



Province of the
EASTERN CAPE
EDUCATION

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

NATIONAL SENIOR CERTIFICATE

IBANGA 12

SEPTEMBER 2026

IMATHEMATIKA P2

AMANQAKU: 150

IXESHA: 3 iiyure

Eli phepha linamaphepha ali13, lidibene nephepha eliyi1 leenkukacha kunye nencwadi yokuphendulela enamaphepha angama22.

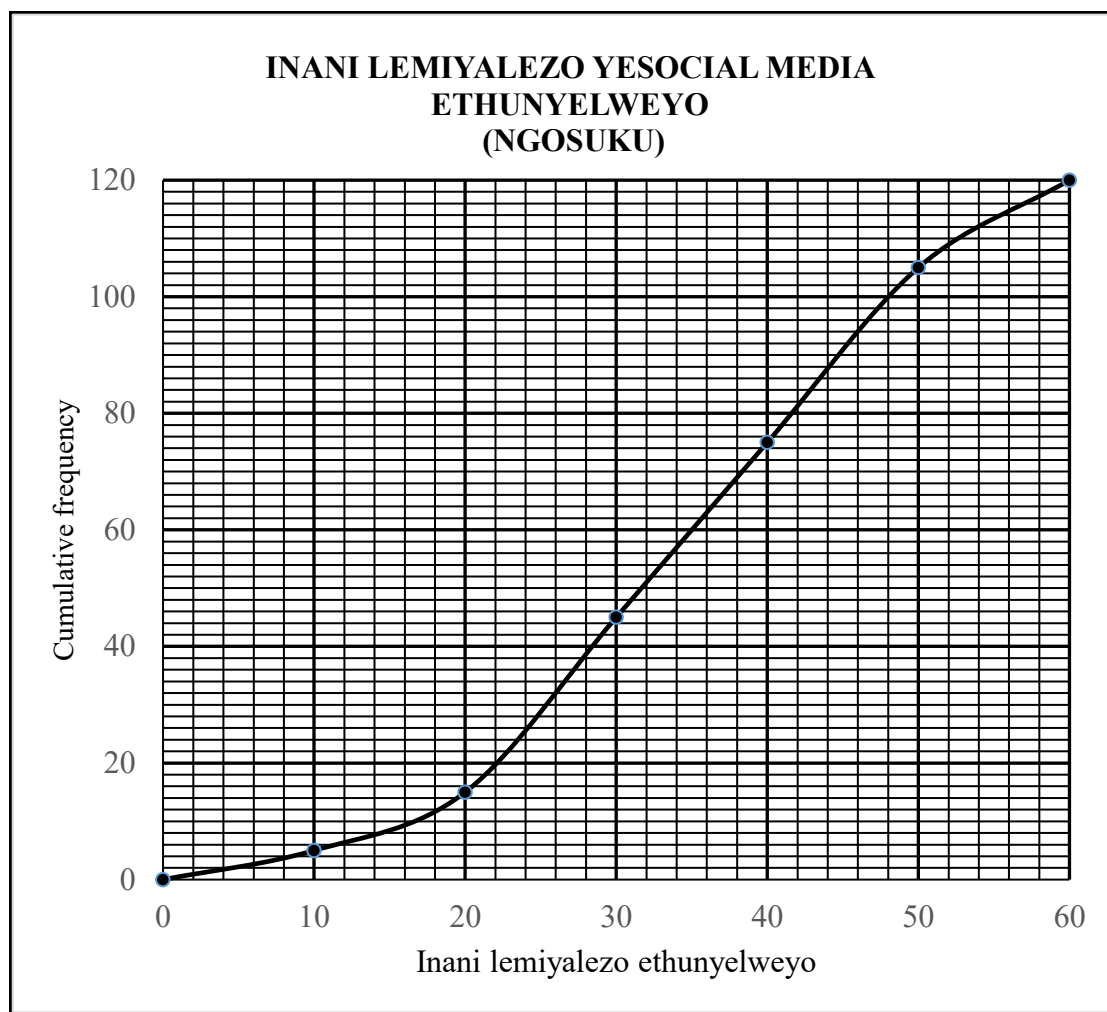
IMIYALELO NEMIQATHANGO

Funda imiyalelo elandelayo ngocoselelo phambi kokuphendula imibuzo.

