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Province of the
EASTERN CAPE
EDUCATION

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

NATIONAL SENIOR CERTIFICATE

IBANGA 12

SEPTEMBA 2026

IMATHEMATIKA P2

AMANQAKU: **150**

IXESHA: **3 iiyure**

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

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IMIYALELO NEMIQATHANGO

Funda imiyalelo elandelayo ngocoselelo phambi kokuphendula imibuzo.

1. Eli phepha lemibuzo linembuzo eli11.

2. Phendula YONKE imibuzo kwiNCWADI EKHETHEKILEYO YOKUPHENDULELA enikiweyo.

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

4. Iimpendulo kuphela AZINYANZELEKANGA ukunikwa amanqaku apheleleyo.

5. Ungayisebenzisa isayentifikhi khalityhuleyitha 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 leenkcukacha elineefomyula lifakiwe ekugqibeleni kwephepha lemibuzo.

9. Bhala ngokucocekileyo nangokucacileyo.

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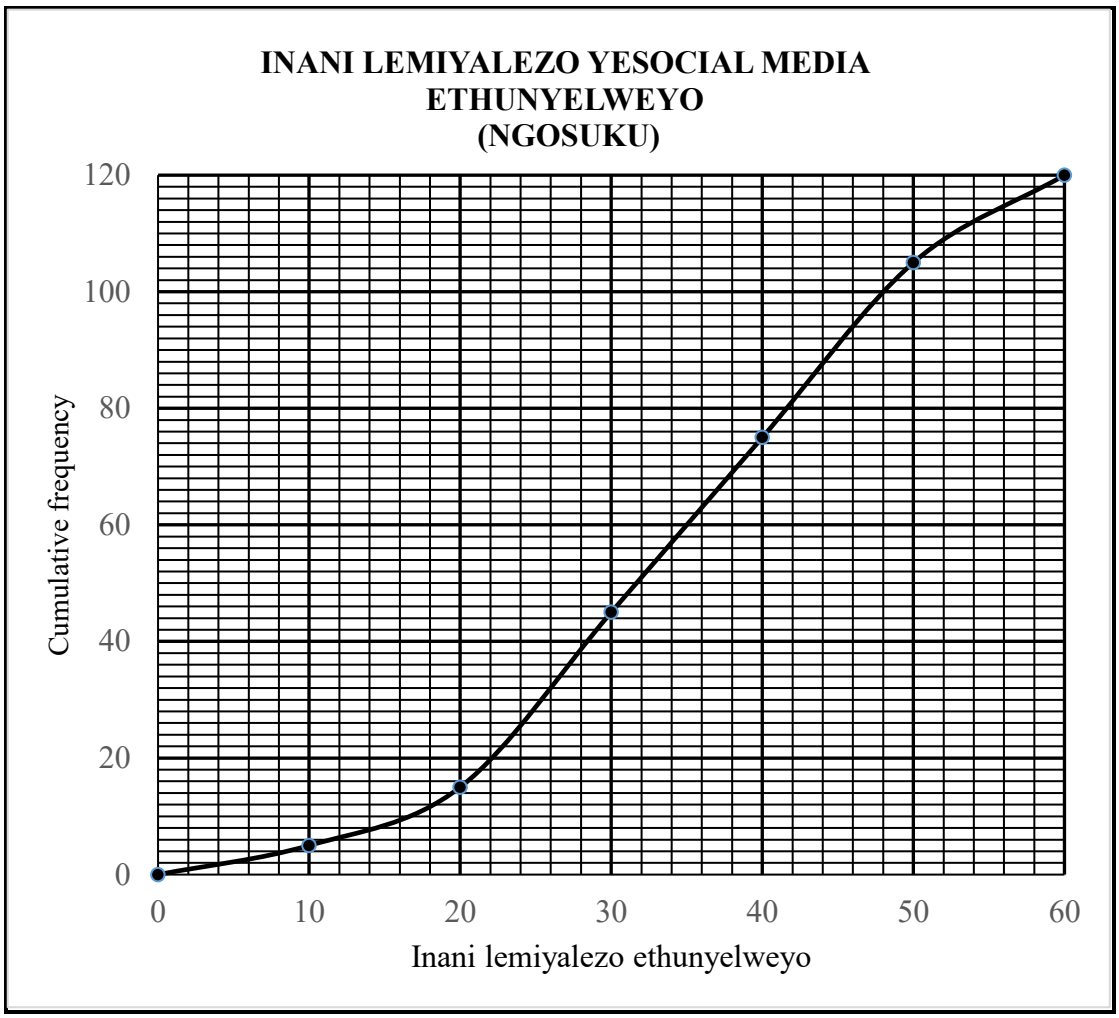
UMBUZO 1

