



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL  
SENIOR CERTIFICATE**

**IBANGA 12**

**SEPTEMBER 2020**

**IMATHEMATIKA P2**

**AMANQAKU: 150**

**IXESHA: 3 iiyure**

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Eli phepha lemibuzo linamaphepha ali 15, kudibene nephepha eli 1 lolwazi,  
kunye nencwadi yokuphendulela enamaphepha ayi 25.

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**IMIYALELO NOLWAZI**

Funda imiyalelo ngocoselelo phambi kokuphendula imibuzo.

1. Eli phepha lemibuzo linemibuzo eyi 10.
2. Phendula YONKE imibuzo kwiNCWADI EKHETHIWEYO YOKUPHENDULELA enikiweyo.
3. Bonisa ngokucacileyo ZONKE iikhaltyhuleyshini, iidayagram, iiigrafu, njl.ozisebenzisileyo ukubonisa iimpendulo zakho.
4. Iimpendulo kuphela azinyanzelekanga UKUNIKWA amanqaku apheleleyo.
5. Ungayisebenzisa ikhaltyhuleytha esayentifikhi evunyiweyo (engaprogranyangwa nengenagrafikhi), ngaphandle kokuba uxelelwe ngeny'indlela.
6. Ukuba kunyanzelekile, sondeza iimpendulo kwiindawo EZIMBINI zedesimal, ngaphandle kokuba uxelelwe ngeny'indlela.
7. Iidayagram AZI zotywanga ngokwesikeyile (scale).
8. Iphepha lolwazi elineefomyula lifakiwe ekugqibeleni kwiphepha lemibuzo.
9. Bhala ngokucocekileyo nangokucacileyo.



**UMBUZO 1**

Itheybhile elandelayo ibonisa uthelekiso lwamanqaku okugqibela abafundi bebanga le 12 ngonyaka ka2019 kunye namanqaku eSchool Based Assessment (SBA) abafundi onyaka.

ABAFUNDI	1	2	3	4	5	6	7	8	9	10
AMANQAKU ESBA	99	93	77	74	63	62	63	63	47	37
AMANQAKU OKUGQIBELA	94	81	73	65	59	58	55	49	43	31

- 1.1 Fumana i-ikhweyzhini yezona zikwere zincinci zomgca werhigreshin (least squares regression line) zedatha. (Sondeza impendulo yakho kwindawo ye 4 echanekileyo yedesimal). (3)
- 1.2 Fumana ikhorheleyshin khoefishiyenti phakathi kwamanqaku eSBA namanqaku okugqibela. (1)
- 1.3 Phawula (Comment) ngekhoreleyshin phakathi kwamanqaku eSBA namanqaku okugqibela. (1)
- 1.4 Umfundi we11 wafumana i51% kwiSBA. Qikelela amanqaku okugqibela anokuwafumana, lungisa use kwiyunithi ekufutshane. (2)
- 1.5 Unikwe ukuba imin (mean) yamanqaku okugqibela ngu 60,8; khalityhuleytha ukuba bangaphi abafundi ababekwi diviyeshini enye yemin. (3)

**[10]****UMBUZO 2**

Isantya ngeekhilomitha ngeyure, somkhweli bhayisekhile sidlula ipoynti kumda weIronman Race warhekhodishwa watshwankathelwa kwitheybhile engezantsi:

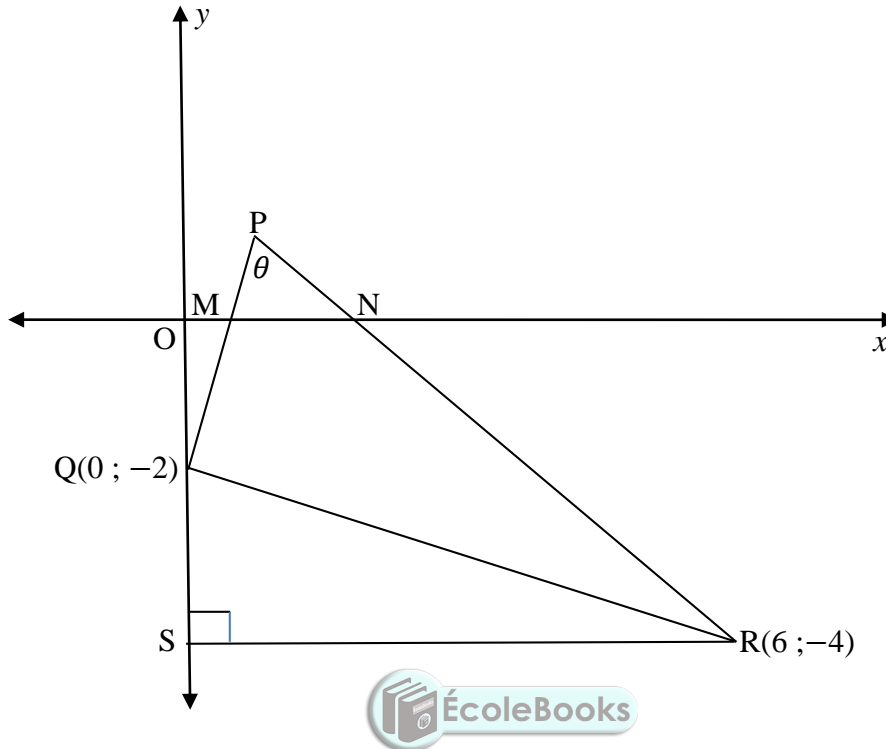
Isanya (km/h)	Ifrikwensi ( $f$ )	Tyhumulethive Frikwensi
$0 < x \leq 10$	10	10
$10 < x \leq 20$		30
$20 < x \leq 30$	45	
$30 < x \leq 40$	72	
$40 < x \leq 50$		170