1. Eli phepha lemibuzo linembuzo eli 11.
2. Phendula YONKE imibuzo kwiNCWADI EKHETHEKILEYO YOKUPHENDULELA enikiweyo.
3. Bonisa ngokucacileyo ZONKE iikhalithyuleyishini, iidayagram, iigrafu, njl. ozisebenzisileyo ukubonisa iimpendulo.
4. Iimpendulo kuphela AZINYANZELEKANGA ukunikwa amanqaku apheleleyo.
5. Ungayisebenzisa isayentifikhi khalithyuleyitha evunyiweyo (engaprogranywanga nengenagrafikhi), ngaphandle kokuba uxelelwe ngeny'indlela.
6. Xa kunyanzelekile, sondeza iimpendulo kwindawo EZIMBINI zedesimali, ngaphandle kokuba uxelelwe ngeny'indlela.
7. Iidayagram AZIZOTYWANGA ngokwesikeyile.
8. Iphepha leenkukacha elineefomyula lifakiwe ekugqibeleni kwephepha lemibuzo.
9. Bhala ngokucocokileyo nangokucacileyo.

UMBUZO 1

Iogive (cumulative frequency curve) engezantsi ibonisa inani lemiyalezo yesocial media ethunyelwe ngabafundi abayi120 ngosuku.



Sebenzisa iogive ukuphendula imibuzo elandelayo.

- 1.1 Bangaphi abafundi abathumele imiyalezo engaphantsi kwe50? (2)
- 1.2 Qikelela imedian namba yemiyalezo ethunyelweyo ngosuku. (2)
- 1.3 Fumana i-interquartile range (IQR) yedatha. (3)
- 1.4 Zoba ibox and whisker dayagram yedatha kwinambalayini enikiweyo kwiNCWADI YOKUPHENDULELA, ukuba iminimum ngu0 nemaximum ngu60. (2)
- 1.5 Imean namba yemiyalezo ilinganiswe ngoqikelelo olulingana no37. Phawula kwidistribution yedatha. (2)

[11]

UMBUZO 2

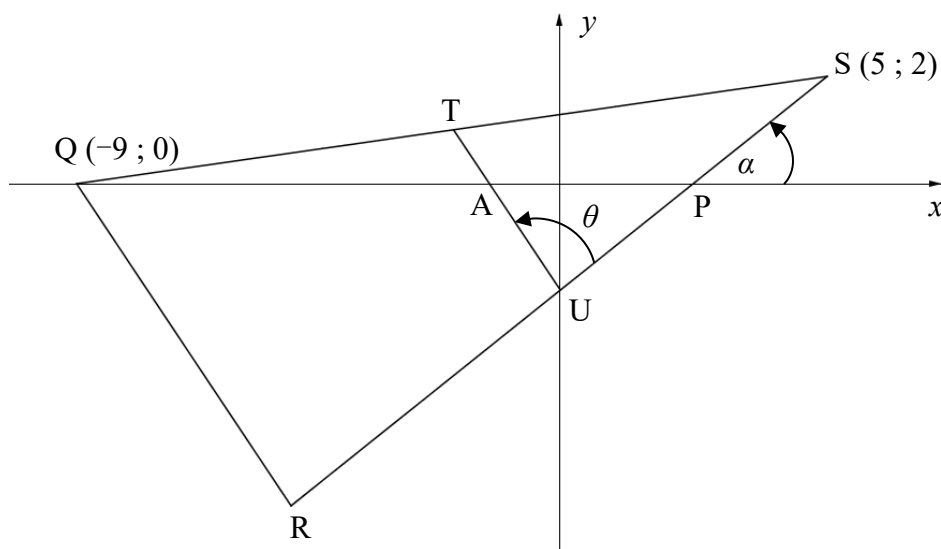
Kwiqela lezemidlalo yesikolo, iimbaleki ezisibhozo ezincinci zachongwa. Itheyibhile engezantsi ibonisa iiyure ngeveki zeweighthlifting zabo kunye nomgama (ngokweemitha) abanokujula ngawo ijavelin.