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)

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UMBUZO 2

Kwiqela lezemidlalo yesikolo, iimbaleki ezisibhozo ezincinci zachongwa. Itheyibhile engezantsi ibonisa iiyure ngeveki zeweightlifting 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)

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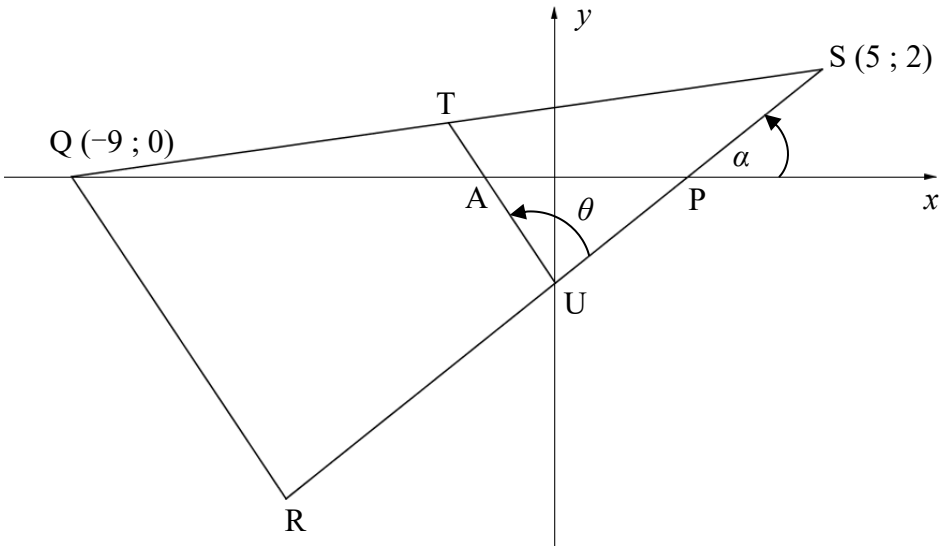
UMBUZO 3

Kwidayagram engezantsi, S (5 ; 2), Q (−9 ; 0) no R ziivertices zika Δ SQR. Upoyinti T yimidpoyinti kaQS. I-ikhweyizhini kaSR inikwe ngo $5y = 4x - 10$. U yi y-intercept kaTAU noSPUR. A no P bakwi x-axis. $T\hat{U}S = \theta$. I-inclination kaSPUR ngu α.