- 2.1 Gqibezela itheybhile engentla, kwiNCWADI YOKUPHENDULELA oyinikiweyo. (2)
- 2.2 Sebenzisa iekheziz enikiweyo kwiNCWADI YOKUPHENDULELA ukuzoba ityhumulethive frikwensi khevu (cumulative frequency curve) yedatha engentla. (3)
- 2.3 Bonisa ngokucacile kwigrafu apho uqikelelo lwe quartile esezantsi (lower quartile) ( $Q_1$ ) nemidiyen (M) spidi (median speed) zinokufundeka. Bhala olu qikelelo. (2)
- 2.4 Zoba ibhokisi nedayagram yewhisker yedatha. Sebenzisa umgca manani kwiNCWADI YOKUPHENDULELA. (2)
- 2.5 Sebenzisa igrafu yakho ukuqikelela inani labakhweli zibhayisekile abagqitha kwipoynti ngesantya esingaphezulu kune 35 km/h (km ngeyure). (1)

**[10]**

### UMBUZO 3

Kwidayagram, P, Q (0 ; -2) no R (6 ; -4) zivethesis zetrayengli PQR. I-ikhweyzhin ka PQ ka  $3x - y - 2 = 0$ . I-ikhweyzhin ka PR ngu  $y = -x + 2$ . U RS uyiphendityhula ukusuka ku R ukuya kwi y-axis.  $\widehat{QPR} = \theta$ .