Umfundi	1	2	3	4	5	6	7	8
Inani leeyure (x)	5	12	15	20	25	30	42	45
Umgama weJavelin (y)	130	118	115	95	88	72	48	30

- 2.1 Khalityhuleyitha istandard deviation somgama wejavelin. (2)
- 2.2 Khalityhuleyitha icorrelation coefficient (r) yedatha. (1)
- 2.3 Fumana i-ikhweyizhini yeleast squares regression line. (3)
- 2.4 Umfundi ongachongwanga wachitha i35 yeeyure ngeveki kwiweightlifting.
- 2.4.1 Sebenzisa iregression ikhweyizhini ukuqikelela umgama anokuwuthatha kwijavelin. (2)
- 2.4.2 Ingaba ukunyusa iiyure zokuzilolonga kungawuphucula umgama wejavelin? Xhasa impendulo yakho. (2)
- [10]

UMBUZO 3

Kwidayagram engezantsi, $S(5; 2)$, $Q(-9; 0)$ no R ziivertices zika ΔSQR . Upoyinti T yimidpoyinti ka QS . I-ikhweyizhini ka SR inikwe ngo $5y = 4x - 10$. U yi y -intercept ka TAU no $SPUR$. A no P bakwi x -axis. $\hat{TUS} = \theta$. I-inclination ka $SPUR$ ngu α .