3.1 Khalityhuleyitha iikho-odineyithi zikaT, imidpoyinti kaQS. (2)

3.2 Khalityhuleyitha iikho-odineyithi zikaU. (2)

3.3 Khalityhuleyitha ubude bukaSU. (2)

3.4 Kunikwe ukuba $3x + 2y + 27 = 0$ yi-ikhweyizhini kaQR, bonisa ukuba uQR || TU. (3)

3.5 Ngoko okanye kungenjalo, bhala ubude bukaQR. (2)

3.6 Fumana isayizi ka θ. (4)

3.7 Fumana ieriya ka Δ SQR (4)

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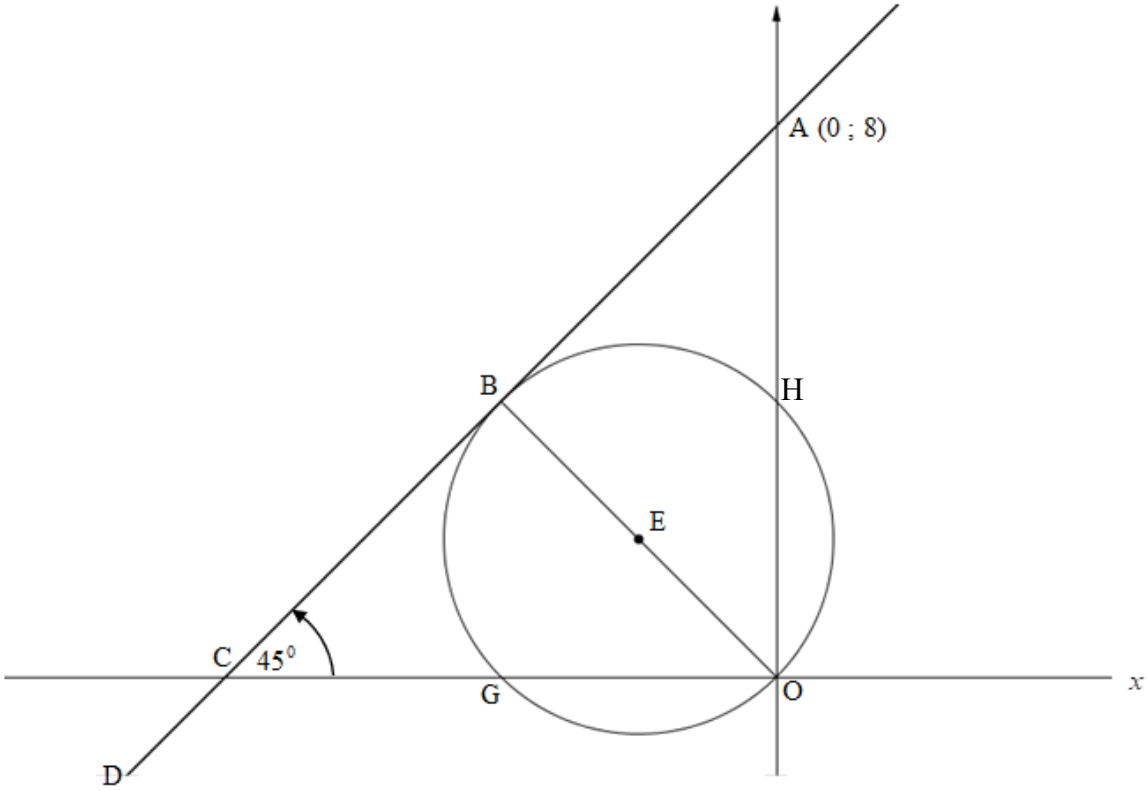
UMBUZO 4

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)

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UMBUZO 5

5.1 Unikwe: $\sin 49^0 = q$, fumana okulandelayo ngokweethem zika q:

5.1.1 $\tan 41^0$ (2)

5.1.2 $\cos 229^0$ (2)

5.1.3 $\sin 4^0$ (4)

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

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)

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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 khalityhuleyitha**, pruva ukuba