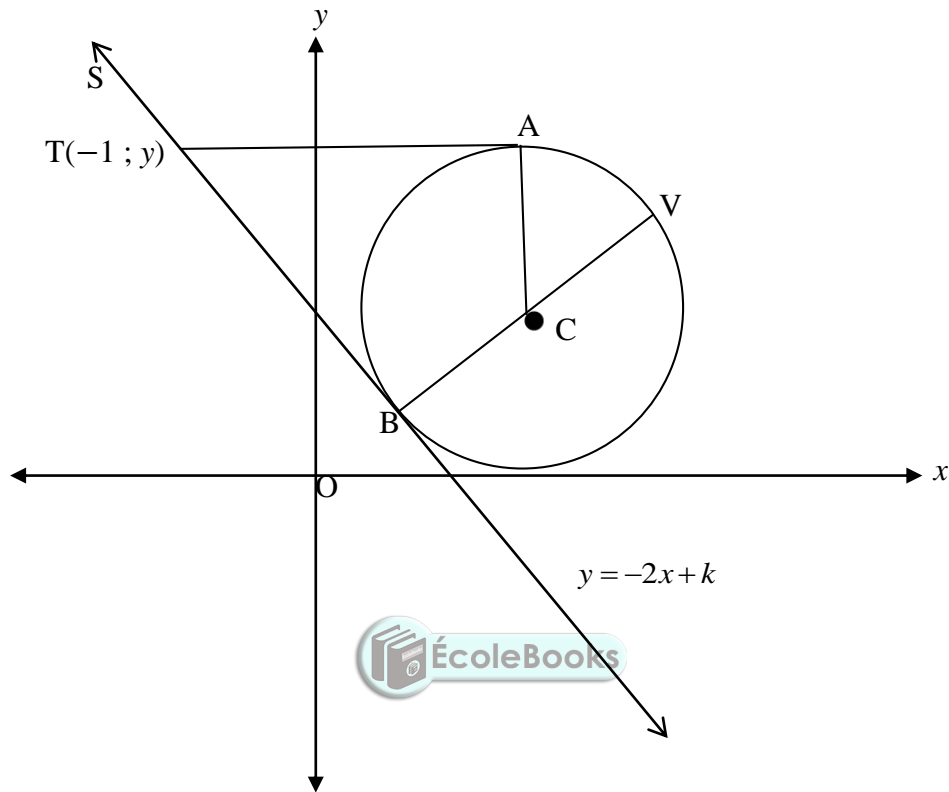


- 3.1 Khaltyhuleytha igradiyent ka QR. (2)
- 3.2 Nqina ukuba  $\widehat{PQR} = 90^\circ$ . (2)
- 3.3 Khaltyhuleytha iikho-odineyithi zika P. (3)
- 3.4 Khaltyhuleytha ubude buka QR. Shiya impendulo yakho ikwi surd form. (2)
- 3.5 Fumana i-ikhweyzhin yesekile ugqitha Q, P no R. Nika impendulo yakho ngokwefom:  $(x - a)^2 + (y - b)^2 = r^2$ . (5)
- 3.6 Khaltyhuleytha isayzi ka engile  $\theta$ . (5)
- 3.7 Khaltyhuleytha ieriyi ka  $\Delta PQR$ . (3)

[22]

## UMBUZO 4

Kwidayagram engezantsi, u C ngumbindi wesekile echazwe ngo  $x^2 - 6x + y^2 - 4y + 9 = 0$ . T  $(-1; y)$  yipoynti ngaphandle kwesekile. Iithanjenti ezimbini zizotywe ukuya kwisekile ukusuka kuT. U STB yithanjenti ukuya kwisekile ku B kwaye ine ikhweyzhin u  $y = -2x + k$  U TA yithanjenti kusekile A kwaye upharalel kwi  $x$ -ekhziz. U BV yidayamitha yesekile.



- 4.1 Fumana iikho-odineythi zika C. (4)
- 4.2 Fumana i-ikhweyzhin ka BV. (3)
- 4.3 Fumana i-ikhweyzhin yomgca TA. (1)
- 4.4 Khaltyhuleytha ubude buka TB. Nika izizathu. (4)
- 4.5 Khaltyhuleytha ivelyu ka  $k$ . (2)
- 4.6 Khaltyhuleytha isayzi ka  $\widehat{ACB}$ . Nika izizathu. (4)

[18]

**UMBUZO 5**

5.1 Ukuba  $u \cos 22^\circ = p$ ; fumana iithem ezilandelayozi ka  $p$ :

5.1.1  $\cos 158^\circ$  (2)

5.1.2  $\sin 112^\circ$  (2)

5.1.3  $\sin 38^\circ$  (4)

5.2 Fumana zonke iivelyu zika  $P$  kwi intavali ka  $[0^\circ; 360^\circ]$  eyonelisa i-ikhweyzhin:  
 $\sin P = \sin 2P$  (4)

5.3 Ukuba u  $\triangle ABC$  yi scalene triangle, bonisa ukuba:  $\cos(A + B) = -\cos C$  (2)

5.4 Nqina olufana lulandelayo:

$$\frac{\cos^2 x - \cos x - \sin^2 x}{2 \sin x \cdot \cos x + \sin x} = \frac{1}{\tan x} - \frac{1}{\sin x} \quad (5)$$

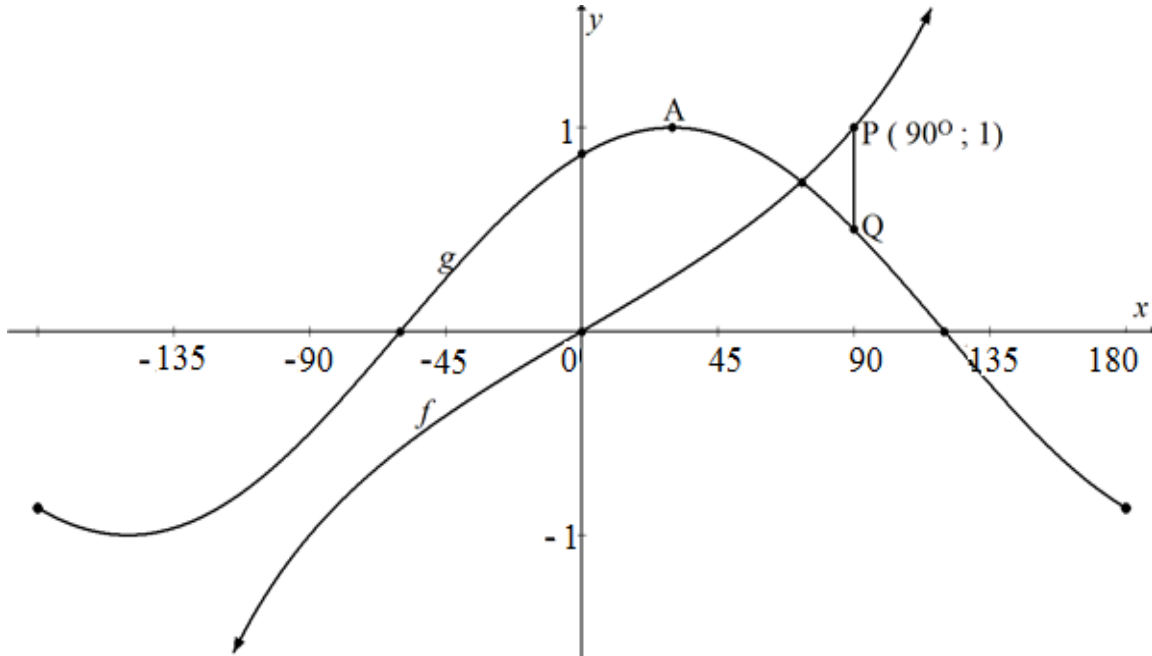
5.5 Fumana ijeneral sholushini ka:  $4 + 7 \cos \theta + \cos 2\theta = 0$ . (6)