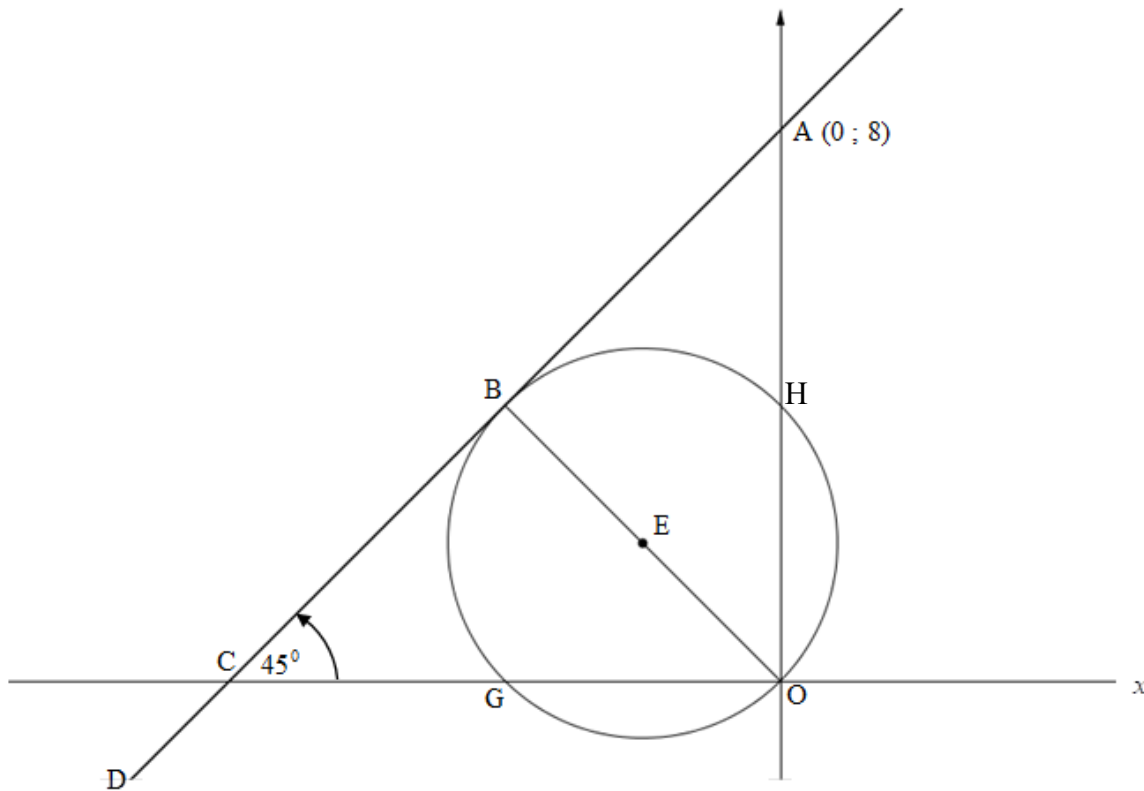


- 3.1 Khalityhuleyitha iikho-odineyithi zika T , imidpoyinti ka QS . (2)
- 3.2 Khalityhuleyitha iikho-odineyithi zika U . (2)
- 3.3 Khalityhuleyitha ubude buka SU . (2)
- 3.4 Kunikwe ukuba $3x + 2y + 27 = 0$ yi-ikhweyizhini ka QR , bonisa ukuba $uQR \parallel TU$. (3)
- 3.5 Ngoko okanye kungenjalo, bhala ubude buka QR . (2)
- 3.6 Fumana isayizi ka θ . (4)
- 3.7 Fumana ieriyi ka ΔSQR (4)

[19]

UMBUZO 4

Isekile enosenta E inqumla kwiorigin. Isekile i-intasekhtha i x -axis kuG ne y -axis kuH. Itangent yesekile kuB inqumla i y -axis kuA (0 ; 8) yenze iengile ka 45° ne x -axis.



- 4.1 Bhala igradiyenti kaAD. (1)
- 4.2 Fumana i-ikhweyizhini kaOB. (3)
- 4.3 Fumana iikho-odineyithi zikaB, ukuba i-ikhweyizhini yetangent inikwe: $y = x + 8$ (3)
- 4.4 Khalityhuleyitha ubude beradius yesekile. (3)
- 4.5 Fumana i-ikhweyizhini yesekile ngokwefom $(x-a)^2 + (y-b)^2 = r^2$ (4)
- 4.6 Zeziphi iivelyu zika t apho i-ikhweyizhini $y = x + t$ ingayitangent yesekile? (2)
- 4.7 Enye isekile eneikhweyizhini $(x-4)^2 + (y-8)^2 = 9$ inikiwe. Fumana ukuba ezi sekile ZIMBINI ziyadibana na okanye hayi. Xhasa impendulo yakho. (4)

[20]

UMBUZO 5

5.1 Unikwe: $\sin 49^\circ = q$, fumana okulandelayo ngokweethem zika q :

5.1.1 $\tan 41^\circ$ (2)

5.1.2 $\cos 229^\circ$ (2)

5.1.3 $\sin 4^\circ$ (4)

5.2 Unikwe: $f(x) = \frac{\sin(x - 180^\circ) \cdot \sin(90^\circ + x)}{\sin^2 x - \cos^2(360^\circ - x)}$

5.2.1 Simplifaya u $f(x)$ ibeyitrigonometric ratio enye ka x . (7)

5.2.2 Zeziphi iivelyu zika $x \in [-180^\circ + 0^\circ]$, apho u $f(x)$ e-undefined? (2)

[17]

UMBUZO 6

6.1 Unikwe: $\cos(A - B) = \cos A \cos B + \sin A \sin B$

Sebenzisa ifomyula enikwe ngentla ukudirayiva ifomyula ka $\cos(A + B)$ (3)

