzi yokukhulisa/ukunciphisa, amathanjenti); ukuhunyushwa kwendlela yokuziphatha kwemisebenzi ukusuka lapho evela khona nala iya khona

3b ITHRIGONOMETHRI EYISISEKELO, KUBANDAKANYA AMAGRAFU EMISEBENZI YETHRIGONOMETHRI, IZIBALO EZIDINGA UKUBALA KWETHRIGONOMETHRI KANYE NOKUSETSHENZISWA KWEMIQONDO YETHRIGONOMETHRI

- Izincazelo zezilinganiso zethrignonometri (i-sine, cosine, nethanjenti)
- Izimpawu nokuhunyushwa kwemisebenzi yethrignonometri namagrafu ayo (isib. indawo, izinga, isikhathi, ubukhulu), kubandakanya nokuguqulwa kwemisebenzi yethrignonometri
- Ukuxazulula izibalo zethrignonometri ngokusebenzisa okufanayo; ukwenziwa lula kokushiwo yithrignonometri ngokusebenzisa okufanayo namaformula okunciphisa lapho okudingeka khona; ama-engela akhethekile; ama-engela ayinxube naphindwe kabili
- Ukusetshenziswa kwemithetho yendawo, sine ne-cosine
- Ukusetshenziswa kwemiqondo yethrignonometri ukwenza izibalo, kubandakanya izibalo ezinhlangothimbili nezinhlangothintathu

3c UMBONO WENDAWO KUBANDAKANYA AMA-ENGELA, OKUFANA NACALA WOMABILI, IZILINGANISO, IMIFANEKISO NOKUHUNYUSHWA KWEZIMO EZINHLANGOTHIMBILI NEZINHLANGOTHINTATHU

Izinto zejiyometri

- Izimpawu zemifanekiso yezinto ezi-2D ne-3D (ezifana nesiyingi, unxande, ithraphiziyamu, imbulunga, ikhoni, iphiramidi)
- Isiphindi sesilinganiso
- Umjikelezo wokusasikwele, indawo, umthamo (futhi oqukethe izinombolo nezinto)

Ijiyometri yokuhlaziya (ukuhlanganisa izimpawu zejiyometri ne-algebhra ebhanoyini lika-Cartesia)

Ijyomethri Yesiyingi

- Okusanxande kwesiyingi
- Ubudlelwane phakathi kwamathanjenti, imidwa enqamula ucezu esiyingini, ne-engela esiyingini

3d UKUPHATHWA KOLWAZINGQO NOKUNGENZEKA

- Izilinganiso (nokuhumusha okumayelana nazo)
- Umfanekiso (ofana nama-histograms, amagrafu omugqa, amashadi kaphaya, ama-ogives, amaploti e-box-and-whisker) nemifanekiso efana nakho)
- Okunokwenzeka

3e UKUSEBENZISA NGOBUCHULE AMAKHONO OKUKWAZI UKUBONA NOKUVEZA UKUBA YIKHO KWALOKHO OKUNIKEZIWE

4. OTHISHA KUMELE BENZENI?

4a. IMIGOMO YOKUFUNDISA OKUNEZINGUQUKO

Ukubhekana nemibuzo enezimpendulo eziningi ongakhetha kuzo

Ngaphandle uma imibuzo enezimpendulo eziningi ongakhetha kuzo isisetshenziwe eklasini, kungasiza ukunikeza abafundi imihlahlandlela mayelana nokuthi bangabhekana kanjani nalolu hlobo lokuhlolwa. Kungasiza uma othisha bengalandela la maphuzu alandelayo, kokunye kube nezibonelo ukwenza le migomo icace.

- Funda kahle umbuzo ngaphandle kokubheka noma yikuphi okungase kube yimpendulo.
- Zama ukubhekana nombuzo ngaphambi kokubheka noma yikuphi okungaba yimpendulo.
- Bheka izimpendulo ubone ukuthi ngabe enye yazo iyahambisana yini nempendulo yombuzo, uma kunjalo khetha leyo mpendulo. **Kodwa**

qaphela isizathu esibandakanyekayo, uma kwenzeka ukuthi impendulo ikhomba okuphuma eceleni, njengakulesi sibonelo esilandelayo:

Lokhu $x > 0$, $\sqrt{9x^2 + 16x^2}$ kulingana nalokhu

(A) $5x$ (B) $7x$ (C) $\pm 5x$ (D) $\pm 7x$

Ukusebenza umbuzo ngaphambi kokubheka izimpendulo, futhi ukwazi ukubona okuphuma eceleni kokuthi (a) unomboloziphinde wesibalo akalingani nesamba sezinomboloziphinde, futhi (b) 'unomboloziphinde' ngokwenzazelo ungaphezu kweqanda, kungasiza ababhali bakhethe impendulo okuyiyo.