**[25]**



## UMBUZO 6

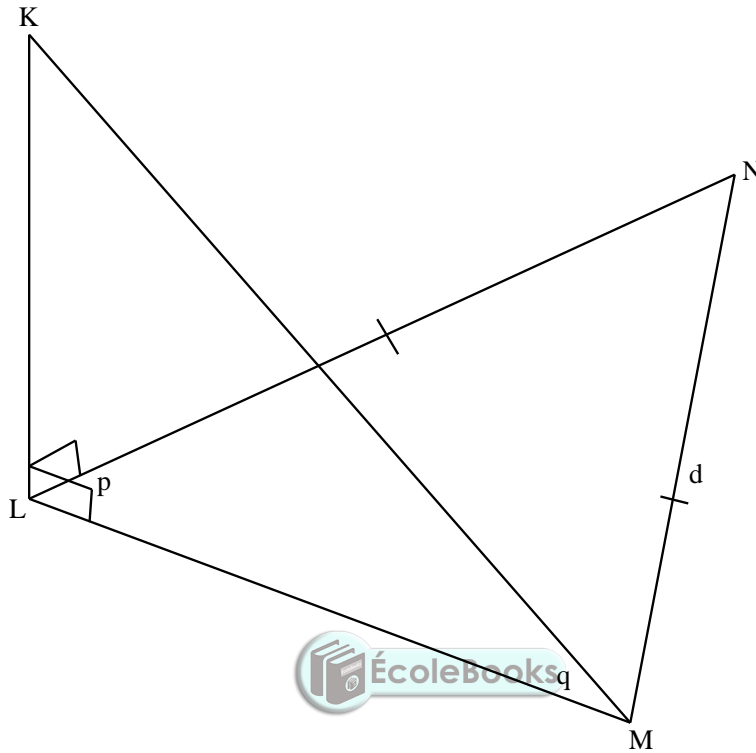
Kwidayagram engezantsi, iigrafu zika  $f(x) = \tan bx$  no  $g(x) = \cos(x - 30^\circ)$  zizotywe kwiseti enye ye ekhiz zika  $-180^\circ \leq x \leq 180^\circ$ . Iipoynti  $P(90^\circ; 1)$  no  $Q$  ilale ku  $f$  no  $g$  ngokulandelelana. Sebenzisa idayagram ukuphendula imibuzo elandelayo.



- 6.1 Fumana ivelyu ka  $b$ . (1)
- 6.2 Bhala iikho-odineyithi zika  $A$ , ipoynti ejikayo (turning point) ka  $g$ . (2)
- 6.3 Ukuba uPQ upharalel kwi  $y$ -ekhiziz, fumana iikho-odineyithi zika  $Q$ . (2)
- 6.4 Bhala i-ikhweyzhini ye asymptote(s) ka  $y = \tan b(x + 20^\circ)$  ka  $x \in [-180^\circ; 180^\circ]$ . (1)
- 6.5 Fumana irheyntji ka  $h$  ukuba  $h(x) = 2g(x) + 1$ . (2)
- [8]**

## QUESTION 7

Upoynti L, M no N bakwi pleyini ehorizontali. U KL yivethikhal thawa (vertical tower). Iengile ye eleveyshin (angle of elevation) ka K ukusuka ku M ngu  $q^\circ$ .  $\widehat{NLM} = p^\circ$ ;  $NL = NM = d$  no  $KL = h$ .