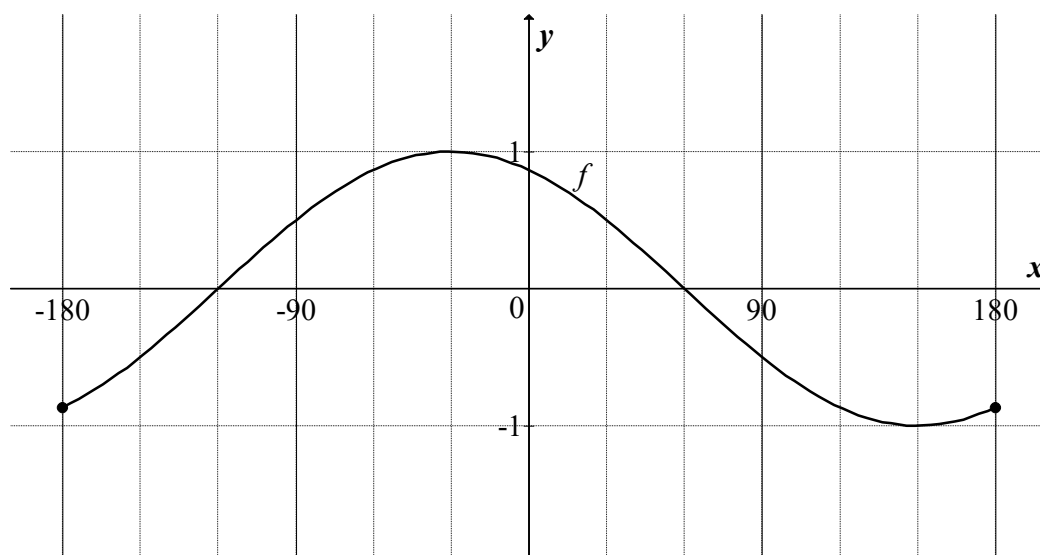
6.2 Ungasebenzisanga khalithyuleyitha, pruva ukuba

$$\frac{\sin 22^\circ \cdot \cos 320^\circ + \sin 40^\circ \sin 68^\circ}{\sin 391^\circ \cdot \cos 31^\circ} = 2 \quad (6)$$

6.3 Kunikiwe ukuba u $\cos 2x + 5 \sin x = 3$. Fumana iivelyu zika x kwi-intavali apho u $-360^\circ \leq x \leq 0^\circ$ (5)
[14]