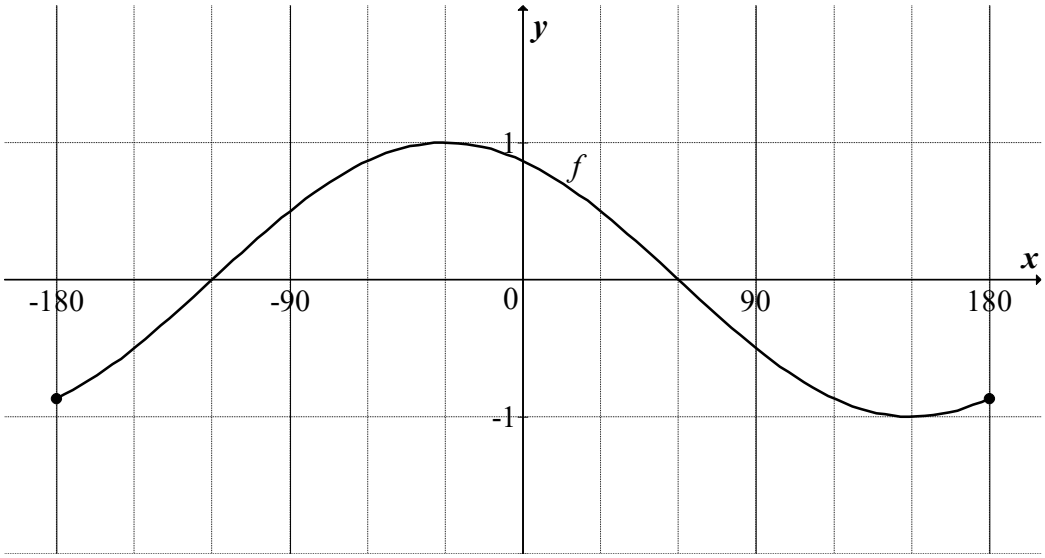
$$\frac{\sin 22^{\circ}.\cos 320^{\circ}+\sin 40^{\circ}\sin 68^{\circ}}{\sin 391^{\circ}.\cos 31^{\circ}}=2$$ (6)

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

[14]

UMBUZO 7

Unikwe: $f(x)=a\cos(x+p)$ apho u $x\in[-180^{0};180^{0}]$



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 $x\in[-180^{0};180^{0}]$ kwigrid enikiweyo kwiNCWADI YOKUPHENDULELA. Bonisa ngokucacileyo ii-intasephthi nee-axes. (3)

7.4 Bhala iivelyu zika x apho u $g(x)=f(x)$ kwi-intavali u $x\in[-180^{0};180^{0}]$. (2)

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

[10]

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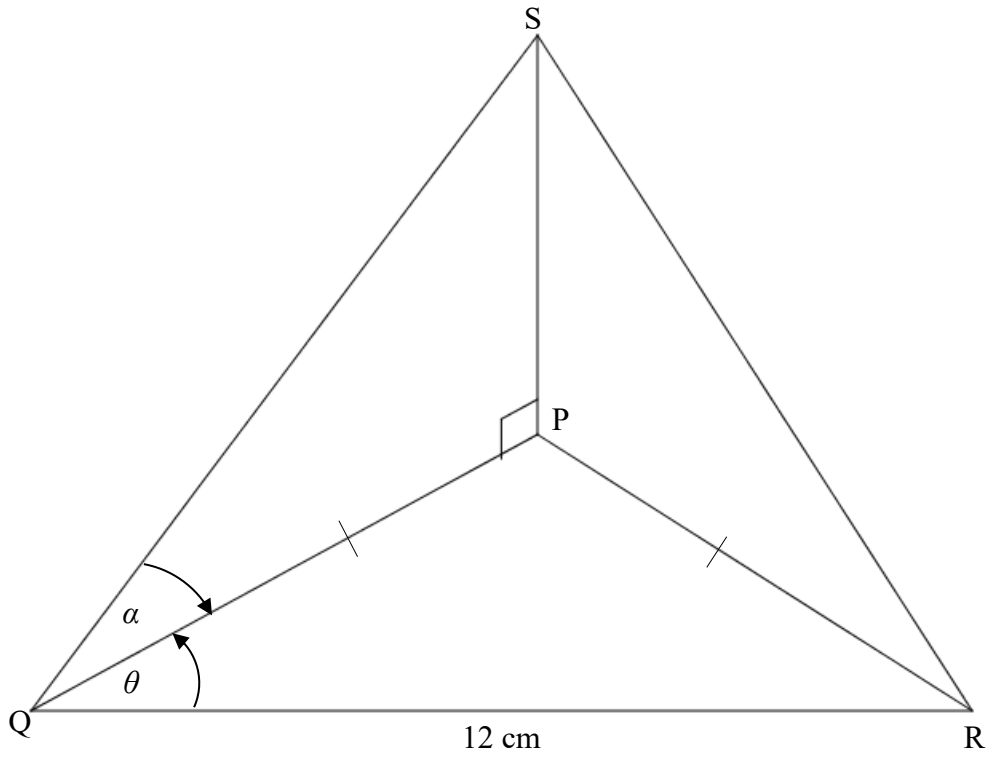
UMBUZO 8