7.1 Fumana isayizi ka  $\widehat{LNM}$  ngokweethem zika  $p$ . (2)

7.2 Ngqina ukuba  $LM = \frac{d \sin 2p}{\sin p}$ . (2)

7.3 Bonisa ukuba  $h = 2d \cos p \tan q$ . (3)

[7]



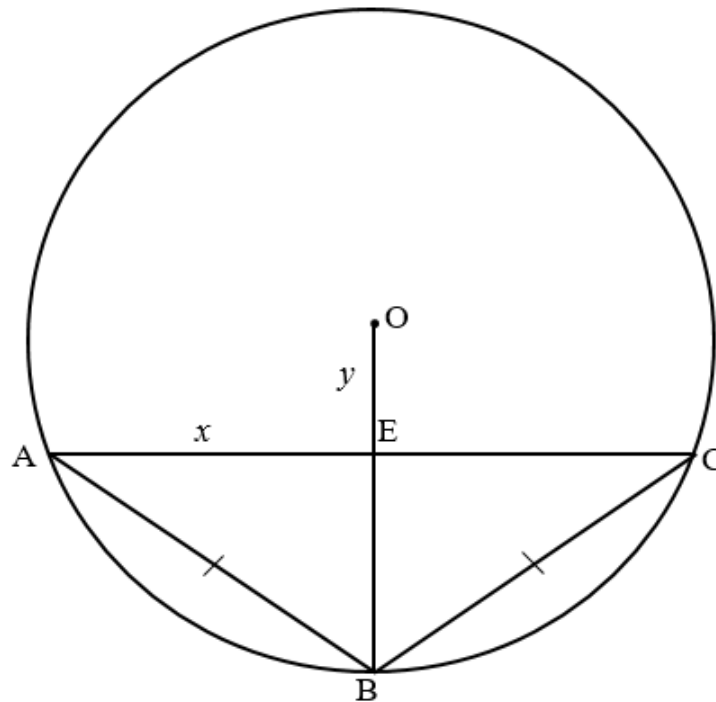
**UMBUZO 8**

8.1 Gqibezela ingxelo yethiyorem (theorem statement) elandelayo:

*Umgca ozotywe ukusuka embindini wesekile uphephendityula kwikhodi ...*  
*(The line drawn from the centre of a circle perpendicular to a chord ...)*

(1)

8.2 Kwidayagram engezantsi, isekile ABC enesenta O inikiwe.  $OB = 8$  yunithi no  $AB = BC = 10$  yunithi. U E yimidi poynti (midpoint) ka AC. U  $OE = y$  ze u  $AE = x$ .



Khaltyhuleytha ngezizathu, ubude buka OE.

(5)

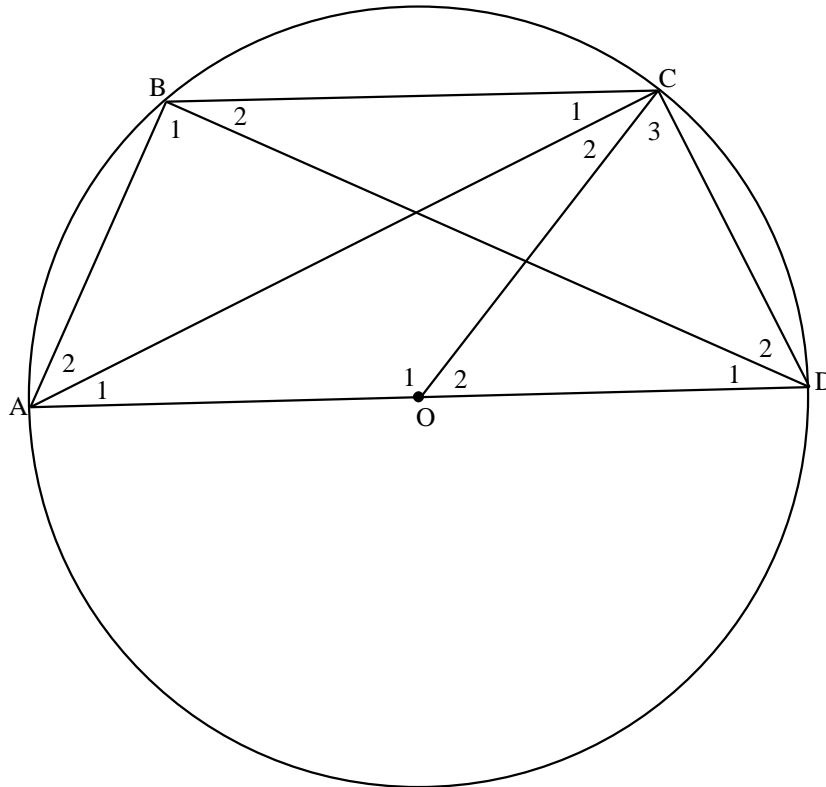
8.3 Gqibezela ingxelo yethiyorem (theorem statement) elandelayo:

*Iengile ebiyelwe yiakhi kwisenta/embindini wesekile iyi... kwisenta ( kwicala elifanayo lekhodi njengesenta).*

*(The angle subtended by an arc at the centre of a circle is ... at the circle (on the same side of the chord as the centre).*

(1)

8.4 Kwidayagram, u O uyisenta yesekile ABCD. U AOD yidayamitha aze u OC abe yirhedyas (radius). U AB, BC, CD, AC no BD babe yimgca estreythi (straight lines).