- **Zinike isikhathi!** Uma ingekho kulezo zimpendulo ozinikeziwe ehambisana nempendulo oyikhethile, qala phansi umbuzo, uzame futhi. Uma ingekho impendulo oyitholayo, uyeke lowo mbuzo uqhubekele phambili, uzobuye ubuyele kuwo. Yonke imibuzo inempendulo eyodwa okuyiyo – lokhu kuhloliwe ngaphambili, futhi ababhali akumele bazikhathaze ngokuthi kungase kwenzeka kube nephutha embuzweni.
- Imibuzo okungenzeka ukuthi zingasetshenziswa izimpendulo ngokuthi kufakwe okunye iyekwa ngamabomu. Isibonelo, angeke yabakhona imibuzo efuna isisombululo esithile esibalweni, ngoba kulula ukushintsha noma impendulo ngayinye enikeziwe bese kutholakala okuyiyona ngokuthi ikhishwe. Isibonelo, uma besizobuza lokhu okulandelayo: "Impendulo yalokhu $3x + 4 = -8$ yilokhu

(A) -4 (B) $-\frac{4}{3}$ (C) 4 (D) $\frac{4}{3}$ "

Kalula nje ungafaka $u = -4$ bese uyabona ukuthi $u = (A)$ kumele kube yikhona ongakukhetha.

Ukusiza abafundi balungiselele ukuhlololwa i-MAT

Le mibono engezansi yimizamo yokusiza othisha abafuna ukuthi abafundi babo bathole ulwazi namakhono ezibalweni. Uma ikhono labo lilikhulu, bayothola kangcono kwi-NBTs.

- Qinisekisa ukuzibandakanya okunokuzibophezela eklasini lapho abafundi bekhuthazwa ukubuza imibuzo (lokhu kulungiselela ulwazi olunzulu nokuqondisisa kukathisha).
- Qinisekisa abafundi – imbalwa kakhulu imibuzo ewubulima; yonke imibuzo ingamathuba okuzibandakanya okujulile nokusabalele.
- Ukuthuthukisa ulwazi olunzulu lokuqonda kwabafundi ngemiqondo ngokubabuza ukuthi bachaze ngalokho okusemqondweni yabo ngaso sonke isikhathi.
- Yenza ngokucacile amakhono okufunda nokubhala adingekayo ezifundweni zezibalo: kulula ukucabangela ukuthi abafundi bayawuqondisisa umehlukwana wolimi lwezibalo, kodwa-ke akunjalo. Isibonelo, ngabe bawazi kahle umehluko phakathi kuka ‘kodwa’ no ‘kanye’, phakathi ‘kokuphindwe kabili’ nalokhu ‘kungaphezulu ngokubili’; ngabe balwazi kahle ulimi olumayelana nokungalingani, okufana ‘okungenani imivo emithathu’ noma ‘okungekho ngaphezu koku-5’, njll.?
- Ukwenza ngokucacile amakhono okubala adingekayo ezibalweni. Ngenxa yokuthi ubukhulu bokulinganiselwa, iphesenti, ukulawula izinombolo, njll., akusiwona amakhono akhethekile adingeka ohlelweni lwezifundo zebanga le-12 (yize kufanele ngenxa yokuthi kwafundiswa emabangeni angaphambili), abafundi sebekhohliwe (noma mhlawumbe abazange bayizwisise) le miqondo yamanani. Ekuhlololweni i-MAT akuvunyelwe ukusebenzisa imishini yokubala, futhi kumele bakhombise ulwazi lwabo lwaleyo miqondo. Ukuthembela kakhulu emishinini yokubala kuphinde kwenze abafundi balahlekelwe amakhono okukwazi ukubala, nokungakwazi

ukuqondisisa ngezinombolo, ubungako bazo kanye nendawo yazo emgqeni wezinombolo.