UMBUZO 7

Unikwe: $f(x) = a \cos(x + p)$ apho u $x \in [-180^\circ; 180^\circ]$



7.1 Fumana iivelyu zika a no p . (2)

7.2 Bhala iPeriod ka f (1)

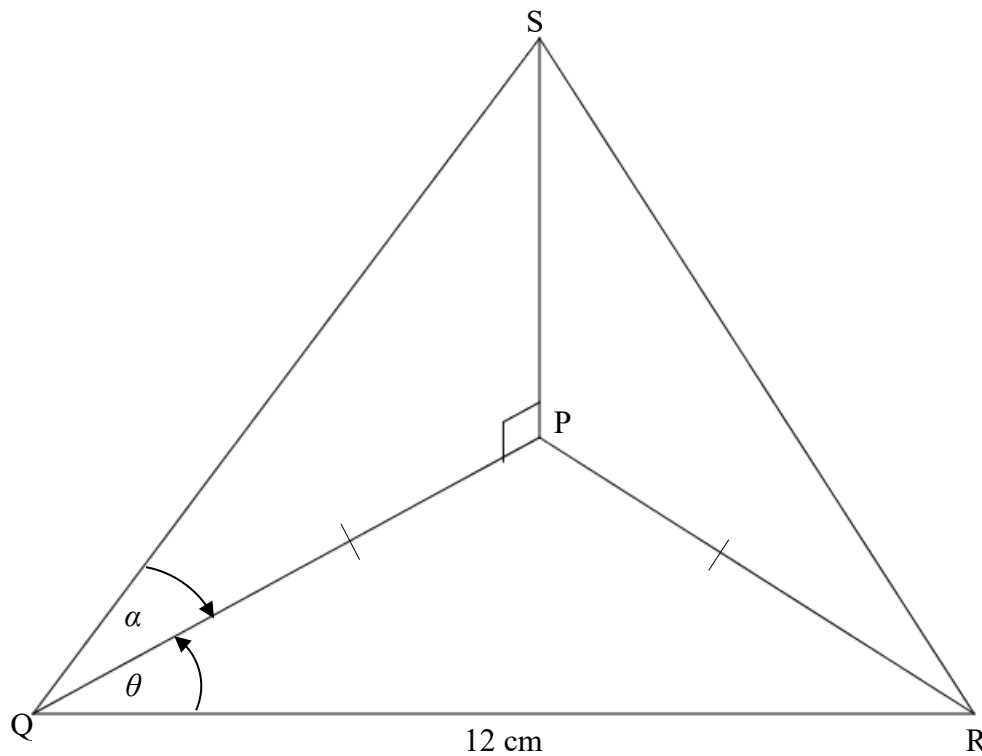
7.3 Sketsha igrafu ka $g(x) = -\sin x$, apho u $x \in [-180^\circ; 180^\circ]$ kwi-grid enikiweyo kwi-NCWADI YOKUPHENDULELA. Bonisa ngokucacileyo ii-intasephthi nee-axes. (3)

7.4 Bhala iivelyu zika x apho u $g(x) = f(x)$ kwi-intavali u $x \in [-180^\circ; 180^\circ]$. (2)

7.5 Fumana irange ka h , ukuba u $h(x) = -g(x) - 2$. (2)
[10]

UMBUZO 8

Kwidayagram, uQ, P no R ziipoyinti kwi-same horizontal plane. S yincochoyi yevertical tower. $QR = 12 \text{ cm}$, $\hat{SQP} = \alpha$ no $\hat{PQR} = \theta$. $PQ = PR$



8.1 Bonisa ukuba $uSQ = \frac{6}{\cos \theta \cos \alpha}$ (6)

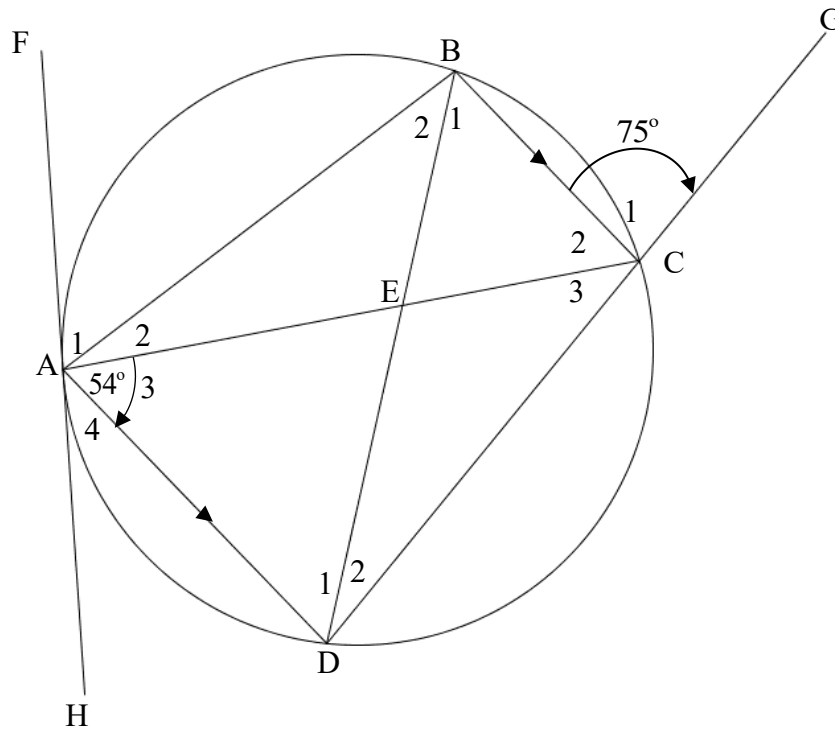
8.2 Ukuba kunikwe u $\theta = 50^\circ$ no $\alpha = 35^\circ$, khalityhuleyitha ubude bukaSQ. [Sondeza impendulo yakho kwiindawo ezimbini zedesimali.] (2)
[8]