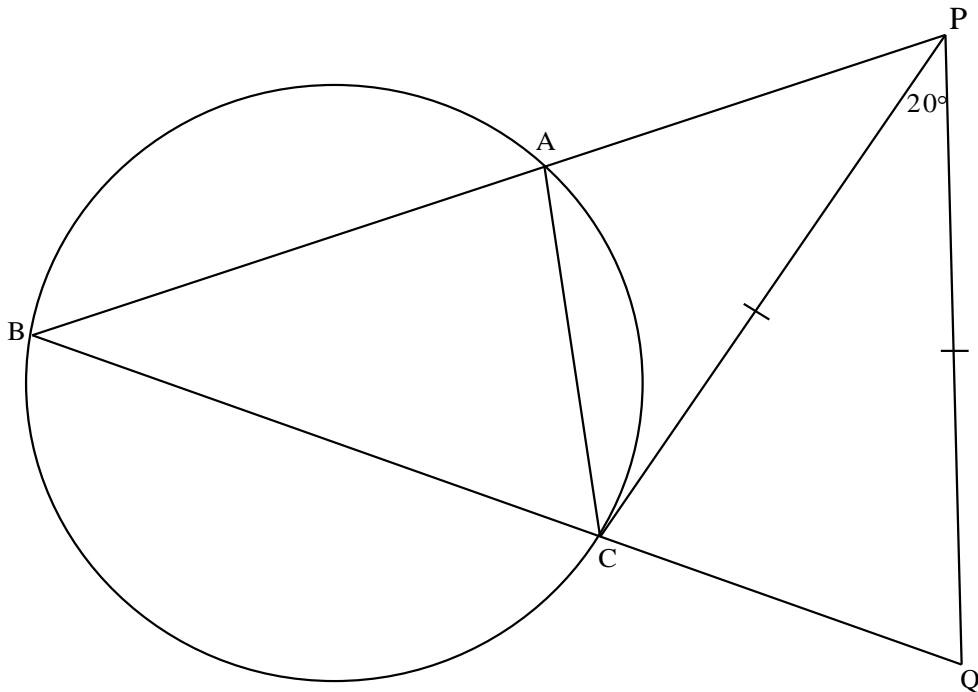
Bhala ngezizathu, i-ikhweyzhin echaza ingxininise uzalwano phakathi kweqela ngalinye lee-engile ezinikiweyo.

	IIENGILE	I-IKHWEYZHIN/ UZALANO	ISIZATHU
e.g.	$\hat{M}_3; \hat{P}$	$\hat{M}_3 = 2 \times \hat{P}$	$\angle$ at centre = $2 \times \angle$ at circum.
8.4.1	$\hat{O}_2; \hat{B}_2$		
8.4.2	$\hat{D}_1; \hat{C}_3; \hat{D}_2$		
8.4.3	$\hat{B}_1; \hat{B}_2; \hat{D}_1; \hat{D}_2$		
8.4.4	$\hat{D}_1; \hat{C}_1$		

(8)  
[15]