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



8.1 Bonisa ukuba u $SQ = \dfrac{6}{\cos\theta\cos\alpha}$ (6)

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

[8]

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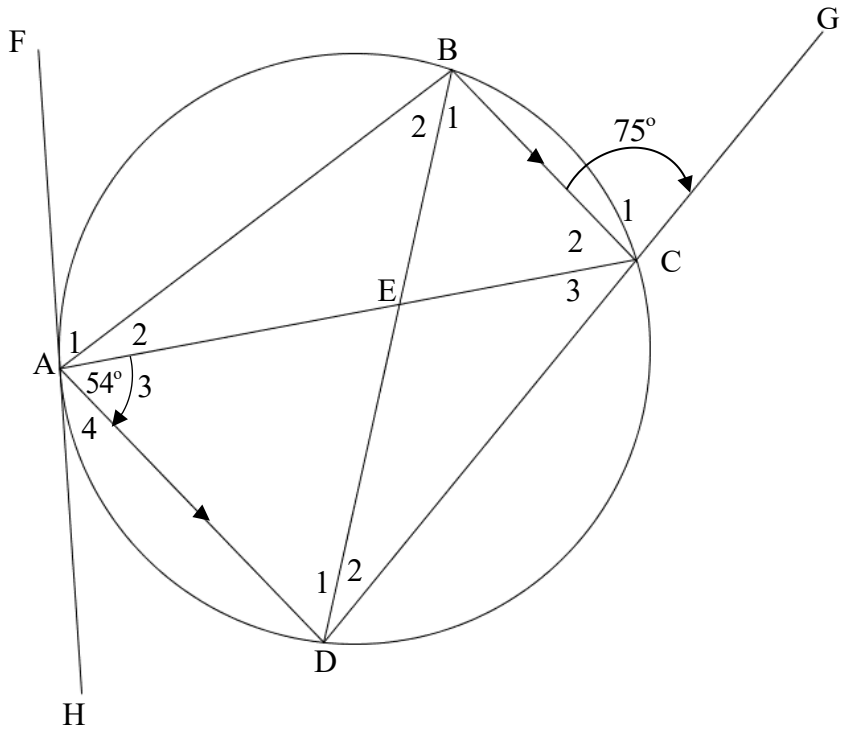
UMBUZO 9

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 ∥ 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)

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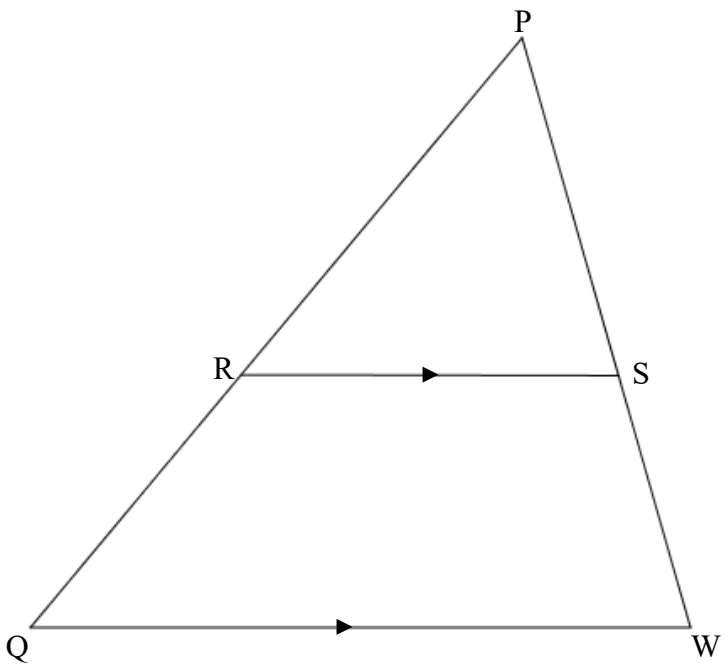
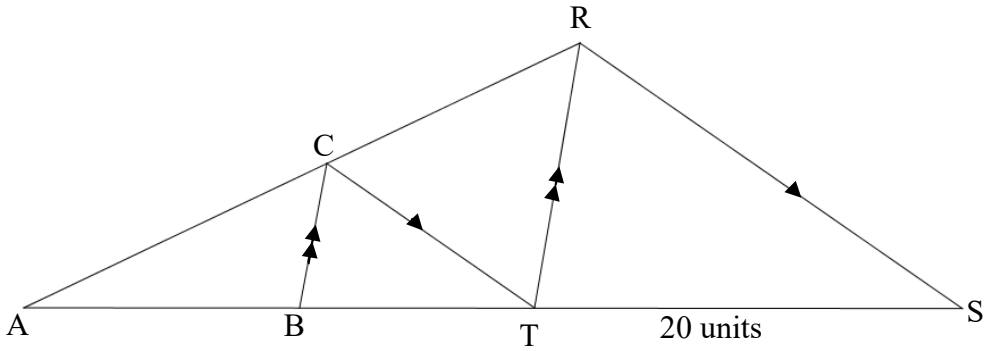
UMBUZO 10