UMBUZO 9

9.1 Gqibezela itheorem engezantsi:

Exterior angle of a cyclic quadrilateral ... (1)

9.2 Kwidayagram engezantsi, uABCD yicyclic quadrilaterali. DC wandisiwe ukuya kuG. FAH yitangent kwisekile kupoyinti A. $BC \parallel AD$, $\hat{C}_1 = 75^\circ$ no $\hat{A}_3 = 54^\circ$.



Fumana isayizi yee-engile ezilandelayo unike izizathu:

9.2.1 $\hat{A}_2$ (2)

9.2.2 $\hat{D}_2$ (2)

9.2.3 $\hat{A}_1$ (3)

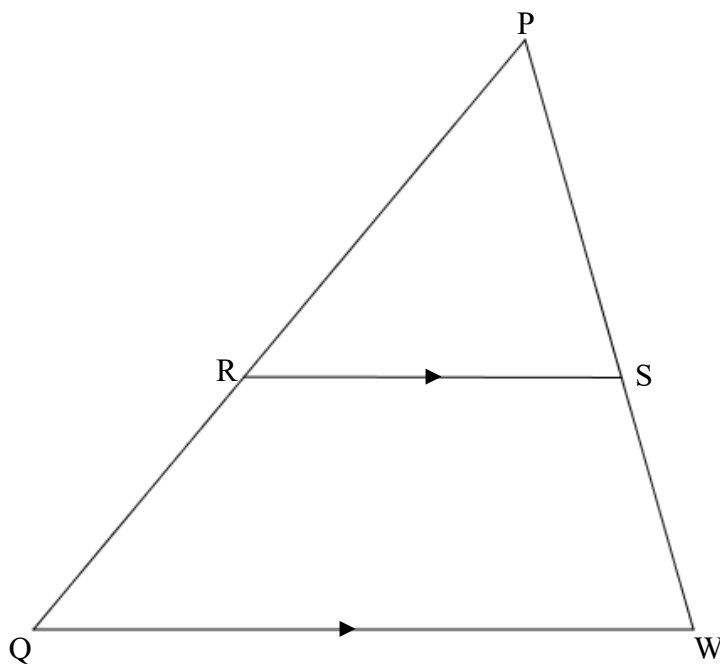
9.2.4 Nika isizathu sokuba uAE = ED. (3)

[11]

UMBUZO 10

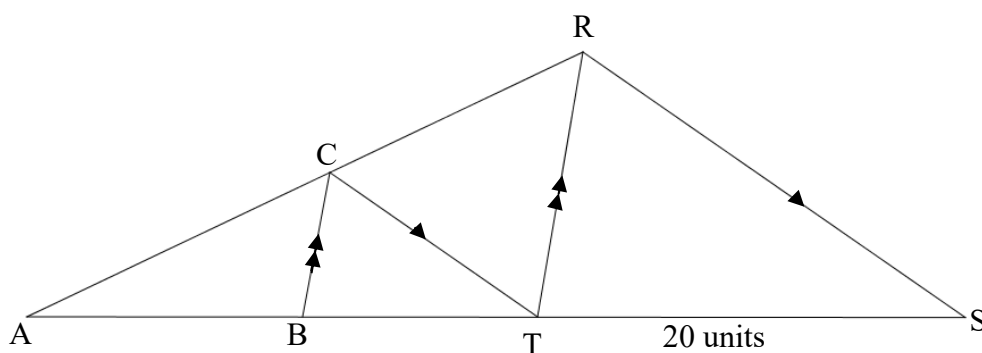
- 10.1 Kwidayagram engezantsi, i $\triangle PQW$ izotywe noR kwicala likaPQ noS kwicala likaPW. uRS udivyanisiwe ukuze $uRS \parallel QW$. Pruva ithethe ethi, line drawn parallel to one side of a triangle divides the other two sides proportionally,