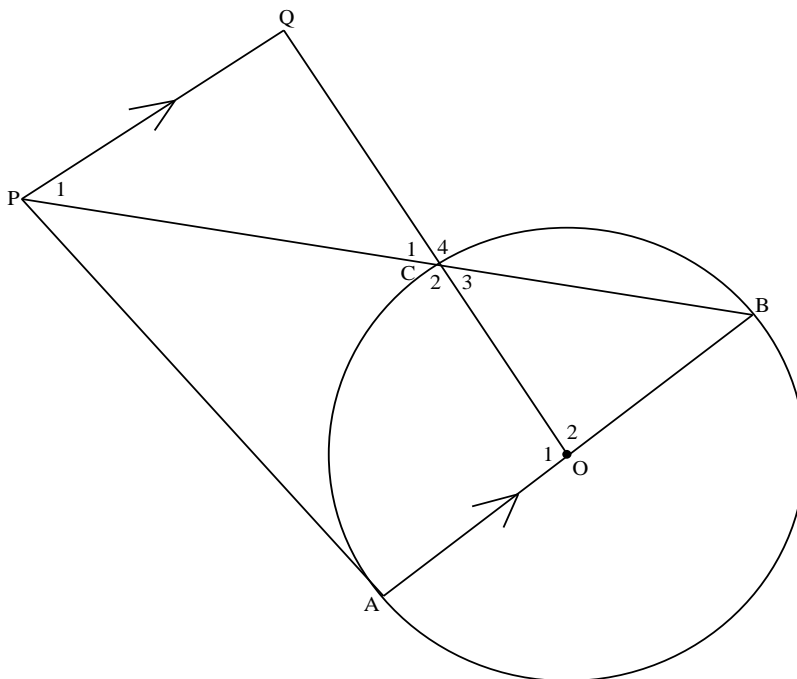
**UMBUZO 9**

- 9.1 Unikwe ukuba u PC yithanjenti kwisekile ACB; BAP no BCQ bayimigca estreythi. U PC = PQ and  $\widehat{CPQ} = 20^\circ$ .



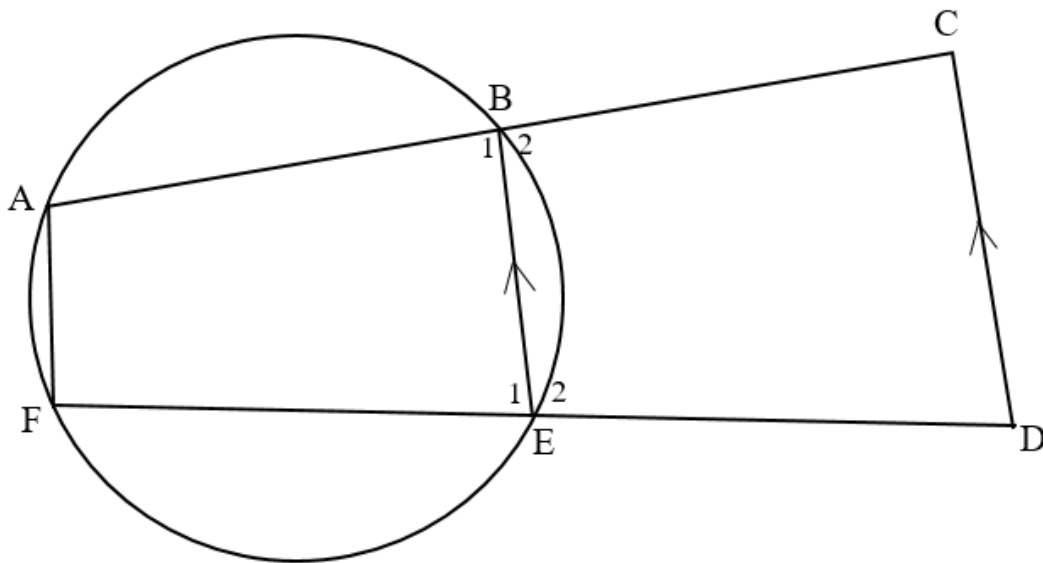
Ngqina, nika izizathu, ukuba u BC AKAYIYO idayamitha. (5)

- 9.2 Kwidayagram engezantsi, u O yisenta yesekile ABC. Ithanjenti PA kwisekile ze idayamitha AB zidibane ku A. U OCQ no BCP babeyimigca estreythi. U  $PQ \parallel AB$ .



Ngqina, unike izizathu, ukuba u  $PQ = QC$ . (6)

- 9.3 Kwidayagram engezantsi, iikhodi (chords) AB no FE zezsekile ezinesenta O zitsaliwe ukuya kwiipoynti C no D. U  $BE \parallel CD$ .



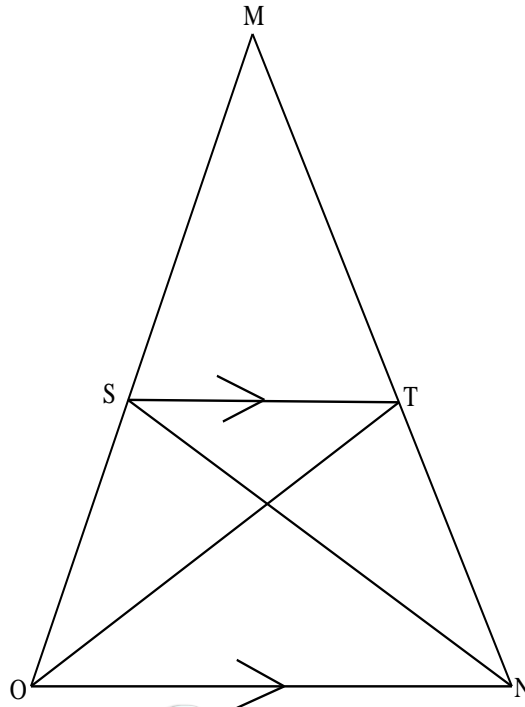
Ngqina ukuba u ACDF yi syklikh khwadrilatherali (cyclic quadrilateral).