10.1 Kwidayagram engezantsi, iΔPQW izotywe noR kwicala likaPQ noS kwicala likaPW. uRS udityanisiwe ukuze uRS || QW. Pruva itheorem 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,iΔARS izotywe noC kulayini AR, B noT kulayini AS. BC || TR noCT || RS. $TS = 20\,\text{units}$ ze u AC : AR = 3 : 8.



Khalityhuleyitha ubude buka:

10.2.1 AT (4)

10.2.2 AB (3)

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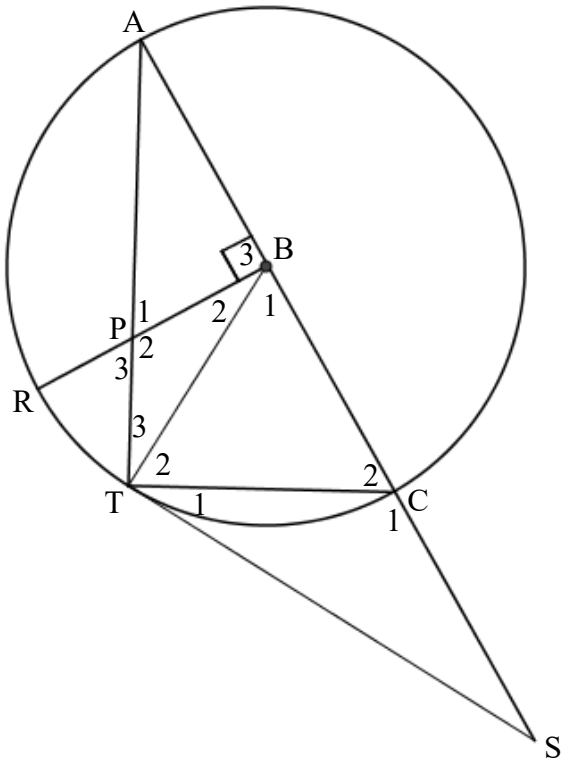
UMBUZO 11

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 $\Delta SCT \,|||\, \Delta BPT$ (4)

11.4 Pruva ukuba u $SC = \dfrac{ST.BP}{AB}$ (2)

11.5 Nika isizathu kutheni u $B\hat{T}S = 90^0$ (1)

11.6 Ukuba kunikwe u $BR = CS$, pruva ukuba u $TS = 3BP$. (5)

[18]

EWONKE: 150

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IPHEPHA LEENKCUKACHA: IMATHEMATIKA

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

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

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

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

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

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

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

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

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

In ΔABC: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$ $\qquad a^2 = b^2 + c^2 - 2bc.\cos A$ $\qquad area\,\Delta ABC = \dfrac{1}{2}ab.\sin C$

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

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

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

$$\bar{x} = \frac{\sum x}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n} \qquad P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

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

Ilungelo lokushicilela likhuselekile

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