i.e. pruva ukuba: $\frac{PR}{RQ} = \frac{PS}{SW}$.



(5)

- 10.2 Kwidayagram engezantsi, i $\triangle ARS$ izotywe noC kulayini AR, B noT kulayini AS. $BC \parallel TR$ no $CT \parallel RS$. $TS = 20$ units ze u $AC : AR = 3 : 8$.



Khalityhuleyitha ubude buka:

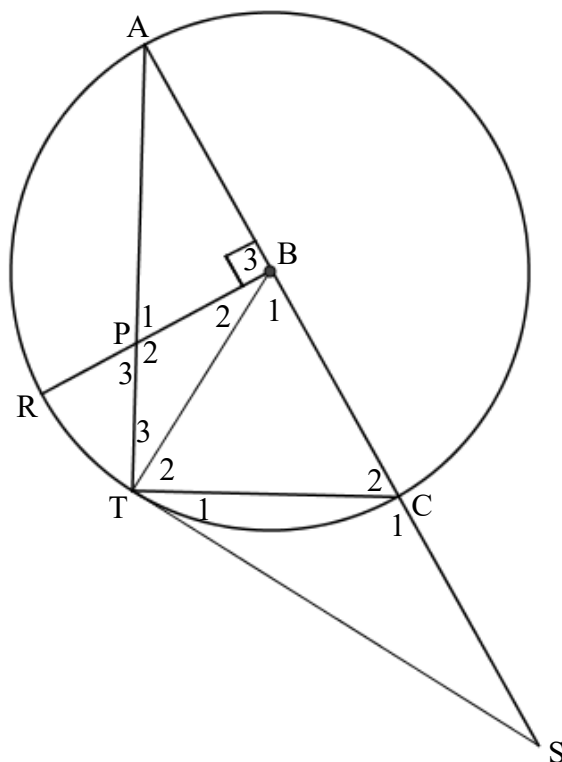
10.2.1 AT (4)

10.2.2 AB (3)

[12]

UMBUZO 11

Kwidayagram engezantsi, uA, R, T noC ziipoyinti kwicircumference yesekile. uB yisenta yesekile. ABC idayametha yesekile wandisiwe ukuya kuS. TS yitangent yesekile kuT. BPR uperpendicular kuABC.



- 11.1 Nika ezinye iiengile EZIMBINI ezilingana no $\hat{T}_1$, unika izizathu. (3)
- 11.2 Pruva ukuba uPBCT yicyclic quadrilateral. (3)
- 11.3 Pruva ukuba u $\triangle SCT \parallel \triangle BPT$ (4)
- 11.4 Pruva ukuba $uSC = \frac{ST \cdot BP}{AB}$ (2)
- 11.5 Nika isizathu kutheni u $\hat{BTS} = 90^\circ$ (1)
- 11.6 Ukuba kunikwe u $BR = CS$, pruva ukuba u $TS = 3BP$. (5)

[18]

EWONKE: 150

IPHEPHA LEENKCUKACHA: IMATHEMATIKA

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$y = mx + c \quad y - y_1 = m(x - x_1)$$

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

$$m = \tan \theta$$

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

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

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

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

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

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

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

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

$$\bar{x} = \frac{\sum x}{n} \quad \sigma^2 = \frac{\sum (x_i - \bar{x})^2}{n}$$

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

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

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

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