(5)  
[16]



**UMBUZO 10**

- 10.1 Kwidayagram,  $\triangle MON$  uzotywe. U S yipoynti ku MO no T yipoynti ku MN kangankuba u  $ST \parallel ON$ . U SN no OT bazotywe.

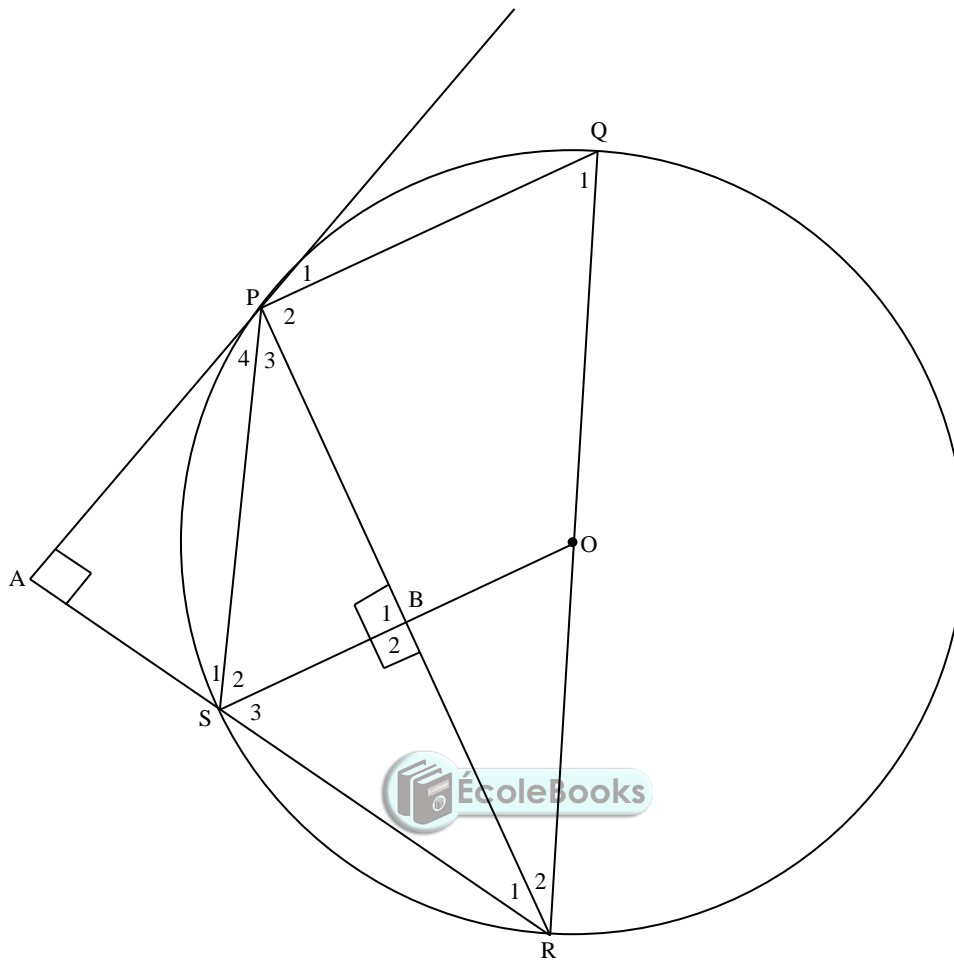


Sebenzisa idayagram kungqina itheorem ethi: a line parallel to one side of a triangle divides the other two sides proportionally. Ngamanye amagama, ngqina

ukuba:  $\frac{MS}{SO} = \frac{MT}{TN}$ .

(5)

10.2 Kwidayagram, u O yisenta yesekile. U PQRS yi sayklich khwadrilatherali (cyclic quadrilateral). Ithanjenti egqitha kuP i-intasekthe uRS otsalwe ku A. U  $OB \perp PR$  no  $PA \perp AS$ .



Ngqina ukuba:

10.2.1  $\Delta APS \parallel \Delta BRS$  (3)

10.2.2  $AP \cdot RS = BR \cdot PS$  (1)

10.2.3  $\hat{P}_4 = \hat{R}_2$  (4)

10.2.4  $BR \cdot RQ = RS \cdot RP$  (6)

[19]

**EWONKE: 150**

**IPHEPHA LOLWAZI: IMATHEMATIKA**

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

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

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

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

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

$$\sum_{i=1}^n 1 = n \quad \sum_{i=1}^n i = \frac{n(n+1)}{2}$$

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

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

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

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

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

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

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

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

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

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

$$y = mx + c$$

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

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

$$m = \tan \theta$$

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



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

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

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

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

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

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

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

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

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

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

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

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

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