- Uma kungase kwenzeka bheka ezinye izindlela zokwenza izibalo: ngabe isibalo sejiyomethri (indawo, umthamo) singenziwa ngokuthi kusetshenziswe indlela yethrignonomethri, noma kungase kwenzeka yini ukuthi isibalo sethrignonomethri senziwe ngokusebenzisa igrafu yethrignonomethri?
- Uma kungase kwenzeka, kuye ngokwemiqondo yezibalo kunokuthi kube ukubala ukuze kwenziwe izibalo. Kungenzeka ukuthi ukubala kuisombulule isibalo, kodwa akusho ukuthi abafundi bayiqonde kahle imiqondo edingekayo ukwenza izibalo. Kungase kwenzeka bangazi ukuthi lesi sibalo $\frac{x^2(x+1)}{x} = 0$ sinempendulo eyodwa kuphela.
- **Okusemqoka kakhulu: ngabe abafundi bayazwisisa?**

5. UKULUNGISELELA I-NBTs

5a. Usizo lwe-inthanethi

Siyazi ukuthi kunabantu abaningi abafuna ukunikeza abafundi abangaqaphele ithuba lokuthola ulwazi kwi-inthanethi oluyobalungiselela ukuthi babhale i-NBTs. Futhi ziningi izindawo kwi-inthanethi ezihlinzeka ngezinto zokufundisa izibalo, futhi ezinye zinikezela ngolwazi olumayelana nemibuzo yohlobo lwezibalo ezinezimpendulo eziningi okungakhethwa kuzo, **akukho kulokhu okunegunya lokukhulumela i-NBTP, futhi akukho kulokhu okunolwazi olukhethekile lokuthi yini ehloswe ukuhlolwa yi-NBTs.**

5b. Izifundo ezengeziwe

Futhi baningi othisha abafuna ukusiza abafundi babo balungiselele i-NBTs. Bayobe sebesebenzisa amaphuzu abalulwe ngenhla, bese bezimisela kakhulu ukuhlinzeka abafundi babo ngesisekelo sezibalo esiqinile. Kodwa-ker, **akekho uthisha onegunya lokukhulumela i-NBTP**, futhi othisha abanalo igunya lokusebenzisa umbhalo noma i-logo ye-NBTP noma i-HESA kunoma yiziphi izincwadi zabo, okungenza kubonakale sengathi kuvunyelwe yi-NBTP.

6. IMIBUZO EVAME UKUBUZWA MAYELANA NOKUHLOLELWA I-MAT: IMIBUZO EMIBILI EHLUPHA ABAZALI NOTHISHA

6a. Ingane yami isebenze kahle kakhulu esikoleni – kungani ekuzuzile kwi-NBT yayo kuphansi kangaka?

Ukuphendula lokhu kudingeka sibuze ukuthi kusho ukuthini ukuthi ‘kahle kakhulu’? Nokuthi kusho ukuthini ukuthi ‘kuphansi kangaka’? Kuye ngesikhathi esichithiwe abafundi bezilungiselela bephindaphinda uhlobo oluthile lokuhlolwa, kungenzeka ukuthi abafundi bathole amamaki aphezulu ekuhlolweni lapho imibuzo

- Ilandela iphethini elilindelekile;
- Ilandela uhlelo oluthile (bheka okushiwo ngaphambili);
- ibivame ukwenziwa njalo.

Lokhu akusho ukuthi kunokuzwisisa okwanele ngalezo zihloko, kumqondosizinda odingwa Yimfundo Ephakeme.

Ukubhala ukuhlololwa i-MAT kubeka ababhali kwesisodwa salezi zigaba ezintathu (Esiyisisekelo, Esiphakathi, Esiphumelele). Akukho ukuphasa noma ukufeyila, futhi ababhali abaqhathaniswa omunye nomunye. Umphumela usiza umbhali, nesikhungo afaka kuso isicelo, ukuthola amazanga afanele okweseka okungadingeka ngokushesha. Uma umbhali esesigabeni Esiphumelele, isilinganiso sangempela asibalulekile futhi akumele siqhathaniswe nanoma yimaphi amaphuzu atholakale ekuhlolweni kwasesikoleni, noma ekuhlolweni kokugcina kwe-NSC, okungumkhuba wokuhlolwa okufakazelwayo.

6b. Yisiphi isikhathi esikahle kakhulu sokubhala ukuhlololwa i-MAT?

Ababhali kudingeka bakhethe isikhathi sokubhala esizobavumela ukuthi bangashiywa yisikhathi sesikhungo abafake kuso isicelo. Ucwangingo lwethu luveza ukuthi abukho ubuhle ekulindeneni ukubhala sekusondele ukuhlololwa i-

NSC. I-NBTP ikwazi kahle kahlolwe ukuthi ezinye izihloko ziyokwenziwa sekusele amasonto ambalwa onyaka wokufundisa, yize othisha bekhuthazwa ukuthi balandele lesi sivinini sokwenza umsebenzi ukuze kube nesikhathi sokubukeza nokulungiselela ukuhlolwa kokugcina.